TOWN OF WINDSOR

WINDSOR RESILIENCY FOR EMERGENCIES AND DISASTERS INITIATIVE (READI)

EXECUTIVE SUMMARY

February 2022



ACKNOWLEDGMENTS

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Acknowledgments
This Plan, and the Town of Windsor, recognizes the Indigenous Peoples who were the original stewards of the lands upon which the Town now resides. The Town of Windsor is located on the traditional and ancestral homelands of the Southern Pomo and Graton Rancheria and lands used by a variety of other Tribes. The Town honors the resilience and continued presence of all Indigenous communities and Tribal Nations today and are grateful for the opportunity to continue to collaborate with these Nations now and into the future.

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INTRODUCTION

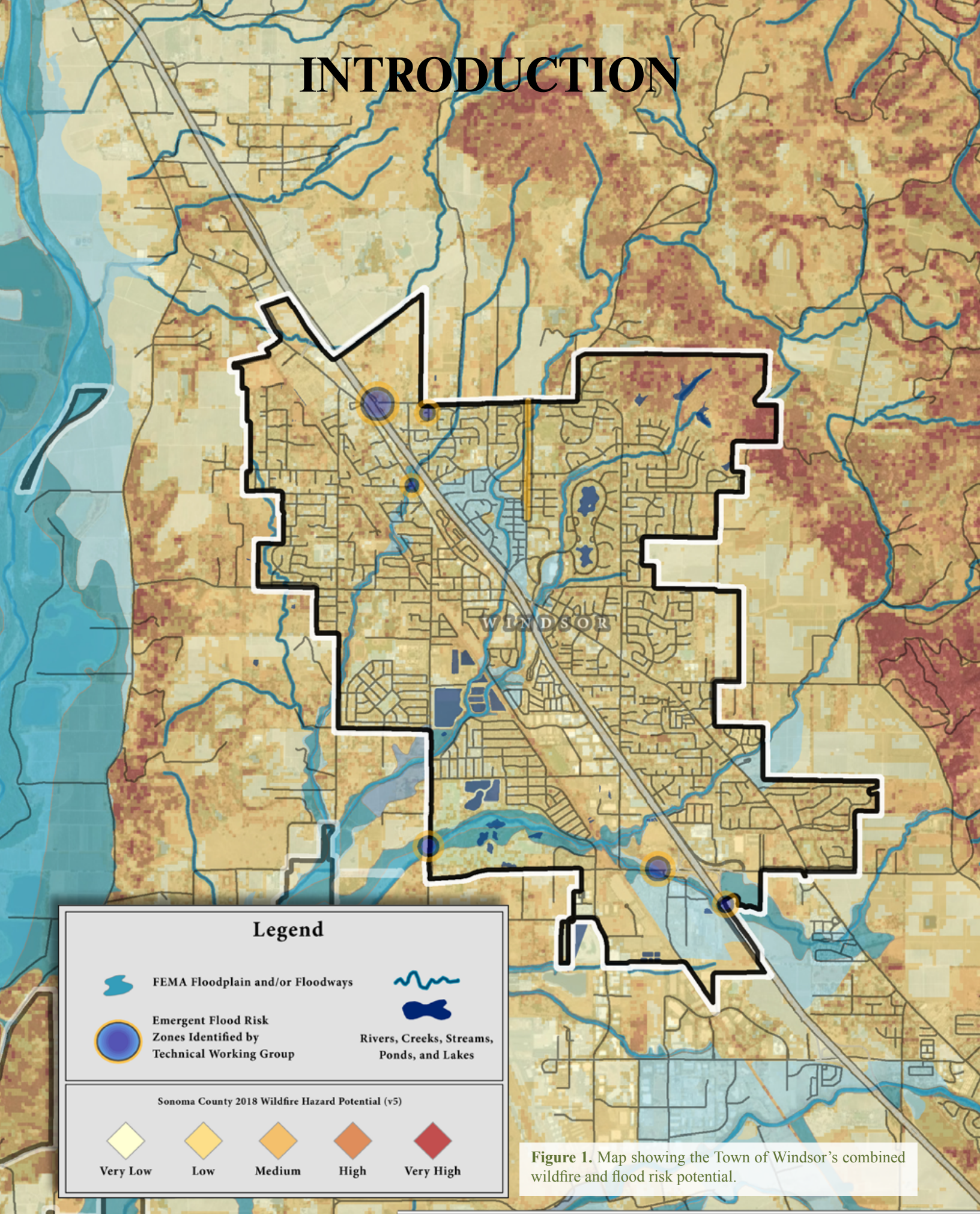
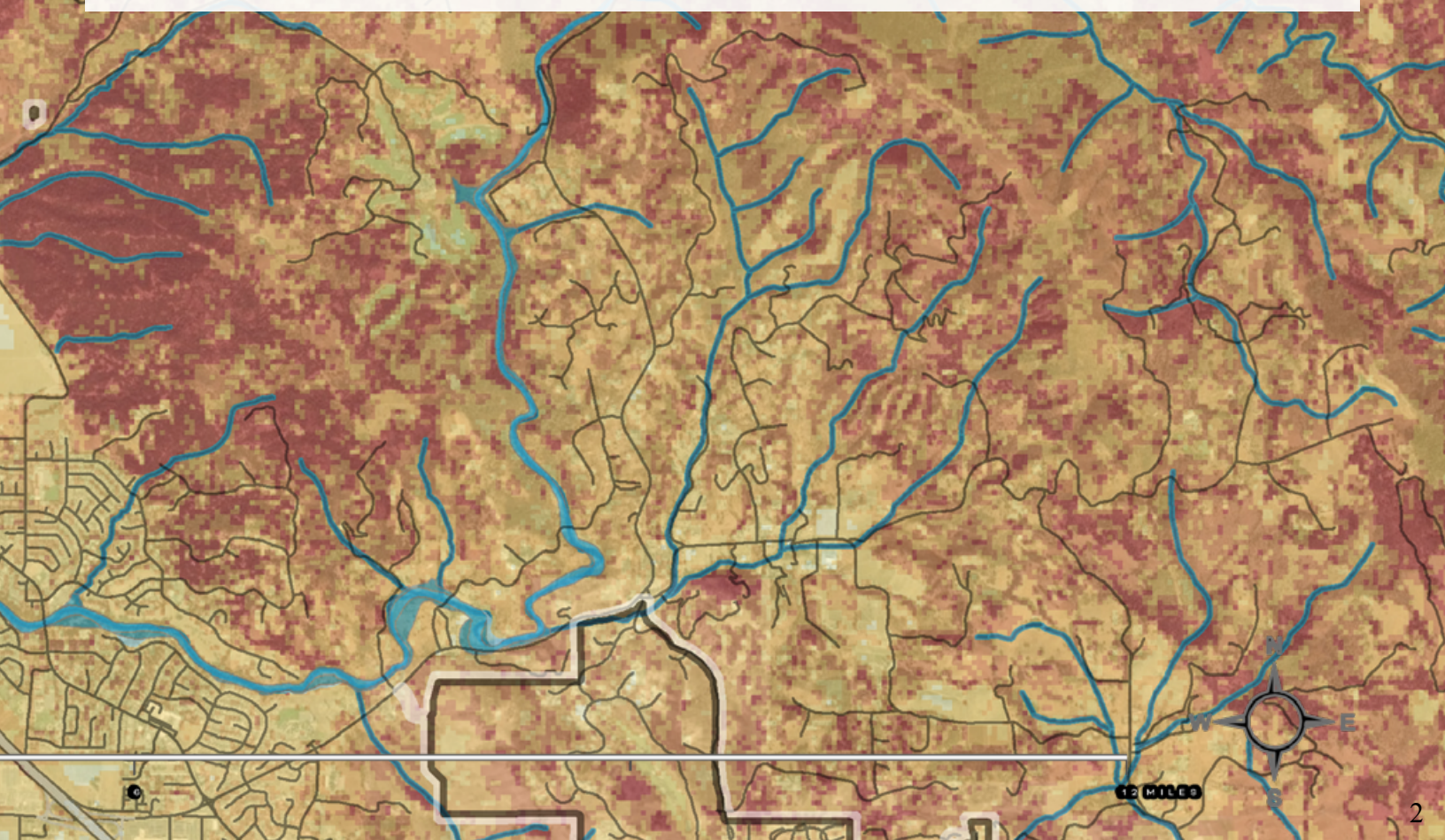


Figure 1. Map showing the Town of Windsor's combined wildfire and flood risk potential.

Windsor is on the front lines of the climate crisis. In recent years, wildfires have destroyed neighborhoods in nearby communities and blanketed the Town in smoke for weeks. In addition, local and regional droughts have been among the most intense ever recorded. Temperatures are increasing, extreme heat events are expected to get worse, and precipitation patterns are changing. Wildfires across the region and state are becoming hotter, more frequent, more severe, more damaging, and more deadly. Climate change impacts the Town of Windsor in a variety of ways; these impacts can affect the health and vitality of the community including local and regional transportation networks, emergency response and evacuation, homes and buildings, natural resources and systems, and the physical and mental health of Windsor's residents, workers, and visitors.

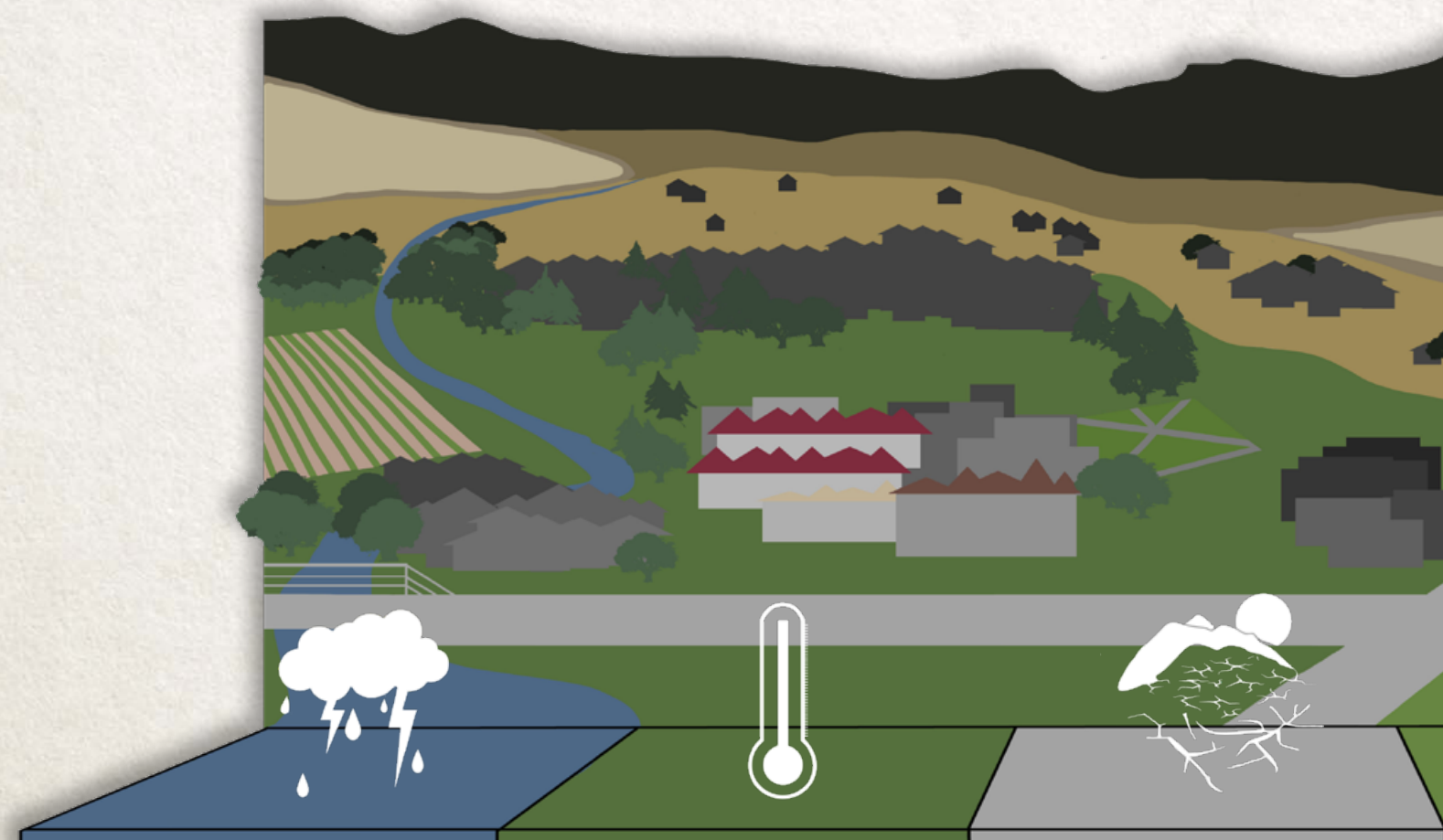
Windsor is on the front lines of the climate crisis. This Resilience Plan provides a roadmap to address the most pressing climate hazards facing the Town.

Windsor's leaders have recognized the need to address the climate crisis through both mitigation and adaptation measures. In order to minimize the most significant impacts of the climate change, it is essential that the Town continues to take action to reduce greenhouse gas (GHG) emissions at both the municipal and regional scales. Yet, the impacts of the climate crisis are already impacting the Town of Windsor and will continue to get worse. This Climate Resilience Plan builds on the Town's forward-thinking approach to reduce the impacts of climate change, including improving wildfire preparedness, emergency response, and land-use planning, all of which have been strengthened and improved in recent years. This Plan provides a roadmap to address the most pressing climate hazards facing the Town and highlights the necessity of partnering with the community to make bold and lasting progress on these climate challenges.



WINDSOR'S CHANGING CLIMATE

Human activity - specifically burning fossil fuels like coal, oil, and natural gas (among others) to create electricity, drive our cars, and heat our homes - is responsible for the changes we are seeing in our climate. The impacts of these emissions, and the associated warming, are being felt and observed across the globe, but the specific impacts vary regionally due to a multitude of factors. Average annual maximum temperatures in the Bay Area region have increased 1.7° F from 1950 through 2005 and are projected to continue to increase. Average annual maximum temperatures in Windsor are projected to increase 4.1° (RCP 4.5 average) to 7.2° (RCP 8.5 average) by the end of the century (2070-2099). Windsor already experiences highly variable precipitation patterns with some wet years and some dry years. For example, 2019 was extremely wet with large amounts of rainfall in the spring and early winter and a total accumulation of nearly 52 inches of precipitation. 2020 was very dry with only slightly more than 10 inches of precipitation over the course of the year. Research suggests that these cycles of wet and dry years will continue for much of the State of California. Changes in temperature and precipitation are the main climate drivers to multiple climate hazards.



INLAND FLOODING

The year to year variability of precipitation is projected to increase, with more intense storms and more precipitation falling in shorter amounts of time.

EXTREME HEAT

Average annual maximum temperatures may increase by up to 7.2° F by the end of the century. In addition, the number of extreme heat days (over 93.9° F) a year are projected to triple by the middle of the century.

DROUGHT

More variable precipitation patterns and hotter temperatures are projected to result in longer and more intense droughts, which will also further exacerbate wildfire risk.

7.2°

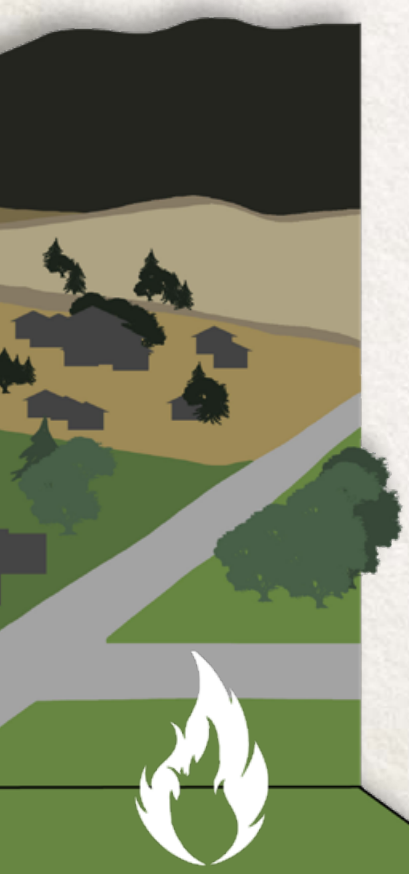
Projected increase in average annual maximum temperatures in the Town of Windsor by the end of the century (RCP 8.5).

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Number of extreme heat days (over 93.9° F) a year by the end of the century under the higher emissions (RCP 8.5) scenario, a more than five fold increase.

77%

Percentage increase in projected area burned by wildfire statewide by 2100 due to a variety of factors including climate change.



WILDFIRE

Wildfire risk is increasing in intensity, frequency, duration, timing, and severity with a potential 77% increase in area burned annually across the state by the end of the century.

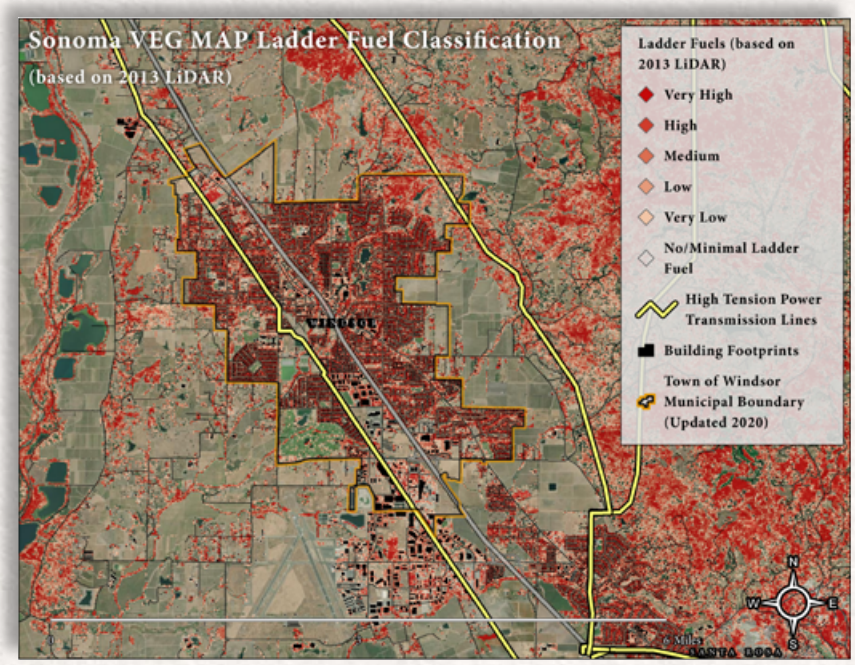
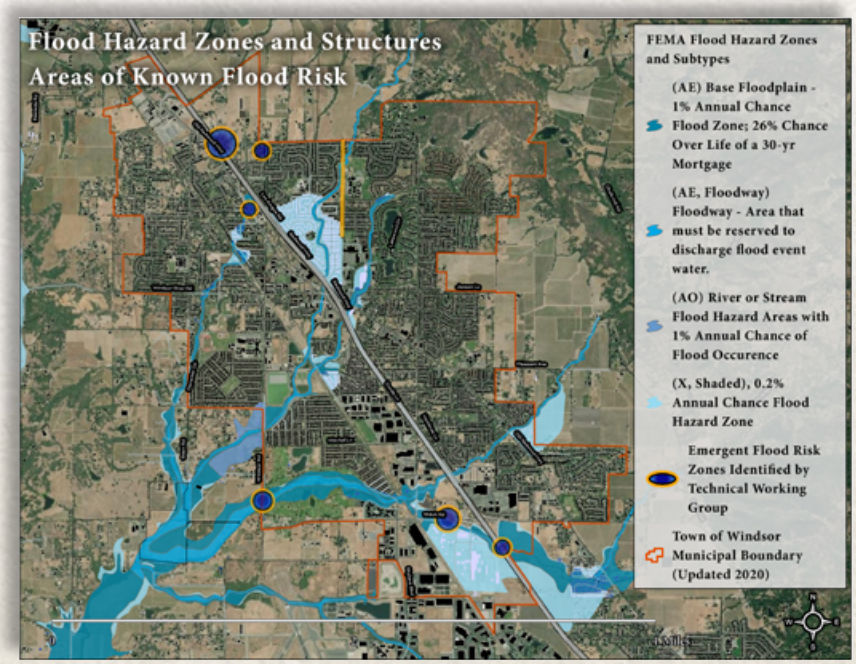


Figure 2. Map showing ladder fuel density for the Town of Windsor (above). Map showing known areas of flood risk for the Town of Windsor (below).



KEY VULNERABILITIES

In July 2021, the Town of Windsor published its first climate change vulnerability assessment. The Town of Windsor Community Vulnerability Assessment focused on identifying the relative vulnerability of key systems to changing climate conditions and specific climate hazards (wildfire, extreme heat, flooding, and drought). The following information is a summary of the results of the Vulnerability Assessment. More information can be found at www.windsorready.com/climate.

PEOPLE



Windsor residents are highly vulnerable to wildfire and extreme heat, have limited vulnerability to extreme precipitation events, and moderate vulnerability to drought conditions. Not all people will be affected equally as specific social and economic factors are shown to limit an individual or families' ability to prepare and respond to extreme weather events (e.g., preexisting health conditions such as asthma may make individuals more susceptible to wildfire smoke).

INFRASTRUCTURE



Windsor's infrastructure (e.g., transportation network) is moderately vulnerable to all of the identified climate hazards. Special considerations include outdated and aging infrastructure, limited resources and capacity for completing updates that can accommodate changing climate conditions, and limited funding available to support future updates and maintenance needs for Windsor's infrastructure systems.



BUILDINGS



Windsor's buildings are highly vulnerable to wildfires, moderately vulnerable to extreme precipitation events and drought, and have limited vulnerability to extreme heat events. Special considerations include older residential structures built prior to current code requirements, the potential risk to new developments from current and future climate hazards, and population growth in the region.

NATURAL SYSTEMS



Windsor's natural systems are highly vulnerable to drought, moderately vulnerable to wildfire and extreme heat events, and have limited vulnerability to extreme precipitation events. Special considerations include the innate cultural value of working lands, recreation, the region's natural resources, endemic and endangered species, and the adaptive capacity of species in the face of a changing climate.

ECONOMY



Windsor's economy has limited vulnerability to extreme precipitation events and moderate vulnerability to wildfire, extreme heat events, and drought. Special considerations include the ability of the region's prominent tourism-focused economy to adapt to changing climate conditions, local and regional population growth, and changing industries due to urbanization and population growth.



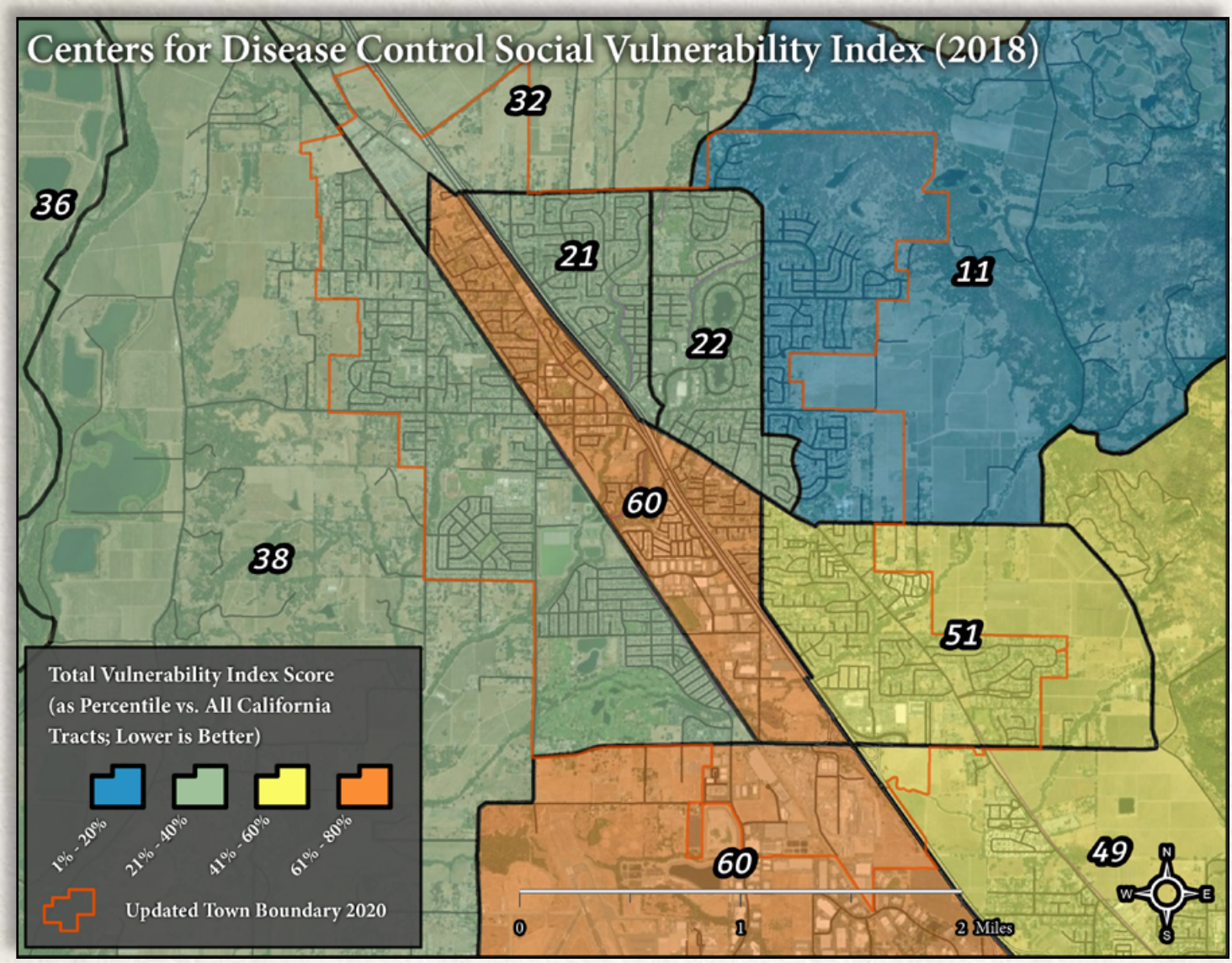


Figure 3. Map of Social Vulnerability Index (SVI) for census tracts in Windsor using data compiled by the Centers for Disease Control and Prevention (CDC). This compilation of 15 factors that are known to affect the ability of households and individuals to prepare for and respond to extreme weather events. Percentile rankings are relative to other census tracts in California where higher numbers (and warmer colors) are more vulnerable, and lower numbers (cooler colors) are less vulnerable to these events.

Decades of research on disasters and climate change have demonstrated that not all people are affected equally by extreme weather and climate events. Social factors, such as individual characteristics (age, gender, existing medical challenges, etc.), social status, capacities, networks, and resource availability can lead to distinctly different outcomes when these groups are exposed to extreme weather events. These "Communities of Concern" often experience the first and worst impacts of climate change. As a whole, Windsor is not among the most socially vulnerable communities in California, yet there are differential risks across the community that should be considered. The Centers for Disease Control and Prevention's Social Vulnerability Index (SVI) program compiles and aggregates U.S. census and other data to identify those areas or segments of the community that are more likely to face social, political, economic, or cultural challenges. While it is not possible to pinpoint the vulnerability of specific individuals or households, the composite indices highlight census tracts that are most likely to be home to individuals and households with heightened sensitivity to hazard and disaster events and that may be limited in their capacity to prepare for, respond to, recover from, and adapt to hazard exposures. **The most vulnerable areas of the community (around the Highway 101 corridor and the south-central portion of town) include households with children and older adults, those that speak Spanish as their first language (or languages other than English), mobile home neighborhoods, and those with pre-existing medical conditions.** Throughout the Resilience Plan, considerations for Communities of Concern are discussed in the context of each priority resilience strategy.

WHAT IS THE PLAN?

The Windsor Resilience Plan was developed as part of an 18-month Caltrans grant-funded initiative focused on helping the Town better understand climate risks facing the community and proactively address these risks and build resilience. The Plan was guided by community values and goals and founded on cutting-edge science and industry best practices on a variety of climate hazards. The Plan identifies near-term actions and establishes a road map for implementing bigger, bolder, and long-term actions over the coming decades.

The Windsor Resilience Plan addresses several of the Town's needs including:

1. Completing Transportation Infrastructure and Community Vulnerability Assessment;
2. Supporting and facilitating community discussions around a vision for a better and more resilient future;
3. Collaboratively developing strategies to reduce the risk of wildfire, drought, flooding, and extreme heat; and,
4. Completing a Resilience Plan that complies with State mandates for Climate Change Resilience Planning, and supports the Town's ability to compete for funding that enhances resilience efforts.

This plan IS	This plan IS NOT	Details
A Roadmap for Action	An Ordinance, Policy, Regulation, or Requirement.	Plan provides a roadmap to address the most pressing climate hazards facing the Town and priority action that could be implemented in the next few years. These are priority options that can be considered, not requirements.
A List of Potential Actions	A Commitment to Implement Actions as Written	The broad suite of high-quality potential and prioritized actions identified by this plan can be used to inform future choices the Town and the community make to enhance resilience. Inclusion of an action in the plan does NOT constitute a commitment to implement that action.
A Suite of Priority Actions	Detailed Final Analysis or Designs of Individual Actions	Key features of this plan are the 10-priority resilience strategy with implementation details and examples. While these priorities were selected by the community, Technical Working Group, and the project Core Team; and designed to address the key climate challenges facing the community, they do not include the final analysis or design work that will be required for any individual action to be implemented.
An Important Step to Building a Resilient Community	The Last Thing the Town will do to Prepare for Climate Change	The Plan represents an important step on the journey to build resilience but is not the end of the journey. The Town will need to commit to implement actions and continue to move forward with strategies and action that enhance resilience to ensure the health, vitality, and resilience of the community.

Figure 4. A summary table highlighting what the Plan is and is not.



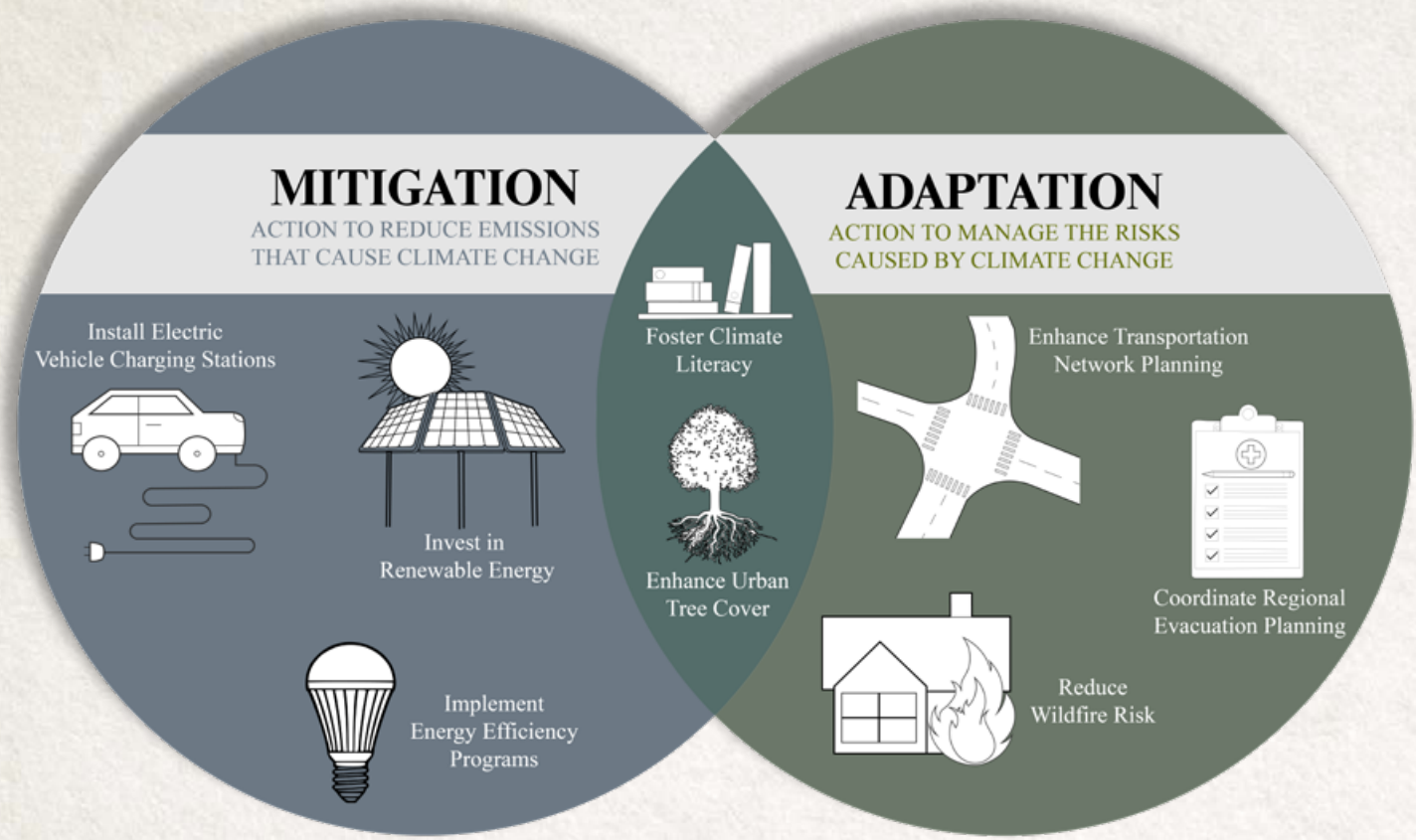


Figure 5. A diagram depicting the differences and relationships between climate change mitigation planning and climate change adaptation planning. The Windsor Resilience Plan was focused specifically on the climate change adaptation planning process.

In contrast to a climate change mitigation or "climate action" plan (a strategic plan designed to reduce greenhouse gas emissions), this resilience plan is designed to reduce the impacts of climate change on the Town of Windsor. The Town of Windsor has already made significant progress towards acknowledging the importance of prioritizing actions that reduce GHG emissions (mitigation) and this Plan represents another important step on the Town's journey to implement actions that reduce the risks caused by climate change (adaptation). Overall, mitigation strategies and adaptation strategies are distinctly different, but work together to create a more complete "solution" to addressing the climate crisis.



Timeline

The Windsor Resilience Plan successfully completes the first three phases of the adaptation planning process, as defined by the California Adaptation Planning Guide (Figure 6). Phase 4 - Implement, Monitor, Evaluate, and Adjust - is a crucial stage in the process and requires ongoing investment, refinement, and adjustment. Resilience planning requires multi-jurisdictional and cross-sector collaboration, identifying new funding sources, and building partnerships. Continuous updates to the Plan will be needed over the coming years.

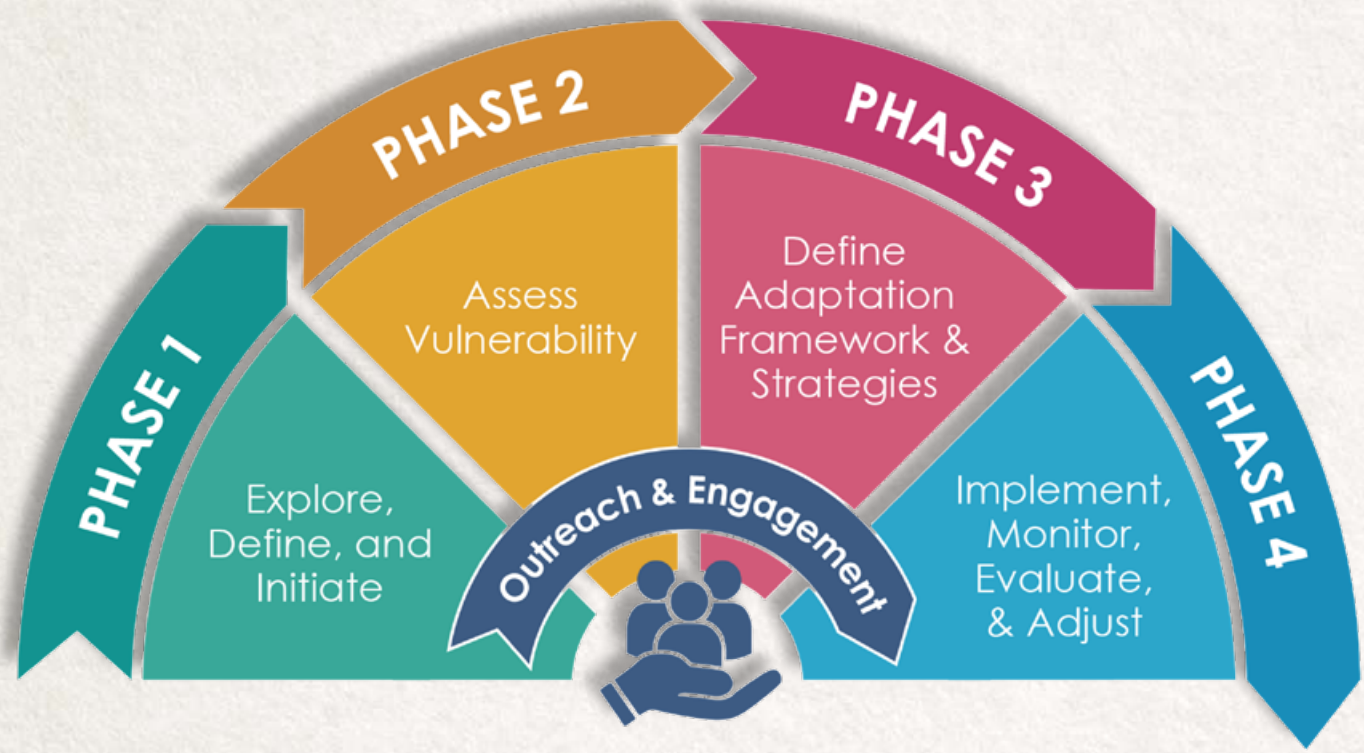


Figure 6. The four phases of Adaptation Planning, as described in the California Adaptation Planning Guide. The Windsor Resilience Plan covers the first three phases of the planning process and situates the Town to continue into Phase 4.



Development of this plan started in July of 2020, near the start of the COVID-19 pandemic, and followed three distinct steps: I) Vulnerability Assessment, Vision, and Goals, II) Strategies and Pathways, and III) Plan Development. Each phase included at least one outreach and engagement activity, a project advisory group meeting, and a key deliverable.

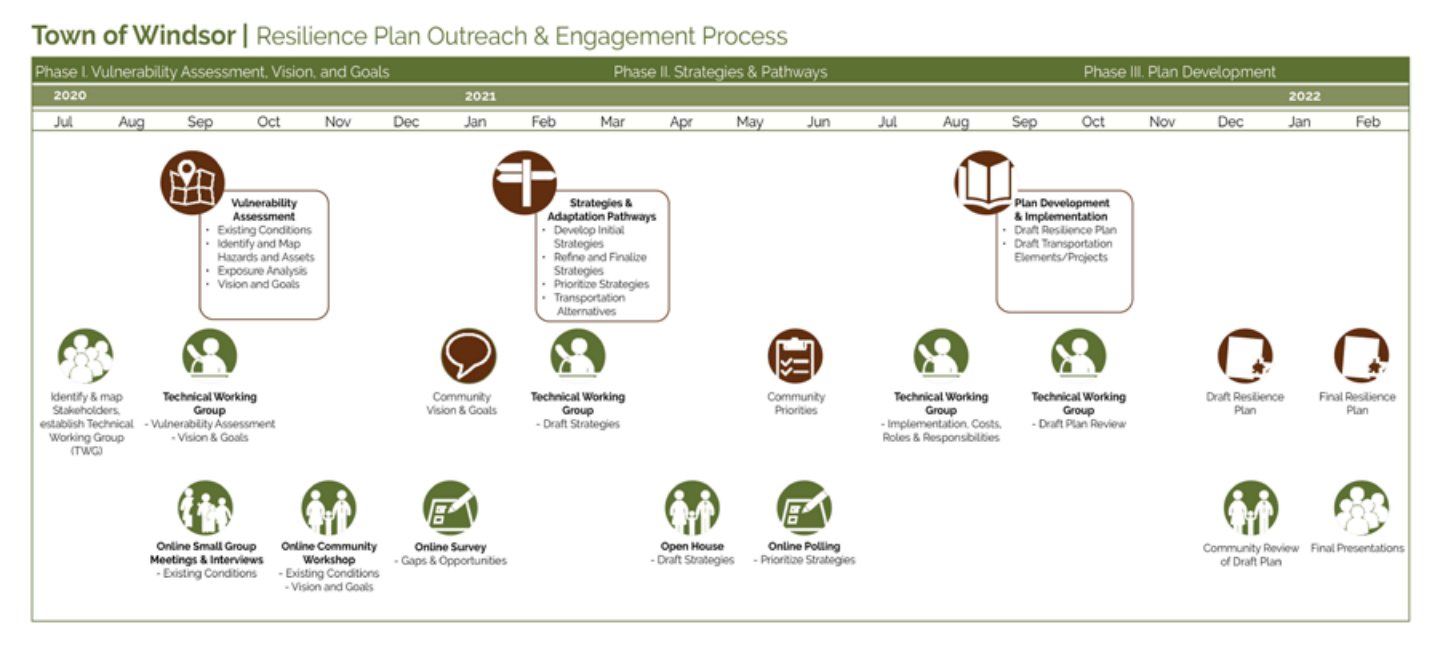


Figure 7. The Windsor Resilience Plan project timeline and key milestones.



Figure 8. Windsor residents line up to express gratitude for the firefighters following the '19 Kincade Fire. © Will Bucquoy

Outreach and Engagement

The majority of this project took place during the COVID-19 pandemic, which limited the ability to host in-person engagement events. The completion of this Plan is a testament to the Town and community's dedication to planning for a resilient future and the willingness of the Core Team to find creative ways to engage with stakeholders. The creative outreach and engagement process helped ensure that the community, including Town staff, field experts, residents, businesses, and visitors could guide the development of the Plan. The project team took equity into consideration when creating as many accessible entry points to the Plan for all residents. All community engagement opportunities were advertised in English and Spanish and in a variety of sources. Key engagement events included:

- **Windsor Resilience Plan Project Website** - The website serves as the repository for all events and materials relevant to the Plan and a communication tool for the project.
- **Technical Working Group Meetings** - The Technical Working Group (TWG) provided technical expertise and guidance throughout the project. Five TWG meetings were held leading up to the publication of the final Plan.
- **Small Group and 1-on-1 Meetings and Interviews** - More than a dozen individual interviews and small focus group meetings helped ensure regional partners and Communities of Concern had additional opportunities to support the development of the Plan.
- **Community Surveys** - More than 40 community members completed an online survey (in both English and Spanish) to provide input and identify priority resilience strategies.
- **Open House Events** - An open house event at a seasonal farmers market provided opportunities to vote on priority strategies was visited by more than 150 community members.
- **Public Review** - The Plan was available for public review and comment December 17, 2021 to January 10, 2022. It was widely distributed to regional partners, the Technical Working Group, core planning team members, interested community members, across the Town's social media channels, website, and newsletters, and more.
- **Community Presentations** - The core team made a variety of presentations to several community groups including the Town Planning Commission, the Senior Citizen's Advisory, and more.
- **Town Council Presentations** - The core planning team presented the draft Plan to the Town council on February 2, 2022. Council members provided valuable feedback on the Plan. The final version of the Plan was accepted by the Town Council on February 16, 2022.

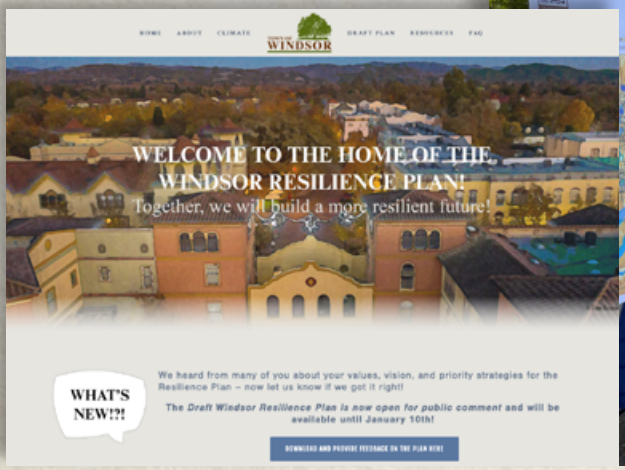




Figure 9. A screenshot of the Windsor Resilience Plan website (below). An image of Project Team member Yeymi Rivas supporting a community engagement event for the Windsor Resilience Plan (right).

RESILIENCE GOALS

The Town is focusing on taking steps towards resilience with actions that can be implemented within the next two years. With a holistic view of resilience in mind, the Town is focused on five actionable goals that address the main climate hazards and increase resilience across the community.

The Plan goals provide direction for the Town to help achieve the community's vision of a resilient future.

Each goal builds on the findings of the Town of Windsor Community Vulnerability Assessment and common themes drawn from initial community outreach and engagement activities. The Resilience Plan goals provide direction to help achieve the community's vision of a resilient future throughout the planning and implementation process. The goals serve as a foundation upon which future decisions can be made and help in evaluating how well the actions are meeting the community values and expectations.



GOAL 1: RESILIENT COMMUNITY

Improve the health, safety, and resilience of the community by establishing trusted communication pathways and enhancing neighborhood social cohesion, with a particular focus on Communities of Concern.

GOAL 2: RESILIENT INFRASTRUCTURE

Support community health and safety by climate-proofing critical infrastructure, enhancing the multi-modal transportation network, and supplementing public services across the Town.

GOAL 3: RESILIENT BUILDINGS

Ensure that all new homes and buildings are designed, and existing buildings are retrofitted, to reduce the impacts of extreme weather and climate change throughout Windsor.

GOAL 4: RESILIENT ENVIRONMENT

Support and enhance natural protective solutions to limit the impacts of climate hazards, preserve and enhance natural resources, and foster community livability and sense of place.

GOAL 5: RESILIENT ECONOMY

Prepare businesses (and business-dependent services) for climate related disruptions.



RESILIENCE STRATEGIES

The Resilience Strategies address particular climate hazards or vulnerabilities and provide direction for where to begin investing resources. The Resilience Strategies can be viewed as broader categories of specific actions and are intended to set the foundation for addressing the highest priority climate adaptation and resilience needs through specific implementable actions. Drafting and finalizing the Resilience Strategies was an iterative process that involved multiple rounds of community engagement and input from the Core Team and Technical Working Group. **There are 11 total Priority Resilience Strategies across all of the Resilience Goals, which are highlighted below in their respective goal categories in bold.**

GOAL 1: RESILIENT COMMUNITY

Ensure all current and future Town plan updates include climate change considerations. Climate change adaptation and resilience can be integrated into community and regional planning processes in many different ways, and exactly how this is done in practice differs based on the needs of the community as well as capacity and available resources. Improving community resilience will require that consideration of climate adaptation and resilience be integrated into all relevant local government, regional and sectoral plans and policy- and decision-making processes.

Support neighborhood connections to enhance self-reliance and assistance during extreme weather events, particularly for residents in Communities of Concern. Building social connectedness is an effective way to empower individuals, neighborhoods, and the community to prepare for and manage extreme weather events. It is essential to establish programs and processes to formalize neighborhood groups across the Town in order to ensure that all communities are supported equally. Especially during an emergency or extreme weather event, it is important for neighbors to understand how to work together and support those who need assistance.

Identify opportunities to reduce the negative effects of poor air quality caused by wildfire smoke on human health. Wildfires near and far pose significant health risks to the Windsor residents in the form of air pollution from smoke and other combustion byproducts. Many recent studies demonstrate a variety of respiratory-related health effects of wildfire smoke exposure, several of which link cardiovascular-related health effects to short-term wildfire smoke exposures. Educating residents on the risk factors and strategies for preventing and reducing their exposure can help to limit negative health outcomes.

Work with neighborhood groups to create Resilience Hubs. Resilience Hubs provide a safe place for community members in the event of an emergency. A Resilience Hub can serve as an evacuation center, cooling center, or charging station during extreme heat or weather events. It can provide clean indoor air in the case of regional wildfires, respite during power safety shut off events, resources, and information for residents on emergency management and preparedness, and a location that supports community values and events on a daily basis.

Enhance evacuation communication, planning, and operation for all residents and visitors. For Windsor to be a resilient community it needs to be able to plan and execute a partial or community-wide evacuation when necessary. This requires multi-jurisdictional collaboration and enhanced communication with community members as well as clear roles and responsibilities during an emergency event. A tabletop exercise is an effective method for testing the Town's capability to execute a timely and effective evacuation when needed.

Additional Strategies

- Work with regional and state partners to enhance greenhouse gas reduction efforts.
- Enhance evacuation education for all residents and visitors.
- Develop an extreme heat preparedness and response program.
- Increase public awareness and understanding about local flood risk, especially among Communities of Concern.
- Invest in community pre-disaster recovery planning efforts.
- Work with regional partners to enhance availability and access to health care for Windsor residents.
- Work with regional and local health providers to provide mental health services for residents following extreme weather events.
- Enhance access to healthy and affordable food choices for all residents.
- Enhance multi-organizational coordination to support people during extreme weather related events (with a focus on pre- and post-disaster resilience and recovery).

GOAL 2: RESILIENT INFRASTRUCTURE

Enhance the multimodal transportation network. Making strategic investments in projects that improve the existing transportation system (i.e., the roads, bike paths, pedestrian paths, sidewalks, intersections, bus stops, bus routes, etc. that Windsor residents use to move around) can enhance the quality of life for residents and visitors, support the ability to live in an environmentally sustainable manner, and help avoid or limit the impacts of extreme weather and changing climate conditions. Near-term strategic investments include addressing obvious traffic flow bottlenecks that could trap community members during evacuations and flooding events and finding ways to enhance daily mobility. Medium-term strategic investments include developing strategies to improve neighborhood coordination and preparation for evacuation and other forms of emergency response. Long-term strategic investments include enabling the transformation of the area's road network in ways that reduce Greenhouse Gas Emissions, eliminate transportation-related risks, and improve the health and well-being of the Windsor community and those who visit it.

Enhance local water conservation efforts to improve drought preparedness. California's periods of drought, some of which persist for years at a time, have highlighted the importance of a diverse and secure water supply. Limited availability of water resources can have several negative implications on Windsor residents, including the need for restrictive water use policies, decreasing water quality, and increasing costs to both the utilities and consumers. The threat of loss of ground and surface water supplies, resulting in town and private wells running dry, has become a reality in the region.

Additional Strategies

- Diversify Town water supply resources.
- Ensure Asset Management performance and investment estimates account for climate-related changes.
- Continue to invest in key transportation corridors to ensure that infrastructure is in a state of good repair and can accommodate multimodal transportation demands.
- Maintain and enhance urban stormwater management systems.
- Work with Sonoma Clean Power and PG&E to enhance the resilience of electrical utility infrastructure.
- Work with regional partners to enhance resilience and redundancy of cell, landline, radio and other key communication infrastructure systems.
- Expand greywater infrastructure and water reclamation capabilities.
- Enhance collaboration with regional and state partners to ensure the regional multimodal transportation system is safe, equitable, and protected from climate hazards.
- Ensure that all new construction projects are built to climate resilient standards.
- Evaluate the public school bus system and routes to identify adjustments that can be made to reduce local and regional traffic.

GOAL 3: RESILIENT BUILDINGS

Enhance vegetation management and defensible space efforts for all homes, buildings, and critical facilities. The Town of Windsor and its regional partners continue to make progress in supporting homeowners as they work to understand and assume the responsibilities that accompany living in and adjacent to wildland areas. Due to the limited amount of Town lands that exist in the WUI, or wildland intermix, there are relatively limited opportunities for municipal staff to require and enforce vegetation management and defensible space work in the most fire-prone areas in the region. Yet, increasing wildfire risk for the Town due to a variety of factors (including climate change) presents notable risk for urban and suburban zones. Therefore, Town action requires that innovative planning and policy considerations are implemented at the local and regional levels to reduce wildfire risk for all Windsor residents. In addition, supporting education efforts on vegetation management and defensible space for all residents is critical to ensuring effective wildfire-adapted landscape stewardship practices.

Expand home hardening and retrofit efforts for all homes, buildings, and critical facilities. Windsor has made great progress towards ensuring the Town's housing infrastructure is protected from wildfires by adopting comprehensive building codes. The Town has helped to advance resilience goals by electing to enact protection measures that exceed what is required by the state or county; however, a concerning amount of residual risk to wildfire and firestorm related hazards remains.

Additional Strategies

- Update building codes to encourage or require the use of climate resilient materials.
- Enhance monitoring and compliance of building code requirements.
- Review and update the operation and maintenance plans for all public and critical facilities to account for climate change projections.
- Enhance flood risk reduction efforts for homes, businesses, and other structures located in the 100-year floodplain, 500-year floodplain, and areas of emerging flood risk.

GOAL 4: RESILIENT ENVIRONMENT

Cultivate and support wildfire adapted landscape practices across the Town and region. The size, intensity, and duration of wildfires in the region and across the state are increasing on account of several factors, including increasing temperatures and extensive periods of drought. Wildfire has been a traditional 'pillar' of ecosystem health in the watersheds surrounding the Town of Windsor, yet climate change and historical and current fire suppression policies and increased development in the wildland urban interface have resulted in a change to local and regional wildfire dynamics. Supporting local and regional efforts to create wildfire-adapted landscapes will not only enhance the resilience of the Town, but it will protect the health, safety, and wellbeing of Windsor residents, enhance biodiversity on conserved lands, protect additional lands from development, and support the vitality of working lands across the region.



Additional Strategies

- Enhance and support regional and local drought contingency planning efforts.
- Increase stormwater retention/detention along the natural drainage basins on both public and private properties.
- Support the use of nature-based solutions in upstream and downstream floodplain management.
- Coordinate with Tribal, regional, and state partners to enhance the resilience of Windsor's watersheds.
- Identify opportunities to enhance and/or incentivize private and other nongovernmental wildfire prevention efforts.
- Reduce the risk posed by extreme heat and drought on shade and anchoring trees, streams and reservoirs, fish and wildlife, and other natural resources and habitats.
- Expand public engagement to support resilient landscape management through volunteerism, ecological education, tourism, community events, and other activities.
- Enhance pre-disaster recovery capacity to assess and restore ecosystems post-wildfire.

GOAL 5: RESILIENT ECONOMY

Prepare businesses (and business-dependent services) for climate related disruptions. Business continuity planning is not new to the private sector and has been used to help businesses prepare for everything from weather disruptions to terrorism for decades. Local businesses have been, and will continue to be, challenged by extreme weather events and climate change. Business Continuity planning and/or management is a great way to embed climate preparedness into business operations and includes evaluating operations and thinking about how climate and weather can affect the people (staff and customers), business operations, and supply chains.

Additional Strategies

- Support businesses in their efforts to harden facilities to the impacts of wildfires, drought, and flooding.
- Limit the impact of extreme heat on local businesses and customers.
- Provide worksite emergency preparedness and evacuation training for private and public sector employees to proactively prepare for climate hazards.
- Reduce flood risk for intersections and road segments that feed into commercial areas.
- Work with surrounding communities and key partners to create new job opportunities that pay a living wage and provide benefits.
- Ensure business operation, strategy, and maintenance plans account for climate change projections.
- Support regional agriculture and viticulture businesses to become more resilient to climate hazards.
- Center and promote diversity, equity, and inclusion practices in workplaces.
- Support businesses in the tourism economy to accommodate changes to the climate.



CONCLUSION

Planning for the impacts of climate change and building resilience is a process. While this Plan reflects the significant amount of work that has already been done by the Town and the community to get to this point, it doesn't stop here. The Plan is intended to serve as a roadmap for decision-making and investment over the coming years. It can help guide the ways climate change is mainstreamed into other community efforts and will undoubtedly require updates, revisions, and enhancements over the coming years as the science evolves, more data about social vulnerabilities becomes available, and the region changes. As defined in this Plan, one of the most important indicators of success is that climate resilience planning shapes all Town planning processes and operations. While this Plan cannot address every vulnerability, nor answer every question facing the Town, it does prioritize actionable steps that address the most pressing vulnerabilities presented by the climate crisis. Effective responses to climate change will require strategic investments in the following areas: collaboration and partnerships; infrastructure investments; Communities of Concern; policy and planning; and, education.



POLICY AND PLANNING

Climate resilience-focused policies are a critical tool in the Town's "toolbox." Finding the balance between regulatory methods and incentives in a variety of strategic areas will be critical as the Town weighs what options it has to enhance resilience. Ensuring all current and future Town plan updates include consideration of climate change and breaking down government department silos are important for moving towards fully-integrated planning efforts.

EDUCATION

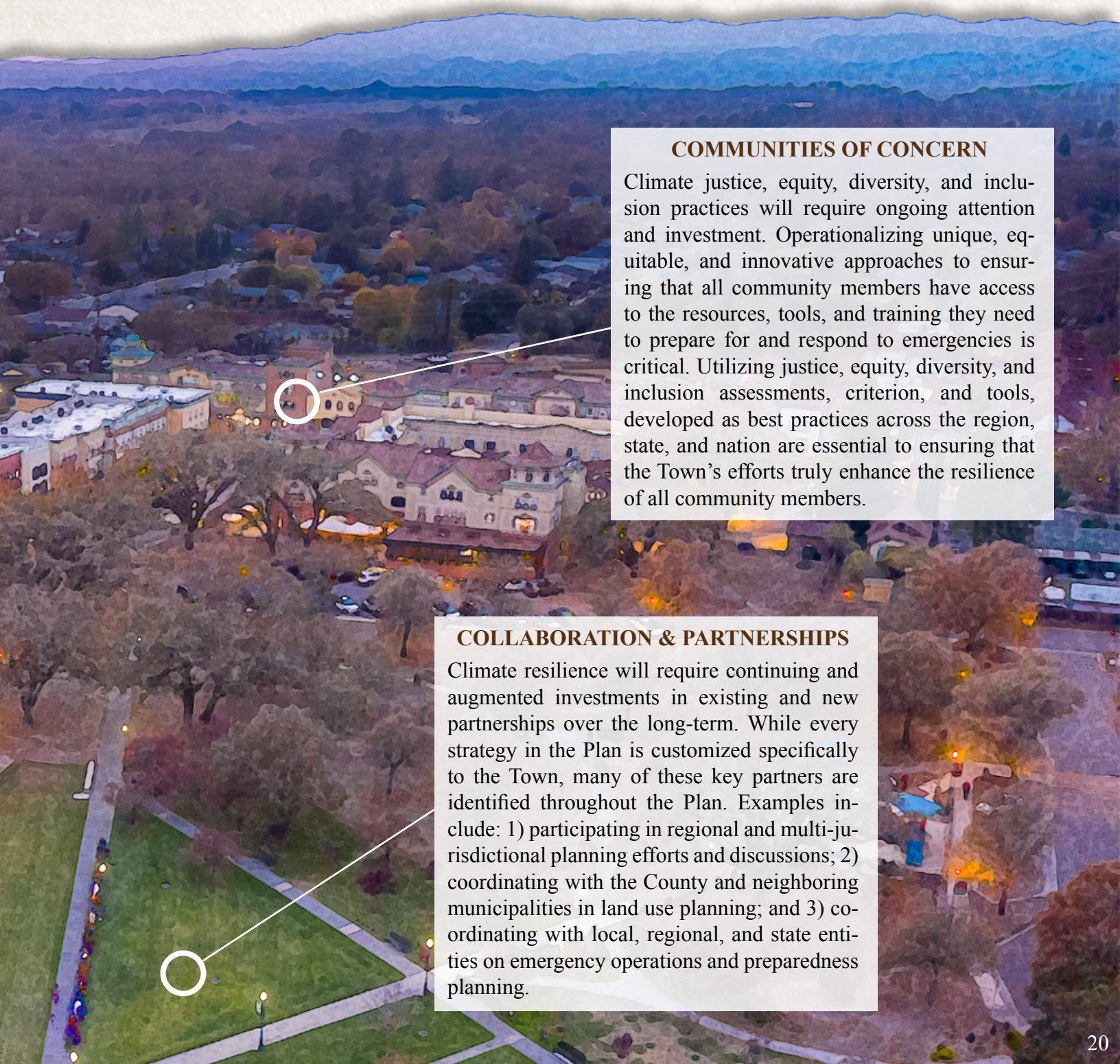
Community education, ranging from collaboration with partners to disseminate information and invest now in meaningful ways for changes that are expected to come. Many communities still face mis- and disinformation regarding next steps to address climate change vulnerabilities. Bridging this gap requires continued engagement and outreach from Town staff and partners. Navigating the challenges of balancing investments and considering tradeoffs, requires information, community champions, and hard conversations.

INFRASTRUCTURE INVESTMENTS

Ongoing capital improvement planning processes must integrate climate change projections to ensure that investments protect the health, safety, and vitality of Windsor residents.

Bold and decisive actions that are implemented now (and in the near future) will enhance the resilience of the Town and region. Implementing, monitoring, and evaluating the success of these resilience efforts will require ongoing collaboration between and among Town and County departments, agencies, and organizations, as well as with other municipalities. It will also require that the Town monitor and act quickly as funding opportunities become available at the regional, state, and national levels. The Town of Windsor understands the challenges of addressing the climate crisis and is committed to putting in the time, effort, and investments necessary to invest in the community.

By completing this Plan, the Town and the community have taken a significant and important step in the journey to build resilience. As the community and Town leadership makes progress reviewing, refining, and implementing resilience actions, the community can ensure that no one is left behind and the Town continues to be a healthy, vibrant, and thriving community for decades to come.



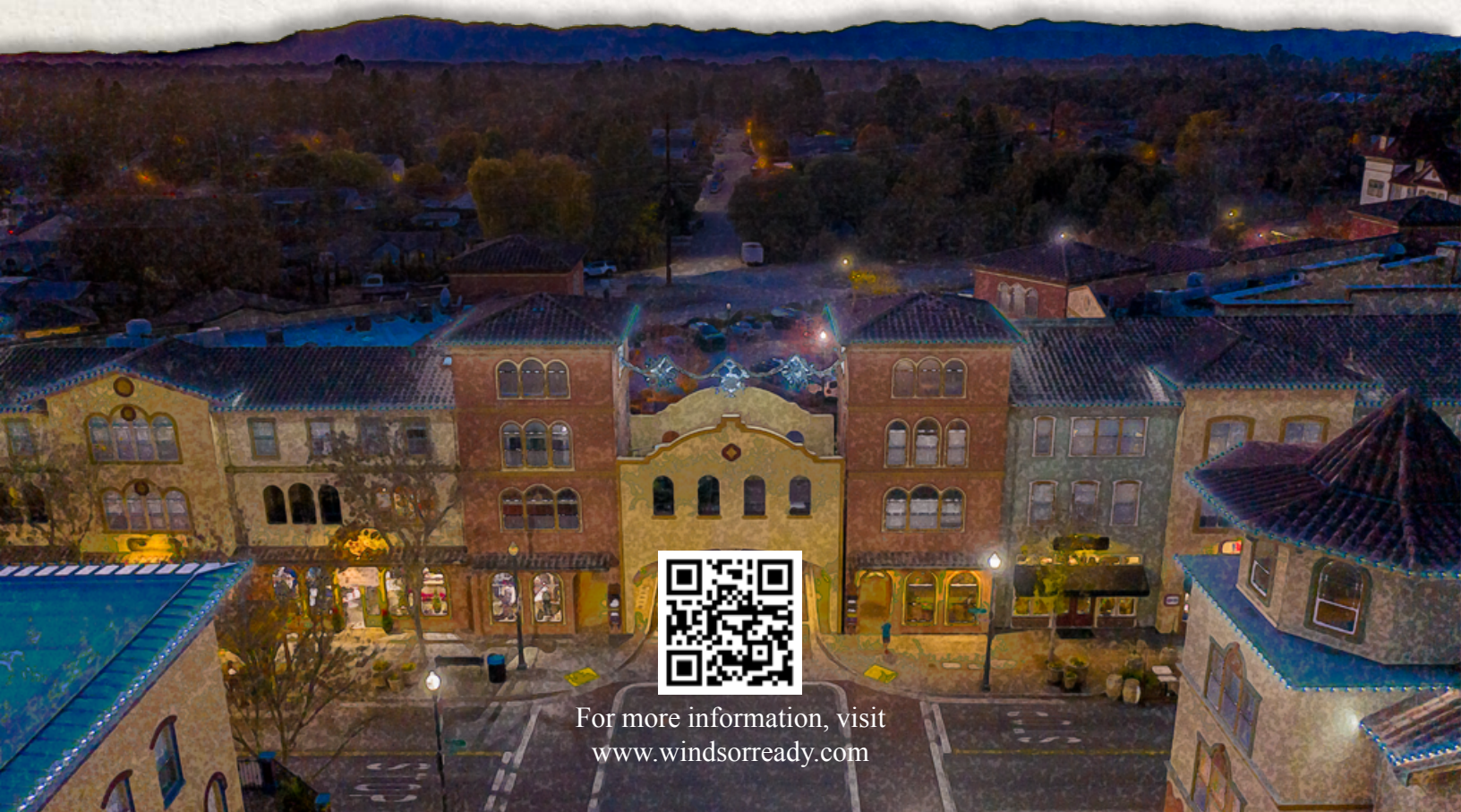
COMMUNITIES OF CONCERN

Climate justice, equity, diversity, and inclusion practices will require ongoing attention and investment. Operationalizing unique, equitable, and innovative approaches to ensuring that all community members have access to the resources, tools, and training they need to prepare for and respond to emergencies is critical. Utilizing justice, equity, diversity, and inclusion assessments, criterion, and tools, developed as best practices across the region, state, and nation are essential to ensuring that the Town's efforts truly enhance the resilience of all community members.

COLLABORATION & PARTNERSHIPS

Climate resilience will require continuing and augmented investments in existing and new partnerships over the long-term. While every strategy in the Plan is customized specifically to the Town, many of these key partners are identified throughout the Plan. Examples include: 1) participating in regional and multi-jurisdictional planning efforts and discussions; 2) coordinating with the County and neighboring municipalities in land use planning; and 3) coordinating with local, regional, and state entities on emergency operations and preparedness planning.

This project was generously funded by CalTrans.



For more information, visit
www.windsorready.com

TOWN OF WINDSOR

Windsor Resiliency for Emergencies and Disasters Initiative (READI)

February 2022



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This Plan, and the Town of Windsor, recognizes the Indigenous Peoples who were the original stewards of the lands upon which the Town now resides. The Town of Windsor is located on the traditional and ancestral homelands of the Southern Pomo and Graton Rancheria and lands used by a variety of other Tribes. The Town honors the resilience and continued presence of all Indigenous communities and Tribal Nations today and are grateful for the opportunity to continue to collaborate with these Nations now and into the future.

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- Debora Fudge, Councilmember
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List of Acronyms and Abbreviations

AQI	Air Quality Index
BAAQMD	Bay Area Air Quality Management District
BayREN	Bay Area Regional Energy Network
BRIC	Building Resilient Infrastructure and Communities Funding (FEMA)
Cal/OSHA	California Division of Occupational Safety and Health
CDBG-DR	Community Development Block Grants-Disaster Recovery
CDC	Centers for Disease Control and Prevention
CIP	Capital Improvement Program
COPE	Citizens Organized to Prepare for Emergencies
CWPP	Community Wildfire Protection Plan
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GHG	greenhouse gas
HMGP	Hazard Mitigation Grant Program
LHMP	Local Hazard Mitigation Plan
MJHMP	Multi-Jurisdictional Hazard Mitigation Plan
OECD	Organization for Economic Co-operation and Development
PG&E	Pacific Gas and Electric Company
RCP	Representative Concentration Pathway
RCPA	Regional Climate Protection Agency
SB	Senate Bill
SCTA	Sonoma County Transportation Authority
SMART	Sonoma-Marin Area Rail Transit
SVI	Social Vulnerability Index
TWG	Technical Working Group
USFA	U.S. Fire Administration
WRRB	Wildfire Risk Reduction Buffer
WUI	Wildland Urban Interface
VA	Vulnerability Assessment

Glossary of Terms

Most glossary terms shown rely on descriptions from the National Climate Assessment (2018), the California Adaptation Planning Guide (2020), and CalFire.

Adaptation. An adjustment in natural or human systems to a new or changing environment. Adaptation to climate change includes proactive planning and preparation to reduce risk, utilize new opportunities and enhance resilience.

Climate change. Changes in average weather conditions that persist over multiple decades or longer. Climate change encompasses both increases and decreases in temperature, as well as shifts in precipitation, changing risk of certain types of severe weather events, and changes to other features of the climate system.

Communities of Concern. Historically disadvantaged and underserved members of the community who experience the first and disproportionately worst impacts of climate change. These frontline community members may include older adults in the community, those with disabilities, low-income residents, BIPOC (Black, Indigenous and people of color), LGBTQIA+ individuals, English as a Second Language (ESL) communities, the unhoused, those who lack transportation, and those who lack access to television, radio, internet and/or phone service.

Defensible space. The buffer you create between a building on your property and the grass, trees, shrubs, or any wildland area that surround it.

Drought. A period with little or no rain. Whether a dry spell becomes a drought depends on how long it lasts, expectations based on historical data and perceptions, and the water needs of people and natural systems.

Equity. As defined by the Sonoma County Office of Equity: "Equity is an **outcome** whereby you can't tell the difference in critical markers of health, well-being, and wealth by race or ethnicity, and a **process** whereby we explicitly value the voices of people of color, low income, and other underrepresented and underserved communities who identify solutions to achieve that outcome." The central equity challenges for climate change policy involve several core issues: addressing the impacts of climate change, which are felt unequally; identifying who is responsible for causing climate change and for actions to limit its effects; and understanding the ways in which climate policy intersects with other dimensions of human development, both globally and domestically.

Extreme weather event. Relatively infrequent water level events that are a result of relatively high astronomical tides coupled with a storm surge event. The absolute elevation reached during these events are due to short-term meteorological processes (such as low atmospheric pressure due to storms) and large-scale oceanographic conditions (such as king tides). The extreme storm events discussed in this analysis do not include the full reach of wind-driven waves.

Fire Hazard Severity Zone (FHSZ). A mapped area designated by CAL FIRE where wildfire hazards are likely to be more severe (based on factors such as fuel, slope, and fire weather) using

varying degrees of fire hazard (i.e., moderate, high, and very high). CAL FIRE uses the FHSV designations to dictate its responsibilities for fire protection and/or mitigation work across the State.

Fuel hazard reduction. The act of reducing surface and ladder fuels that exacerbate wildfire growth and severity to reduce the threat to public safety, firefighter safety, and damage to property and life. Generally, fuel hazard reduction activities include a variety of treatments like thinning and limbing trees, removing underbrush, conducting prescribed burns, grazing, etc.

Greenbelts. Also synonymous with "wildfire risk reduction buffer zones", "community separators", "community wildfire protection zones", or "landscape scale fuel breaks" - are areas of land that separate urban areas from wildlands at risk of burning due to wildfire. Greenbelts can be green spaces, preserves, recreational areas, fields, infrastructure pathways, open spaces, agricultural lands, parks, orchards, or other low risk ignition land areas that support wildfire resilience by protecting urban areas from wildfires. These zones can provide a multitude of benefits, including recreation, conservation, biodiversity, wildlife corridor, cultural, and agricultural benefits

Greenhouse gas (GHG). Any gaseous compound in the atmosphere that can absorb infrared radiation, thereby trapping and holding heat in the atmosphere. Greenhouse gases include carbon dioxide, methane, nitrous oxide, and other compounds.

Hazard. An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural losses, damage to the environment, interruption of business, or other types of harm or loss.

Hazard mitigation. Sustained action taken to reduce or eliminate the long-term risk to human life and property through actions that reduce hazard, exposure, and vulnerability. Hazard mitigation can be one component of climate change adaptation.

Home hardening. Altering the building materials, design features, and landscaping of a home to reduce its susceptibility to wildfire embers, flames, or radiant heat.

Mitigation (Climate). Measures to reduce the amount and speed of future climate change by reducing emissions of heat-trapping gases or removing carbon dioxide from the atmosphere.

Public Safety Power Shutoffs (PSPS). A power shut off event initiated by a utility company (e.g., PG&E) as a precautionary safety measure during severe weather or extreme fire conditions (e.g., drought and/or high winds) to prevent fire ignitions from utility equipment.

Resilience (Climate). The capacity of a community to withstand, survive, and thrive by maintaining and adhering to essential cultural functions, identities, and structures, while co-existing with and managing for changing conditions.

Resilience goal. A broad objective identified by the Town of Windsor and broader community to support the Town's vision for a resilient future. Example goal: Improve the health, safety, and

resilience of the community by establishing trusted communication pathways and enhancing neighborhood social cohesion, with a particular focus on Communities of Concern.

Resilience strategy. A general area of action that can help enhance the climate resilience of the community. Adaptation Strategies bring together sets of actions that have a similar purpose. Example strategy: Enhance and support wildfire-adapted landscape work being completed across the Town.

Resilience value. The unique way(s) in which a particular strategy might enhance the resilience of the Town to the impacts of climate change.

Vulnerability (Climate). The degree to which something is susceptible to adverse effects of climate change as determined by climate exposure, sensitivity, and adaptive capacity. Vulnerability can increase or decrease because of physical (built and environmental), social, political, and/or economic factor(s).

Vulnerability Assessment. An analysis of the degree to which a system is susceptible to or unable to cope with the adverse effects of climate change.

Wildfire Risk Reduction Buffer Zone (WRRB). Also synonymous with “greenbelts”, “community separators”, “community wildfire protection zones”, or “landscape scale fuel breaks” - are areas of land that separate urban areas from wildlands at risk of burning due to wildfire. WRRBs can be green spaces, preserves, recreational areas, fields, infrastructure pathways, open spaces, agricultural lands, parks, orchards, or other low risk ignition land areas that support wildfire resilience by protecting urban areas from wildfires. These buffers can provide a multitude of benefits, including recreation, conservation, biodiversity, wildlife corridor, cultural, and agricultural benefits.

Wildland Urban Interface (WUI). Area between wildland vegetation and the constructed areas that cause significant exposure to structures in the event of a wildland fire.

1

THE FRAMEWORK FOR RESILIENCE



Introduction to the Plan

The Town of Windsor is an idyllic small town located in Sonoma County, approximately 60 miles north of San Francisco, 70 miles west of Sacramento, and 20 miles east of the Pacific Ocean coast in the heart of Northern California's wine country. Windsor is primarily a residential town with character that draws visitors from near and far to the surrounding vineyards and numerous outdoor recreation opportunities.

Windsor is situated on mostly flat land at the northern end of a valley, the Santa Rosa Plain, but is bordered on three sides by hills. The foothills to the east are gently sloping and peak around 700 feet in elevation. The Russian River floodplain defines the western border. The surrounding hills and ridges create the backdrop for the community with beautiful riparian corridors, lush parks, and wooded areas providing oases among the developed neighborhoods. The lands outside of the Town have rich agricultural soils and are home to vineyards and wineries that support the regional economy. There are at least 50 wineries and vineyards within a 5-mile radius of Windsor, and pasture lands and orchards account for most of the other agricultural uses.[1] Access to Windsor and the surrounding region is provided via the U.S. Highway 101 that runs generally north-south and bisects the community. Old Redwood Highway runs primarily parallel to the U.S. Highway 101 and crosses under it in the middle of Town.

Resilience Planning

Windsor is on the front lines of the climate crisis which is increasingly disrupting daily life. In recent years, wildfires have destroyed neighborhoods in nearby communities and blanketed the Town in smoke for weeks. In addition, recent local and regional droughts have been among the most intense ever recorded. Climate change impacts the Town of Windsor in a variety of ways. Direct and indirect impacts affect the health and vitality of the community including local and regional transportation networks, emergency response and evacuation, homes and buildings, natural resources and systems, and the physical and mental health of Windsor's residents, workers, and visitors.

Windsor's local government officials have recognized the need to address the climate crisis through both mitigation and adaptation. It is essential to address the drivers of climate change by taking action to mitigate greenhouse gas (GHG) emissions at both the municipal and individual levels. The Town has committed to GHG reduction targets[2] that align with the State of California's call for communities to reduce emissions levels to 1990 levels by 2020[3] and 40 percent below 1990 levels by 2030[4]. To reach these targets, the Town is addressing community and municipal GHG emission sources and energy standards, regulations, policies. While climate mitigation work is necessary and essential to continue to prioritize in order to reduce impacts and slow the progression of climate change, it is equally important to prepare for these impacts by

[1] (Town of Windsor, 2018)
[2] (Town of Windsor, 2018)
[3] California Assembly Bill 32 (AB 32)
[4] California Senate Bill 32 (SB 32)

acting now to create a more resilient community in the future.[5] The Town of Windsor Climate Resilience Plan (Resilience Plan or the Plan) builds on the Town's forward-thinking approach to climate hazards and challenges, including wildfire preparedness, emergency response, and land-use planning, all of which have been strengthened and improved in recent years.

There are many hallmarks of a resilient system. Resilience includes: involving all people in the process so that their voices are heard and their ideas and values are part of designing successful actions that support all residents and visitors, especially Communities of Concern; developing robust and redundant systems that provide backup and alternatives in the event of disruptions; acknowledging that the future isn't going to be the same as the past and being flexible to continue to change and adapt as the community and the environment continue to change; and breaking down the silos that naturally develop within and between organizations and sectors to develop creative multi-benefit solutions that both limit future risks and enhance quality of life now. Perhaps most importantly, it requires a proactive approach to identify key risks, take action to address those risks, monitor success, and change or update actions over time.

Unfortunately, the Town will not become resilient simply by completing this plan. Building resilience takes time. It takes time to adequately engage with residents. It takes time to modify or improve infrastructure. It takes time to adapt to a new way of thinking about and doing things that we have done a particular way for so long. The Town has already started to change the way it approaches climate adaptation and resilience, and this Resilience Plan is the next big step on that journey. The Plan brings together and builds on previous efforts, identifies key priority resilience strategies, and provides a roadmap to address the most pressing climate hazards facing the Town. Of course, the Town is just a part of a larger region. Climate risks are regional challenges, and it will be important to build on or enhance collaborations with regional partners and local organizations to effectively implement meaningful solutions.

It will be up to the Town leadership and the community to work together and determine which of these strategies it ultimately wants to pursue, and in what order it wants to pursue them. The strategies in this Plan are not final, and they may acquire additional analysis and community engagement. The Plan will also need to be continuously refined over time. The suite of strategies listed in the Plan provides a menu of high value and effective approaches to enhance resilience that the Town can choose from or build off as they apply for grants, develop budgets, or update policies and regulations. This is a plan for the Town, the community, and the individual Windsor resident. From here, it is ultimately up to the community to work together, take ownership of, and take action to build resilience now and for decades to come.

[5] (Windsor Town Council, 2019)

What the Plan Is and Is Not

The intent of this project was to identify and quantify the Town's most significant potential climate change risks and vulnerabilities (see *Town of Windsor Community Vulnerability Assessment*[6]) and to identify priority Resilience Strategies in the Resilience Plan that resonate with the community and can be implemented in the coming years to reduce climate related risks. This Plan can guide current and future decision makers in protecting the natural and built environment, residents and visitors, the economic vibrancy of the community, and the overall quality of life within Windsor. Having a Resilience Plan that draws on the latest science and outlines directly implementable actions the Town can take creates the opportunity for the Town to apply for national (e.g., FEMA, EPA), state, and other funding sources to take the actions identified and detailed in this Plan.

This plan IS	This plan IS NOT	Details
A Roadmap for Action	An Ordinance, Policy, Regulation, or Requirement.	Plan provides a roadmap to address the most pressing climate hazards facing the Town and priority action that could be implemented in the next few years. These are priority options that can be considered, not requirements.
A List of Potential Actions	A Commitment to Implement Actions as Written	The broad suite of high-quality potential and prioritized actions identified by this plan can be used to inform future choices the Town and the community make to enhance resilience. Inclusion of an action in the plan does NOT constitute a commitment to implement that action.
A Suite of Priority Actions	Detailed Final Analysis or Designs of Individual Actions	Key features of this plan are the 10-priority resilience strategy with implementation details and examples. While these priorities were selected by the community, Technical Working Group, and the project Core Team; and designed to address the key climate challenges facing the community, they do not include the final analysis or design work that will be required for any individual action to be implemented.
An Important Step to Building a Resilient Community	The Last Thing the Town will do to Prepare for Climate Change	The Plan represents an important step on the journey to build resilience but is not the end of the journey. The Town will need to commit to implement actions and continue to move forward with strategies and action that enhance resilience to ensure the health, vitality, and resilience of the community.

[6] (*Town of Windsor Community Vulnerability Assessment*, 2021)

Climate Resilience Plan Development

The Windsor Climate Resilience Plan was developed as part of an 18-month Caltrans grant-funded initiative focused on helping the Town better understand climate risks facing the community and proactively address these risks and build resilience.

The Windsor Climate Resilience Plan encompasses the following elements to understand and address the Town's needs:

1) Completing transportation infrastructure and Community Vulnerability Assessment;
2) Supporting and facilitating community discussions around a vision for a better and more resilient future;
3) Collaboratively developing strategies and approaches to reduce the risk of wildfire, drought, flooding, and extreme heat; and finally,
4) Completing a Resilience Plan that complies with State mandates for Climate Change Resilience Planning and supports the Town's ability to compete for funding that enhances resilience efforts.

In contrast to a climate change mitigation plan (a strategic plan designed to reduce greenhouse gas emissions) this Plan is designed to manage and reduce the risks of and vulnerability to climate change. This project was guided by community values and goals and founded on cutting-edge science and industry best practices on a variety of climate hazards. The plan identifies critical, near-term actions and establishes a road map for bigger, bolder, and longer-term actions over the coming decades.

Most of this project took place during the COVID-19 pandemic, which limited the ability to host in-person engagement events. However, the completion of this Plan is a testament to the Town and community's dedication to planning for a resilient future and the willingness of the Core Team to find creative ways to engage with stakeholders and collaborate to complete this important project.

Project Timeline

The Windsor Climate Resilience Plan successfully completes the first three phases of the adaptation planning process, as developed by the California Adaptation Planning Guide[7] (Figure 1). It can serve as a roadmap that will support and guide decision-making for Town investments in resilience over the next few years. Details on individual actions will need to be updated as the priorities, needs, and capacity of the Town and region change.

[7] (Cal OES Governor's Office of Emergency Services, 2020)

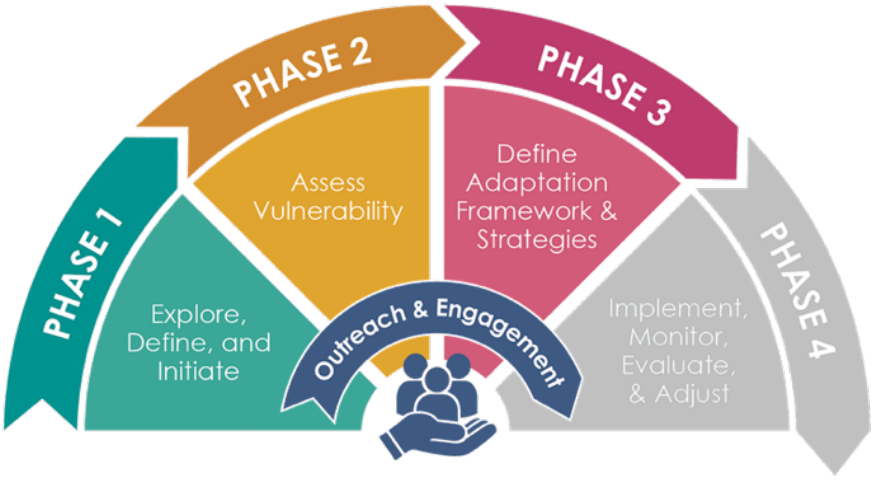


Figure 1. The four phases of Adaptation Planning, as described in the California Adaptation Planning Guide. The Windsor Climate Resilience Plan covers the first three phases of the planning process and situates the Town to continue into Phase 4.

This plan was developed in three phases: I) The Vulnerability Assessment, Vision, and Goals, II) Strategies and Pathways, and III) Plan Development. Each phase included at least one outreach and engagement activity, a project advisory group meeting, and a key deliverable.

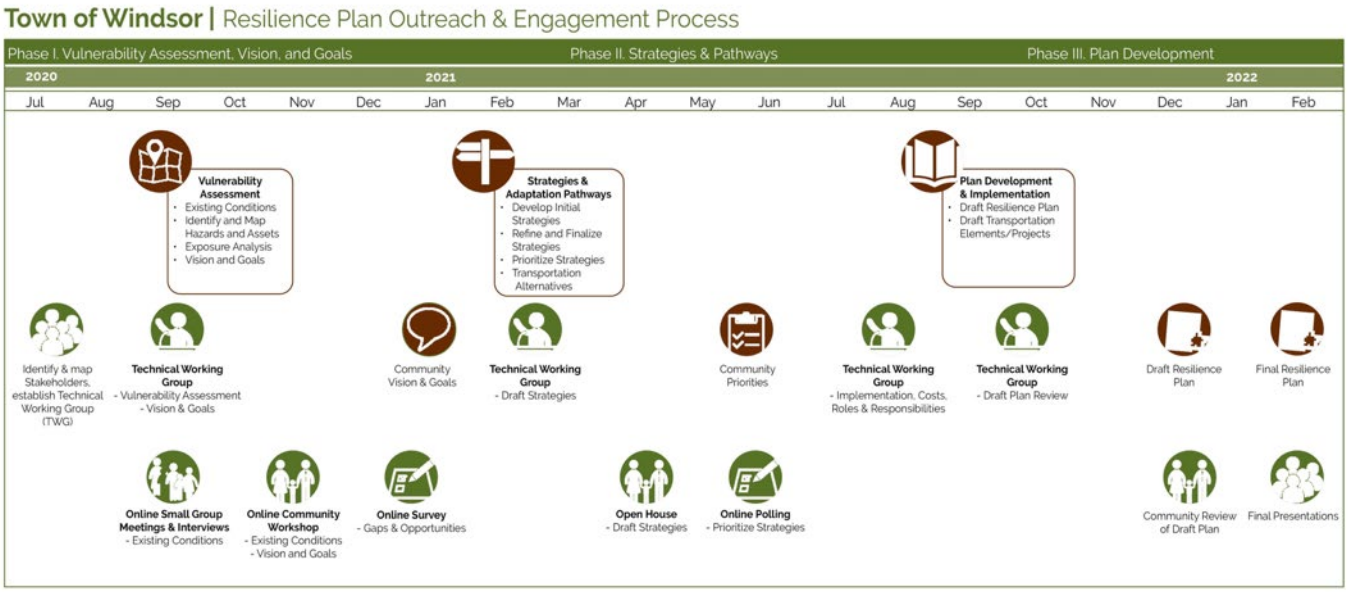


Figure 2. Project Timeline and Key Milestones

Public Outreach and Community Engagement Activities

The Windsor Climate Resilience Plan was informed by a robust outreach and engagement process to ensure that the community, including Town staff, field experts, residents, businesses, and visitors were integral to the development of the Plan. Outreach and engagement efforts aimed to enhance community participation were developed and conducted with an equity lens, paying particular attention to creating accessible entry points to the Plan for Communities of Concern. All community engagement opportunities were advertised through social media and the project website in English and Spanish.

Phase I: The Vulnerability Assessment, Vision and Goals

This phase focused on developing the core planning team (Core Team), conducting initial community outreach, and identifying the existing environmental and climate hazards that affect the Town of Windsor and the subsequent impacts on the community. Initial outreach was conducted to inform the creation of the Plan goals. The project team then completed the *Town of Windsor Community Vulnerability Assessment.* The assessment summarizes the current climate hazards and future climate projections for Windsor and assesses the transportation and social vulnerabilities of the Town, with a particular focus on the Town's current evacuation policies and programs. Analyses during this phase of the project highlighted the potential impacts of a changing climate on the residents and the Town's social systems, community, infrastructure, and transportation network. Key Phase I outreach and engagement activities included:

- Developing the core planning team (Core Team) - The Core Team consisted of Town staff from the Public Works and Community Development Departments as well as the project team.
- Convening the Technical Working Group (TWG) - The TWG is an ad hoc group of experts made up of Town, Sonoma County, and regional experts from a variety of sectors (i.e., emergency response, planning, economic, transportation, natural resources, etc.) that helped guide problem solving, identify challenges, and develop potential strategies for the Plan. The TWG served as a critical advisory committee and advocacy group to communicate the Plan. The TWG convened at least once during each outreach phase.
- Developing the Project Website - This website (Figure 3) serves as the repository for all events and materials relevant to the Windsor Climate



Figure 3. Screenshot of the Windsor Climate Resilience Plan website homepage (http://www.windsorready.com)

Resilience Plan and served as a communication tool throughout the duration of the project.

- Conducting Initial Outreach Activities - Key outreach activities with the community helped the project team identify community priorities and create the Resilience Plan goals. This initial outreach included: 1) five small group meetings with special interest groups, including: critical services, environmental, community, business and visitors, and youth; 2) five individual stakeholder interviews with community leaders who have deep knowledge of the Town and community needs; and 3) a virtual workshop to educate the community about the plan and receive detailed input from more than 80 attendees.

Phase II: Strategies & Pathways



Figure 4. Community member voting on priority resilience strategies at the Farmers Market.

This phase of the project focused on the identification, development, and finalization of Resilience Strategies based. An initial list of Resilience Strategies was compiled based on best practices as well as State and National resources. Input from the Core Team, TWG, and the community at-large (both in-person and electronically) helped to identify the top 10 Priority Resilience Strategies that the Town should pursue in the near-, medium-, and long-terms. The community engagement events included:

- An open house event at the farmers market with opportunities to vote on priority strategies; visited by more than 150 community members.
- An online survey on Consider.it in both English and Spanish that received input from more than 40 community members.

Phase III: Plan Development and Review

The final phase of the project was focused on building out the details of the Priority Resilience Strategies and drafting and finalizing the plan itself. These details of each priority resilience strategy are the product of additional analysis and multiple discussions with Town staff, key experts, and other local and regional stakeholders. The Draft Climate Resilience Plan was released to the public on December 17, 2021 and had a comment period of 25 days. After reviewing and integrating public comments, the Plan was presented to the Town Council on February 2nd for an initial review and discussion. The project team made updates and modifications as needed and provided the plan to the Town Council on February 16th for final review and acceptance. Key engagement activities included the following.

- A Technical Working Group (TWG) meeting to provide an overview of the Priority Resilience Strategies and an opportunity to provide additional feedback on details of each strategy and steps to implementation.
- At least one meeting for each of the Priority Resilience Strategies with relevant stakeholders. These meetings frequently included multiple individuals from different Town departments,

county staff, and relevant local non-profits and other organizations as relevant to the strategy and helped refine the strategy and details for implementation.

- An opportunity for the public to comment on the Draft Resilience Plan (December 17, 2021, through January 10, 2022).
- A thorough review and consideration of all public comments and feedback on the Draft Resilience Plan by the Core Team and necessary changes made.
- Initial presentation to the Town Council on February 2, 2022, with opportunity for Council members to provide feedback.
- Final Town Council consideration of the Plan on February 16, 2022.
- Final Technical Working Group (TWG) meeting to close out the project.

2

A CALL TO ACTION: WINDSOR'S CLIMATE CHALLENGE SUMMARY



The Town of Windsor is on the front lines of the climate crisis. Temperatures are increasing, and precipitation patterns are changing. Wildfires across the region and state are becoming hotter, more frequent, more severe, more damaging, and more deadly. In addition, extreme rainfall and associated flooding, prolonged periods of drought and extreme heat, and impacts to people as well as the human and natural environments are likely to get worse. Beyond what is provided below, a more detailed analysis is available in the *Town of Windsor Community Vulnerability Assessment.*[8]

Windsor's Climate Hazards and Challenges

Human activity - specifically burning fossil fuels like coal, oil, and natural gas (among others) to create electricity, drive our cars, and heat our homes - is responsible for the changes we are seeing in our climate.[9] The impacts of these emissions and the associated warming are being felt and observed across the globe, but the specific impacts vary regionally due to a multitude of factors.

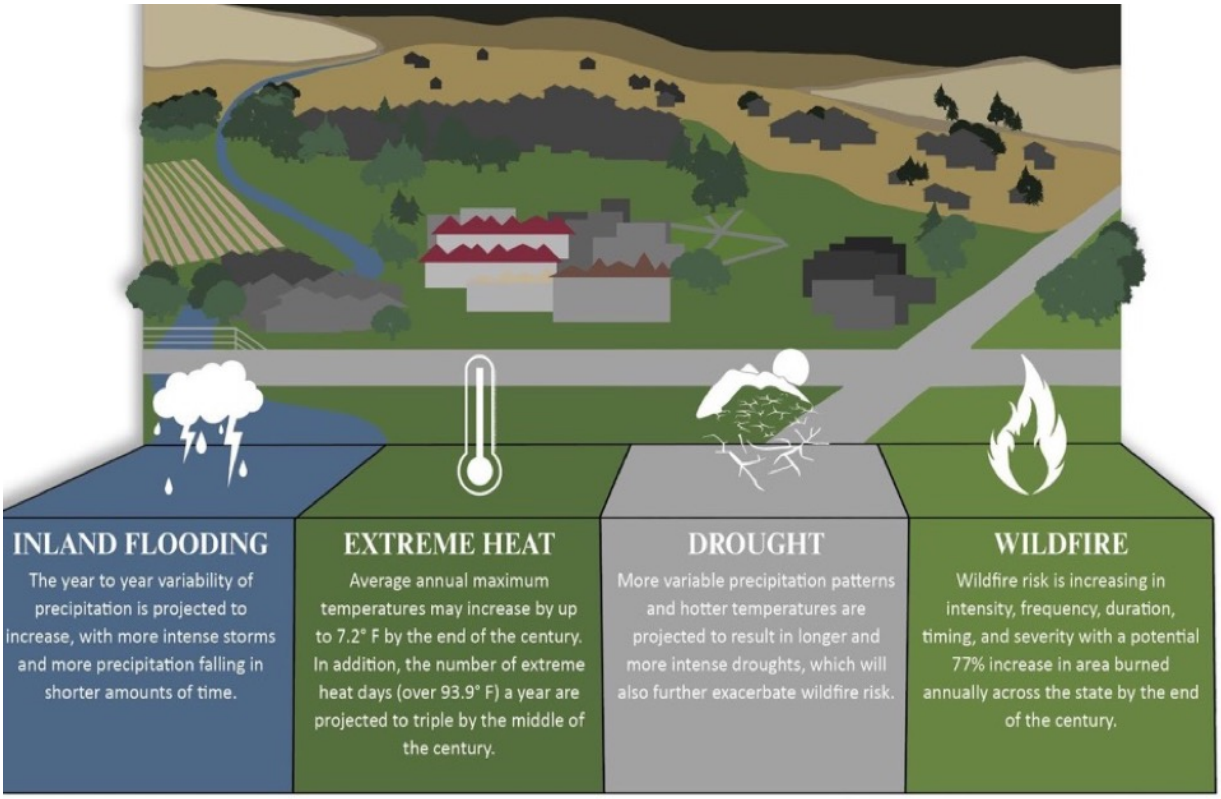


Figure 5. Summary of climate change hazards for the Town of Windsor. The four main climate hazards facing the community are wildfire, drought, extreme heat, and flooding.

[8] (*Town of Windsor Community Vulnerability Assessment,* 2021)
[9] More information on Sonoma Countywide greenhouse gas emissions by source can be found here.

Changes in temperature and precipitation are the main climate drivers to multiple climate hazards. Average annual maximum temperatures in the Bay Area region have increased 1.7°F from 1950 through 2005 and are projected to continue to increase.[10] Average annual maximum temperatures in Windsor are projected to increase 4.1 °F to 7.2 °F by the end of the century (2070-2099).[11] Windsor already experiences highly variable precipitation patterns with some wet years and some dry years. For example, 2019 was extremely wet with large amounts of rainfall in the spring and early winter with a total accumulation of nearly 52 inches of precipitation. 2020 was very dry with only slightly more than 10 inches of precipitation over the course of the year.[12] Research suggests that these cycles of wet and dry years will continue for much of the State of California.[13] Figure 6 describes the main relationships between extreme temperatures and precipitation, the four main climate hazards impacting Windsor, additional considerations, and the subsequent impacts to Windsor's people, assets, and resources.

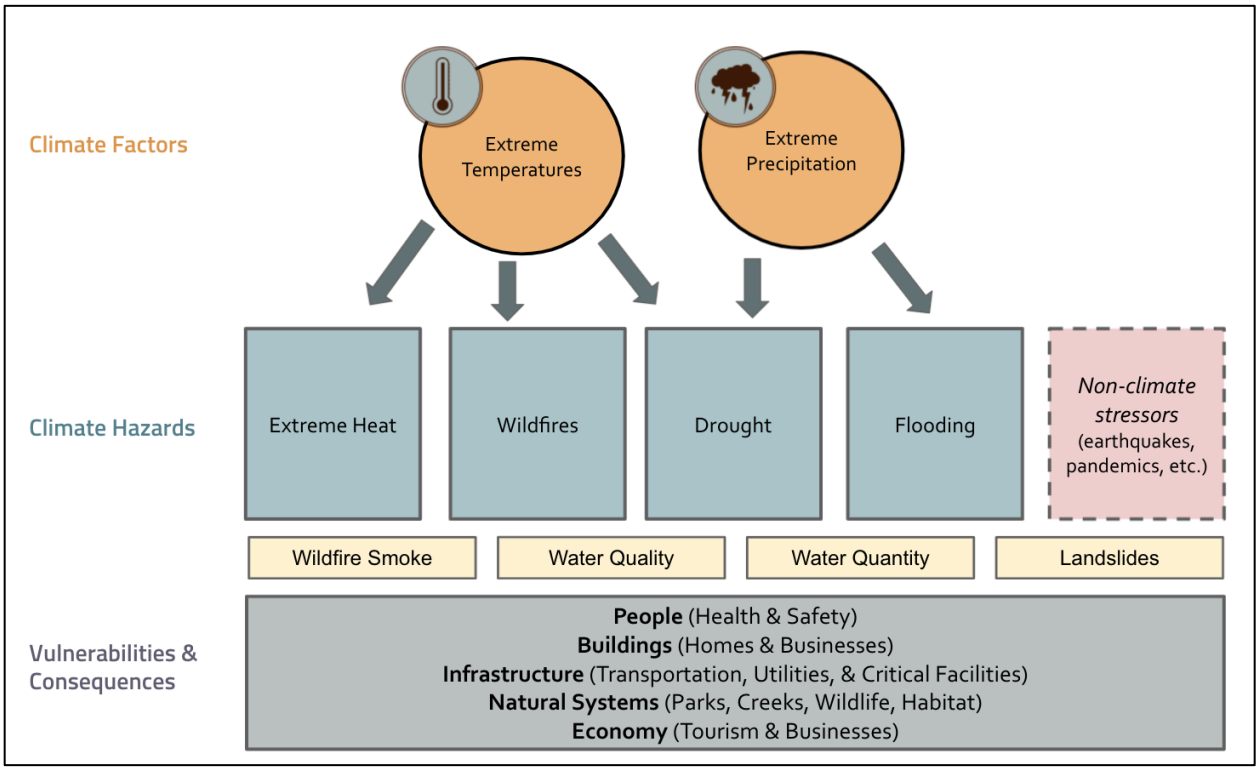


Figure 6. Relationship of climate factors, hazards, and vulnerabilities. A graphic representation of the relationships between climate factors (extreme temperatures and extreme precipitation), climate hazards (extreme heat, wildfires, drought, and flooding), and the vulnerabilities and consequences to assets for Windsor.

[10] (Ackerly et al., 2018)
[11] (Cal-Adapt, 2018)
[12] (Cal-Adapt, 2018)
[13] (Bedsworth et al., 2018)

Wildfire

Wildfire is a familiar and current risk across the region and is expected to get worse. In addition to historic and current fire suppression policies[14] and continued development in the Wildland Urban Interface (WUI)[15], climate change is increasing the frequency, and exacerbating the intensity of wildfires in California.[16] Wildfires threaten the health and safety of residents, and can impact the Town's infrastructure, economy, natural resources, and more. In addition, smoke from regional wildfires can affect daily life (especially for those with existing respiratory conditions) and stress residents, negatively affect natural resources, and impact the economy.

Wildfire risk in older maps and planning efforts understate the actual wildfire risk for the Town. Although the Town is not located directly in the WUI, parts of town are directly adjacent to forested woodlands. Due to the changing characteristics of wildfires, areas outside the traditional WUI are more and more vulnerable to ignition by ember cast and firestorms from wildfires burning miles away. For towns like Windsor, that maintain a reputation as a thriving tourism destination, a viable place to build a business, and a stable community to raise a family or enjoy one's retirement, changing wildfire risk presents a real threat to the community's identity and vision for the future.

Drought

Windsor is familiar with the impact of drought on its infrastructure, people, economy, and natural systems.[17] Windsor's local dependence on surface water makes the Town highly vulnerable to regional drought events. For the region, seasonal precipitation patterns are likely to change and there are risks for longer or more extended periods of drought. In addition, hot days and nights will increase, further heightening the intensity of the region's dry summer seasons. As a result, there will be less surface water and drier soils which can affect both agriculture and the functioning of natural ecosystems in the region.

Droughts rarely pose a direct safety threat to Windsor residents but may pose health risks to specific proportions of Windsor's residents, particularly for low-income households. Natural systems, both terrestrial and aquatic, are highly vulnerable to prolonged drought conditions. The projected increasing temperatures and drying trend for the Town will not only decrease water quality and quantity but can increase regional wildfire risk. Infrastructure and buildings are moderately vulnerable to drought, mainly due to the link to increased risk of wildfire and impacts to water systems.

[14] (Plumer & Schwartz, 2020)
[15] (Pierre-Louis & White, 2018)
[16] (Bedsworth et al., 2018)
[17] (*Town of Windsor Local Hazard Mitigation Plan*, 2018)

Extreme Heat

Average annual maximum temperatures in Sonoma County and the surrounding region have increased and are projected to continue to increase,[18] and as part of this broader trend, the number of days with extreme heat is expected to dramatically increase. All residents, especially *Communities of Concern*, are highly vulnerable to extreme heat events. Prolonged heat events increase demand on certain infrastructure systems (e.g., electricity for cooling homes and buildings), making them moderately vulnerable to extreme heat. Extreme heat reduces the amount of moisture in soils and can exacerbate drought conditions and affect agricultural crops, such as grapes.

Windsor "feels" the California heat differently, in that it is typically cooler than many other locations throughout the Bay Area and southern California; however, how humans and the natural world react to increased temperatures is all relative. Residents and native species have adapted to the historic temperature ranges, yet the projected increase in temperatures can cause significant health stress on organisms at the top of their specific temperature thresholds. In general, extreme heat events rank as one of the deadliest natural hazards, yet heat-related illnesses and deaths can be largely prevented.[19] Although life-threatening impacts are preventable, it will take preparation and planning for Windsor to prevent significant impacts to people, natural systems, and critical infrastructure.

Flooding

While flooding is the second most financially devastating hazard facing Californians,[20] it may not be a hazard that many Windsor residents think about or deal with frequently. However, as precipitation in the region becomes less consistent and more variable, the Town of Windsor and the surrounding area are increasingly vulnerable to damage from fluvial (Russian River) and creek flooding. Windsor has experienced highly variable precipitation patterns over the last few years and research suggests that these cycles of wet and dry years will continue. While overall average annual precipitation may remain constant, there will also be more intense storms and more precipitation in shorter amounts of time. Traditional 100-year and 500-year flood events may become more frequent and cover areas that have not previously flooded. Atmospheric river events can precipitate large volumes of water and cause rivers and creeks to swell or flood, leading to overtopping of critical roadways and inundation of low-lying neighborhoods. While flooding events are generally short-lived, the impacts they have on the quality of Windsor's consumptive water resources can be much longer lasting and felt by many more people. Most buildings and critical infrastructure are located outside of the 100- and 500-year flood zones, making them only moderately vulnerable to flooding.

[18] (Bedsworth et al., 2018)
[19] (California Climate Action Team, 2013)
[20] (Taylor, 2017)

3

BUILDING CLIMATE RESILIENCE



Resilience Planning in Context

The Town's commitment to resilience and addressing climate hazards via the Community Vulnerability Assessment and Climate Resilience Plan assures that the Town is in compliance with the State of California mandates. California Government Code § 65302 was amended by Senate Bill (SB) 379 and SB 1035 to require that local jurisdictions and counties incorporate climate adaptation and resilience in the next update of their general plans (either an individual element update or a comprehensive update). More specifically, in 2015, SB 379[21] required the inclusion of information relating to flood and wildfire hazards and adaptation and resilience strategies to address these hazards in the safety element of the general plan update. It requires that each municipality and county include in the Safety Element of its General Plan a vulnerability assessment that identifies risks posed by climate change as well as climate adaptation and resilience goals and strategies that outline a set of feasible implementation measures designed to carry out these goals.[22] In 2018, SB 1035 further revised the code to require that after 2022, jurisdictions review and update the safety element upon each revision of the housing element or Local Hazard Mitigation Plan to address climate adaptation and resilience and include and identify any new information regarding flood and fire hazards.[23]

The State of California is taking a comprehensive and aggressive approach to climate mitigation and adaptation within state agencies and is providing a multitude of resources for other organizations and local jurisdictions to fund planning and implementation efforts of their own. In addition, Governor Newsom's Administration is currently updating[24] California's Climate Adaptation Strategy, as required by the Legislature, with the goal to deliver a strategy "that outlines the state's key climate resilience priorities, includes specific and measurable steps, and serves as a framework for action across sectors and regions in California".[25]

Building on Local and Regional Resilience Efforts

The Resilience Plan was informed by robust local and regional hazard and climate mitigation and resilience efforts. Sonoma County has recognized the need to take action to reduce the causes and impacts of climate change through the Sonoma County Regional Climate Action Plan (Climate Action 2020 and Beyond) that outlines aggressive action the county can take to dramatically reduce countywide greenhouse gas (GHG) emissions.[26] In 2009, County jurisdictions established the nation's first Regional Climate Protection Authority (RCPA), a multi-jurisdictional agency that coordinates countywide climate mitigation and adaptation efforts. The multi-jurisdictional and multi-partner framework that is already in place within the County provides an excellent framework to move forward with resilience planning and actions.

[21] SB 379 revised § 65302(g)(4)
[22] (Land Use: General Plan: Safety Element., 2015)
[23] (Cal OES Governor's Office of Emergency Services, 2020)
[24] The draft 2021 California Climate Adaptation Strategy was released for public comment on October 19 and closed on November 17, 2021.
[25] (California Natural Resources Agency, 2021)
[26] (Sonoma County Regional Climate Protection Authority, 2016)

Sonoma County is currently preparing a Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) which includes a section specific to the Town of Windsor ("Windsor Annex"); when complete, this annex will supersede the Town's Local Hazard Mitigation Plan (LHMP). The County is also in the process of updating its Community Wildfire Protection Plan (CWPP), which includes new and updated wildfire risk assessments and modeling that have informed this Plan and is intended to continue to shape discussions about wildfire risk across the region into the future. Other county entities, including the Division of Climate Action and Resiliency (Sonoma County Administrator's Office), Sonoma County Regional Parks, Fire Safe Sonoma, Regional Climate Protection Authority, Sonoma County Fire Districts, Sonoma Land Trust, the Sonoma Valley Wildlands Collaborative, Citizens Organized to Prepare for Emergencies (COPE) Northern Sonoma County, and more, are supporting a range of local and regional initiatives focused on enhancing the County's resilience to a variety of hazards. In addition, there are a variety of biodiversity and conservation focused initiatives happening at the county level including the Sonoma County Agriculture & Open Space Vital Lands Initiative.

The Resilience Plan builds on the Town of Windsor 2040 General Plan, Capital Improvement Program (CIP), Emergency Operations Plan, municipal code, Zoning Ordinance, the concurrent Sonoma County MJHMP[27], Sonoma County Community Wildfire Protection Plan (CWPP), the Sonoma County Resilience and Recovery Framework, and many other planning initiatives. While there are many references to these (and additional) plans and reports, this Plan builds on previous and current planning efforts at the local, regional, and state level, and outlines unique Priority Resilience Strategies, actions, and recommended steps to implementation and integration with other Town planning documents. In addition, this Plan addresses many of the recommended actions within these other documents, serving as a crosswalk between planning efforts and creating redundancies across local and regional planning efforts.

The Town of Windsor has already made significant progress towards acknowledging the importance of addressing GHG emissions and including climate change and adaptation considerations in local and regional planning processes. In September 2019, the Town Council adopted a Climate Emergency Declaration (Resolution No. 3548-19). This resolution declares a climate emergency and identifies specific measures that are currently being undertaken to address climate change through mitigation actions as well as additional priority measures that the Town should implement, especially where it relates to greenhouse gas emission reduction activities. This Resolution acknowledges human activity as being a main cause of climate change, that marginalized communities are being disproportionately affected by these changes, and that efforts to reduce impacts of climate change have co-benefits for the community, among many other things.

The Town has committed to taking action to educate and protect all of Windsor residents by rapidly implementing actions that can help to slow the progression of climate change and improve community resilience. In addition, the Town has incorporated sustainability and resilience into its Guiding Principles and Themes in the Windsor 2040 General Plan.

[27] The Sonoma County MJHMP has been adopted by the Town Council and has FEMA conditional approval.

> "The Town supports efforts to increase the resilience of its residents and businesses in response to the environmental, social, and economic effects of changing climate conditions and potential natural disasters or economic recessions."
>
> *- Windsor 2040 General Plan, page 1-8*

Other on-going efforts include completing the 2023-2031 update to the Housing Element to meet the State-mandated adoption by January 31, 2023. In conjunction with this update, the Town is also required to review the Public Health and Safety Element of the General Plan for compliance with State law regarding the climate change and resilience, wildfire mapping, mitigation, and evacuation routes. The Town is also conducting a technical update to the Windsor Zoning Ordinance, initiated to refine the current Zoning Ordinance to "address changes to State law, increase housing supply, consider changing community needs and opportunities, and ensure consistency with the 2040 General Plan." To better address the Town's climate adaptation and resilience efforts, a part-time Sustainability Coordinator was appointed in 2021 to help with public outreach and the implementation of climate mitigation, resilience, and sustainability activities.

There is no time like the present to be working on resilience planning and taking action! The funding opportunities for municipalities are numerous[28], and the strategies, actions, and steps toward implementation outlined in this plan well-position the Town to apply for grants and other funding sources to carry them out. While this takes significant resources and effort, there is a window of opportunity with a motivated Town Council, momentum in Town staff and departments, and demand from the community to take actions that will help reduce the community's climate vulnerabilities and move towards a more resilient future in the face of a changing climate.

[28] Specific funding Opportunities are outlined for each Priority Resilience Strategy in this Plan.

Considerations for Communities of Concern

Decades of research on disasters and climate change have demonstrated that demographic and social factors including personal characteristics (race, age, gender, existing medical challenges, etc.), social status, capacities, networks, and resource availability can lead to distinctly different outcomes when these groups are exposed to extreme weather events.[29] These "Communities of Concern" often experience the first and worst impacts of the extreme weather events and other changing climate conditions.

Communities of Concern include a diverse cross-section of populations and communities that often experience the first and worst impacts of extreme weather events or other climate conditions. They can include households with low-income status, seniors, youth, people who speak Spanish first, people with disabilities, and more.

Although broad measures of vulnerability in Windsor are generally below that of other California communities, there are differential aspects of risk that are elevated for specific sectors in the community. The Centers for Disease Control and Prevention's (CDC) Social Vulnerability Index[30] program compiles and aggregates U.S. census and other data to identify those areas or segments of the community that are more likely to face social, political, economic, or cultural challenges. While it is not possible to pinpoint the vulnerability of specific individuals or households, the composite indices highlight census tracts that are most likely to be home to individuals and households with heightened sensitivity to hazard and disaster events and that may be limited in their capacity to prepare for, respond to, recover from, and adapt to hazard exposures (Figure 7). Percentile rankings in the Social Vulnerability Index (SVI) are relative to other census tracts in California where higher numbers (and warmer colors) are more vulnerable, and lower numbers (cooler colors) are less vulnerable to extreme weather events and climate hazards.

[29] Cutter et al. (2009); Thomas et al. (2013); Fatemi et al. (2017); USGCRP (2016)
[30] Agency for Toxic Substance and Diseases Registry (2021)

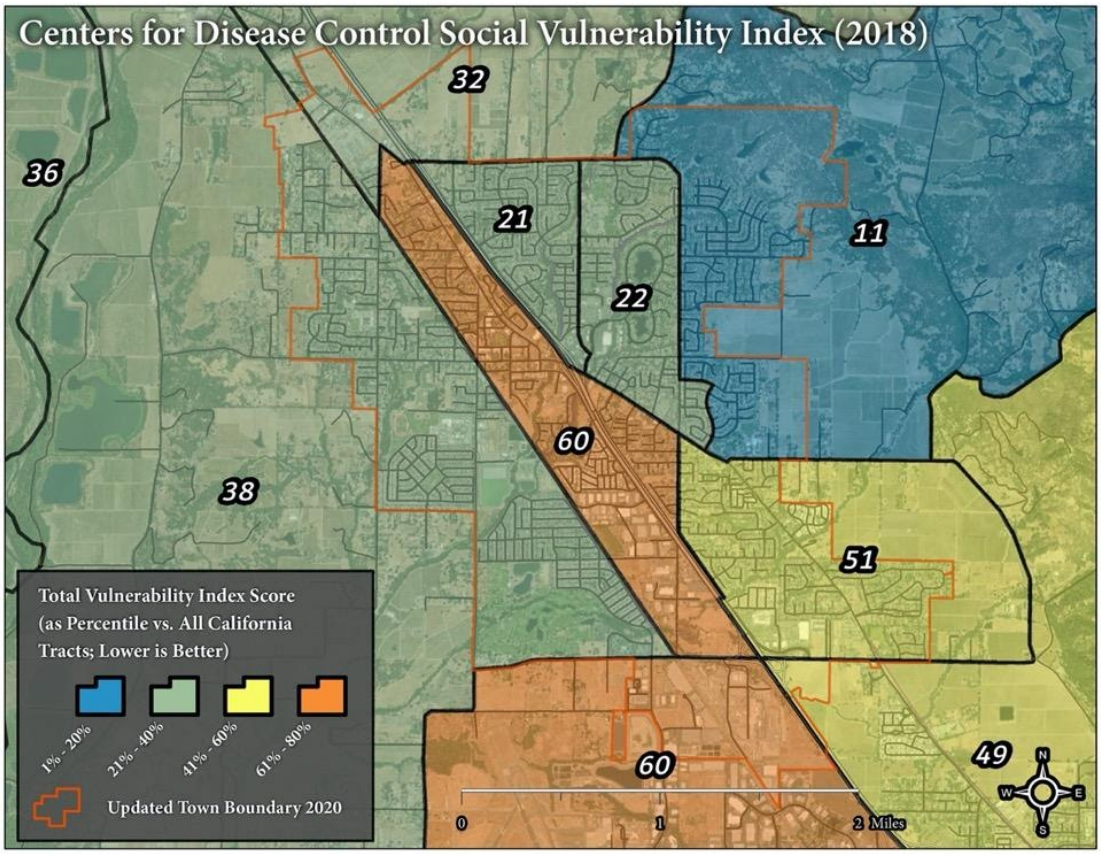


Figure 7. Map of Social Vulnerability Index (SVI) for Windsor. Relative social vulnerability index scores for census tracts in Windsor using data compiled by the Centers for Disease Control and Prevention (CDC). This compilation of 15 factors that are known to affect the ability of households and individuals to prepare for and respond to extreme weather events. Percentile rankings are relative to other census tracts in California where higher numbers (and warmer colors) are more vulnerable, and lower numbers (cooler colors) are less vulnerable to these events.

The most vulnerable areas of the community (around the Highway 101 corridor and the south-central portion of town) rank around the 60th percentile when compared to the rest of California. When designing and implementing resilience strategies, it is important to consider both how those strategies are developed and where they are implemented. It is critical to consider households with children and older adults, those that speak Spanish first (or languages other than English), and those with pre-existing medical conditions. It is also important to consider specific mobile home neighborhoods within and adjacent to the Town as those structures are more easily affected by extreme weather and residents may have less resources to prepare for or respond to extreme weather events. Throughout the Resilience Plan, considerations for Communities of Concern are discussed in the context of each priority resilience strategy.

4

WINDSOR'S RESILIENCE STRATEGIES



Windsor's Resilience Goals and Strategies

The Town is taking a long view of resilience, yet it is focusing on ways to take steps towards resilience with actions that can be implemented in the near-, medium-, and long-term. With a holistic view of resilience in mind, the Town is focused on five actionable goals that address the main climate hazards and increase resilience across Windsor's community and resources. Each goal builds on the findings of the *Vulnerability Assessment* and common themes drawn from initial community outreach and engagement activities.

Goal 1: RESILIENT COMMUNITY

Improve the health, safety, and resilience of the community by establishing trusted communication pathways and enhancing neighborhood social cohesion, with a particular focus on Communities of Concern.

Goal 2: RESILIENT INFRASTRUCTURE

Support community health and safety by climate-proofing critical infrastructure, enhancing the multi-modal transportation network, and supplementing public service across the Town.

Goal 3: RESILIENT BUILDINGS

Ensure that all new homes and buildings are designed, and existing buildings are retrofitted to reduce the impacts of extreme weather and climate change throughout Windsor.

Goal 4: RESILIENT ENVIRONMENT

Support and enhance natural protective solutions to limit the impacts of climate hazards, preserve and enhance natural resources, and foster community livability and sense of place.

Goal 5: RESILIENT ECONOMY

Strengthen and support the local economy by ensuring that businesses and workers are well-prepared for climate-related hazards and can respond to and rebound from disruptions.

The Resilience Plan goals provide direction for the Town to help achieve the community's vision of a resilient future throughout the planning and implementation process. The goals serve as a foundation upon which future decisions can be made and help in evaluating how well the actions are meeting the community's values and expectations.

Table 1. Summary of the Resilience Goals and Strategies. Strategies listed in bold are *Priority Resilience Strategies*.

Goal	Resilience Strategy
	Ensure all current and future Town plan updates include climate change considerations.
Community	**Support neighborhood connections to enhance self-reliance and assistance during extreme weather events, particularly for residents in communities of concern.**
	Identify opportunities to reduce the negative effects of poor air quality caused by wildfire smoke on human health.
	Work with neighborhood groups to create Resilience Hubs.
	Enhance evacuation communication, planning, and operation for all residents and visitors.
	Enhance evacuation education for all residents and visitors.
	Develop an extreme heat preparedness and response program.
	Increase public awareness and understanding about local flood risk, especially among communities of concern.
	Invest in community pre-disaster recovery planning efforts.
	Work with regional partners to enhance availability and access to health care for Windsor residents.
	Work with regional and local health providers to provide mental health services for residents following extreme weather events.
	Enhance access to healthy and affordable food choices for all residents.
	Work with regional and state partners to enhance greenhouse gas reduction efforts.
	Enhance multi-organizational coordination to support people during extreme weather related events (with a focus on pre- and post-disaster resilience and recovery).
Infrastructure	**Enhance multimodal transportation network.**
	Enhance local water conservation efforts to improve drought preparedness.
	Diversify Town water supply resources.
	Ensure Asset Management performance and investment estimates account for climate-related changes.
	Continue to invest in key transportation corridors to ensure that infrastructure is in a state of good repair and can accommodate multimodal transportation demands.
	Maintain and enhance urban stormwater management systems.
	Work with Sonoma Clean Power and PG&E to enhance the resilience of electrical utility infrastructure.
	Work with regional partners to enhance resilience and redundancy of cell, landline, radio and other key communication infrastructure systems.
	Expand greywater infrastructure and water reclamation capabilities.
	Enhance collaboration with regional and state partners to ensure the regional multimodal transportation system is safe, equitable, and protected from climate hazards.
	Ensure that all new construction projects are built to climate resilient standards.
	Evaluate the public school bus system and routes to identify adjustments that can be made to reduce local and regional traffic.
Buildings	**Enhance vegetation management and defensible space efforts for all homes, buildings, and critical facilities.**
	Expand home hardening and retrofit efforts for all homes, buildings, and critical facilities.
	Update building codes to encourage or require the use of climate resilient materials.
	Enhance monitoring and compliance of building code requirements.
	Review and update the operation and maintenance plans for all public and critical facilities to account for climate change projections.
	Enhance flood risk reduction efforts for homes, businesses, and other structures located in the 100-year floodplain, 500-year floodplain, and areas of emerging flood risk.
Environment	**Cultivate and support wildfire adapted landscape practices across the Town and region.**
	Enhance and support regional and local drought contingency planning efforts.
	Increase stormwater retention/detention along the natural drainage basins on both public and private properties.
	Support the use of nature-based solutions in upstream and downstream floodplain management.
	Coordinate with Tribal, regional, and state partners to enhance the resilience of Windsor's watersheds.
	Identify opportunities to enhance and/or incentivize private and other nongovernmental wildfire prevention efforts.
	Reduce the risk posed by extreme heat and drought on shade and anchoring trees, streams and reservoirs, fish and wildlife, and other natural resources and habitats.
	Expand public engagement to support resilient landscape management through volunteerism, ecological education, tourism, community events, and other activities.
	Enhance pre-disaster recovery capacity to assess and restore ecosystems post-wildfire.
Economy	**Prepare businesses (and business-dependent services) for climate related disruptions.**
	Support businesses in their efforts to harden facilities to the impacts of wildfires, drought, and flooding.
	Limit the impact of extreme heat on local businesses and customers.
	Provide worksite emergency preparedness and evacuation training for private and public sector employees to proactively prepare for climate hazards.
	Reduce flood risk for intersections and road segments that feed into commercial areas.
	Work with surrounding communities and key partners to create new job opportunities that pay a living wage and provide benefits.
	Ensure business operation, strategy, and maintenance plans account for climate change projections.
	Support regional agriculture and viticulture businesses to become more resilient to climate hazards.
	Center and promote diversity, equity, and inclusion practices in workplaces.
	Support businesses in the tourism economy to accommodate changes to the climate.

Resilience Strategies Selection and Prioritization Process

While the Plan goals provide direction, the Resilience Strategies address particular climate hazards or vulnerabilities identified in the Community Vulnerability Assessment and provide direction for where to begin investing resources. The Resilience Strategies can be viewed as broader categories of specific actions. The Town will move beyond these broader strategies to address the highest priority climate adaptation and resilience needs through specific implementable actions, some of which are outlined in the following Priority Resilience Strategies.

Drafting and finalizing the Resilience Strategies was an iterative process that involved multiple rounds of community engagement. The Core Team and Technical Working Group helped craft the initial strategies, using the results of the Vulnerability Assessment as a guide. Once the group of Resilience Strategies were finalized, the project team utilized multiple engagement activities to determine the community priorities and select the Priority Resilience Strategies.

In an effort to move the Town closer to implementation, the Priority Resilience Strategies dive deeper into specific actions that can be taken in the immediate future to improve the community's resilience to current hazards and reduce vulnerabilities. The TWG was given the opportunity to rate each resilience strategy using an online tool (Consider.it). This provided the project team insight into priorities from local experts and key stakeholders. The project team then opened the rating process to the community at-large using engagement with the same online tool (which was also available in Spanish) and an in-person outreach event at the local Farmer's Market. Community members were given sticky dots to vote on their top priority strategies. All the public feedback was compiled and used to prioritize the Resilience Strategies. The strategies that rated the highest among both the TWG and community were selected as Priority Resilience Strategies.

To be inclusive of all climate hazards and create a holistic approach to resilience, the Core Team selected the final Priority Resilience Strategies, which may not have been the strategies that received the highest ratings from one or both outreach events. However, the Core Team found that it was necessary to prioritize additional strategies for reasons such as: findings from the vulnerability assessment demonstrated a high vulnerability for a particular asset to one or multiple hazards, certain climate hazards that are likely to impact the Town in the future may not be front of mind for community members but need to be addressed in the Plan; and further discussions among the team and other experts/stakeholders highlighted particular issues that warranted prioritization.

There are 11 Priority Resilience Strategies across the 5 Resilience Goals.

HOW TO READ THE STRATEGIES

FIVE GOALS address Windsor's most pressing vulnerabilities to near- and long-term impacts to climate hazards and other extreme weather events.

Each goal contains one or more **PRIORITY RESILIENCE STRATEGIES** and **ADDITIONAL RESILIENCE STRATEGIES** that highlight ways the Town can make progress towards addressing the goals.

Each Priority Resilience Strategy includes:

- **SUMMARY** of essential information and considerations, including key partners, metrics of success, considerations for communities of concern, and challenges to implementation
- **STEPS TO IMPLEMENTATION** that highlight key actions that can be taken in the near-, medium-, and long-term,
- Additional details and support materials, including a look at one or more ways the Town can **TAKE ACTION NOW**

Additional Resilience Strategies include:

- Name of strategy
- Resilience Value
- Key Partners
- Timeframe for Implementation

The following strategies and suggested steps to implementation provide the foundation for the Town to work with the community and ultimately make decisions on which actions to implement. Many factors will play into those decisions, and community engagement and discussion are paramount to the successful implementation of any resilience efforts.

Goal 1

RESILIENT COMMUNITY

Improve the health, safety, and resilience of the community by establishing trusted communication pathways and enhancing neighborhood social cohesion, with a particular focus on Communities of Concern.



Ensure all current and future Town plan updates include climate change considerations.

STRATEGY SUMMARY

Climate change adaptation and resilience can be integrated into community and regional planning processes in many ways, and exactly how this is done in practice differs based on the needs of the community as well as capacity and available resources. Improving community resilience will require that consideration of climate adaptation and resilience be integrated into all relevant local government, regional and sectoral, and policy- and decision-making processes.

Town Strategy Lead(s):	Key Partner(s):
Town Manager Town Council All Town Department Leads	Sonoma County Office of Resiliency Sonoma County Transportation Authority Sonoma County Fire District Regional Climate Protection Authority Water Districts Planning Commission Youth Organizations Bay Area Regional Energy Network (BayREN) Regional Climate Protection Authority (RCPA)

Metrics of Success

- By 2030, the best available climate projections, information on climate hazards, and resilience actions are incorporated into a section dedicated to climate change and resilience in Town and multi-jurisdictional/regional plans.
- Town staff, with one staff member dedicated to climate change and resilience, are working across sectors to improve the resilience of the community by integrating resilience strategies into their operational plans and implementing the actions identified in Town plan updates and projects.
- The Town participates in regional planning discussions and advocates for cross-sectoral integration of climate projections and ways to improve resilience in regional collaborations and multi-jurisdictional planning.

Considerations for Communities of Concern

Climate change disproportionately impacts Communities of Concern. The Town needs to work with these communities to develop current and future planning efforts that adequately address their needs. Thus, it is essential to conduct adequate and focused education and outreach to these communities when engaging the public on feedback in any future planning efforts. Distributing materials and hosting events in Spanish will be especially important.

Challenges to Implementation

The multiple departments within the Town have very specific focuses and tend to work in isolation. Creating resilience within the community will require additional effort to communicate across departments and sectors to ensure climate adaptation and resilience are included in Town plan and project updates. This likely increases the workload on staff that are already working at capacity. Finding financial resources to fund climate actions across plans is always a challenge that can be overcome with dedicated staff focused on finding and securing funding for resilience.

Town Policy/Planning Connection:	Funding Mechanisms & Opportunities:
Windsor 2040 General Plan Parks and Recreation Master Plan Bike and Pedestrian Master Plan Water Master Plan Hazard Mitigation Plans Capital Improvement Program	California Hazard Mitigation Grant Funding Caltrans Sustainability Grants Local Tax Measures National Science Foundation FEMA EPA

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Create and maintain a master list of Town plans and programs. This will require input and effort from all Department Directors and staff to create a comprehensive list of plans and programs as well as a timeline of required updates and identify opportunities to collaborate on resilience projects.	Near-Term < 2 years, Ongoing
Participate in regional planning discussions. By participating in larger-scale planning discussions (e.g., RCPA, SCTA, Sonoma County), the Town can advocate for the inclusion of climate change projections and resilience actions in multi-jurisdictional planning efforts. This can benefit the Town as well as the region and create more synergies across sectors and jurisdictions instead of creating additional incongruencies.	Near-Term < 2 years, Ongoing

Formally adopt climate projections and/or scenarios to use in future planning. The Town could formally future climate scenarios for temperature and precipitation, as this can help create a standardized baseline reference for planning future projects and the implementation priorities and processes.	Near-Term < 2 years
Conduct an exercise to conceptualize the different potential interactions between planning and adaptation policies. Planning tools can serve multiple objectives, sometimes competing, such as: expanding housing opportunities, supporting economic growth, expanding green spaces; promoting public safety and efficient multi-modal transportation opportunities; and mitigating the Town's climate impact and vulnerability. Understanding potential synergies and competing interests between planning and adaptation policies can help staff and policymakers better understand how to integrate them effectively and efficiently.[31]	Near- Term < 2 years
Convene Town planners and staff for yearly planning and training sessions to integrate all Town work. Town staff can use this opportunity to convene, educate each other, and strategize effective ways to collaborate and deliver planning policies. Outcomes should be integrated into Town plans and programs and brought into other local and regional planning discussions when necessary.	Near- Term < 2 years
Continue to integrate best available science and resilience practices into the Town's planning efforts. As climate science and projections improve and change and new and innovative ways to adapt as these changes emerge, the Town will need to continue to maintain and update programs, policies, and plans to stay as current as possible.	Near-Term < 2 years, Ongoing

STRATEGY DETAILS & ADDITIONAL MATERIALS

Actions to improve the resilience of a community can be integrated into local and regional planning processes, projects, and programs in many ways, and exactly how this is done in practice differs based on the needs of the community. How the strategies and actions within this plan get implemented in the Town of Windsor is ultimately up to the local government and can depend on resources available, the political and social environment within the community and region, and the capability of the community to take action. This plan outlines numerous policies, programs, and projects that could be implemented directly by different departments and through collaborations with local and regional organizations and agencies; however, the ultimate goal of improving community resilience will require that consideration of climate change and resilience be integrated into **all** relevant local government, regional and sectoral, and policy-making

[31] (C40 Cities, 2021)

processes.[32] This mainstreaming of climate considerations into all core functions of government ensures that people, infrastructure, the economy, and nature are protected from climate impacts and extreme weather events.

The following list provides some common local plans and programs where climate adaptation and resilience can be implemented and integrated.[33]

Guiding or Overarching Plans:

- **General Plan.** A community's general plan, especially the safety element, is an appropriate document for defining specific goals, objectives, and policies related to climate adaptation.[34] Other relevant policy areas in the general plan include land use, transportation, conservation, recreation and open space, public safety, and noise.
- **Hazard Mitigation Plans (HMP).** LHMPs already include ways in which the community can mitigate current hazards and provide an excellent opportunity to integrate future hazards created by or exacerbated by climate change. This is an appropriate document to codify adaptation strategies related to mitigation of hazards such as wildfire, flooding, drought, and heat emergencies.
- **Administrative policy, procedures, and initiatives.** Some resilience strategies or actions can be directly implemented by Staff without needing to be formally accepted or adopted by a governing body.

Secondary Long-term Plans:

- **Climate Action Plan / Climate Adaptation or Resilience Plan.** Some communities create a stand-alone plan that addresses climate change. These plans can take many forms, some focusing solely on mitigation efforts, some on adaptation and resilience, and others combine mitigation and adaptation strategies.
- **Tribal and Indigenous Community Plans.** These plans are appropriate for identifying goals, objectives, and policies related to climate change and can help ensure effective and efficient program administration and service delivery to communities and residents.
- **Conservation and/or Restoration Plans.** These plans are appropriate documents to integrate adaptation strategies related to environmental conservation and restoration, or they can get integrated into a community's general plan.
- **Integrated Regional Water Management Plan.** These regional plans support local jurisdictions by providing coordination and information, and the associated grant funding for these programs can help support adaptation strategy development and implementation.
- **Historic or Cultural Preservation Plans.** Adaptation strategies that address historic and cultural resources can be included in these plans, as well as integrated into general plans or more specific plans.
- **Emergency Operations/Management Plan.** Current emergency operations planning should consider how current hazards and extreme weather events are projected to increase in intensity and frequency and how these changes will affect emergency response and evacuations.

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[32] (Cal OES Governor's Office of Emergency Services, 2020)
[33] (Cal OES Governor's Office of Emergency Services, 2020)
[34] The Town's General Plan includes a section specifically on *Climate Change Adaptation*.

Annual Plans and other Implementation Elements:

- **Capital Improvement Program (CIP) and Budget.** The CIP is an appropriate place to address priorities, funding, and scheduling of adaptation strategies that require capital expenditures (e.g., stormwater infrastructure updates, building a resilience hub/cooling center, etc.).
- **Community health assessments and community health improvement plans.** Adaptation strategies that affect public health systems, community health, and medical services can be integrated into a community health improvement plan.
- **Zoning and building codes and other land development codes, ordinances, and resolutions.** Adjusting regulations and procedures governing land use and zoning can be a means to incorporate and implement adaptation strategies.



Figure 8. Graphic depiction of key plans where climate mitigation and adaptation/resilience actions can be integrated within and across. (Source: Oregon Metro and RDPO, 2021)

Integration of climate projections and adaptation and resilience strategies should happen across different plans as well within different stages and phases of planning. For example, climate equity can be integrated into the early stages of a planning process (*who needs to be included in the early stages*); climate data can be included in a risk assessment (*which hazards are exacerbated by climate change*); climate considerations can be incorporated into existing and planned programs and projects (*how can resilience actions create co-benefits for the community*); and climate information and resilience principles can be integrated into implementation and evaluation of plans, policies, and programs (*how well do they increase resilience and reduce vulnerabilities*).

According to the California Adaptation Planning Guide[35], one of the greatest challenges to developing resilience strategies and integrating them into community planning processes is the diversity of potential impacts on public services, equity, community health, economic vitality, ecosystem health, water availability, and more. Fortunately, Windsor and the broader region have taken a holistic and forward-thinking approach to both GHG mitigation and adaptation planning, and have already addressed many of the current and projected climate impacts (identified in the *Town of Windsor Community Vulnerability Assessment*) in the general plan and hazard mitigation plans. Therefore, the Town is well-situated to understand the types of strategies that can be most effective for the Town and the best ways to continue to integrate these actions into existing and future planning efforts.

There are two primary ways to effectively integrate climate resilience and hazard mitigation planning into other local planning efforts:[36]

1) Integrate climate change projections, vulnerabilities, and resilience policies and principles into local planning mechanisms. In addition, integrate local planning mechanisms into climate resilience planning.
    a. Include information on climate change and climate hazards (historical change, past events, potential impacts, and changing vulnerabilities).
    b. Find synergies and co-benefits between GHG mitigation efforts and resilience planning.
    c. Develop appropriate goals, objectives, policies, projects, and programs.

2) Encourage collaborative planning and implementation between and among departments and agencies.
    a. Involve key community officials and leaders with authority to execute policies and programs related to risk reduction and resilience.
    b. Collaborate across departments and agencies with key staff to help share knowledge and build relationships that are essential to the successful implementation of resilience activities.

Areas of Opportunity for Integration

Table 2 provides examples of different types of plans relevant to Windsor's climate resilience efforts, lists dates of the most recent or scheduled update for plans and provides suggestions for ways the Town can feature, integrate, or consider climate change hazards and impacts as well as resilience strategies outlined in this Plan. While not comprehensive, this summary highlights the variety of planning efforts that will be affected by climate change and have an opportunity to incorporate climate considerations and improve or enhance resilience.

[35] (Cal OES Governor's Office of Emergency Services, 2020) - page 17
[36] (FEMA, 2015)

Table 2. Climate change and resilience considerations for the Town of Windsor planning and regulatory documents.

Type of Plan	General Purpose	Town of Windsor Plan/Program	Most Recent or Scheduled Update	Potential Climate Change Considerations
Comprehensive Plan Physical Land Use Plan	Identifies areas for different types of development Identifies development hazard areas Provides long-term policy direction on land use development and overall community development. Zoning Ordinance implements General Plan.	Windsor 2040 General Plan	2018	Highlight areas where climate change impacts/hazards are likely to be most severe. Recognize the continued need to prioritize mitigation efforts while pursing adaptation action. Set policy direction on climate-resilience infrastructure and servicing. Formally recognize climate change and highlights related impacts and adaptation strategies. Identify land capability, suitability, and feasibility of different development alternatives. Formally recognize the disproportional impact of climate change on different Communities of Concern within the Town by including demographic data and social vulnerability index.
		General Plan Housing Element Update	Current: 2014-2022 Update: 2023-2031	
		General Plan Public Health & Safety Element Update	Updated with Housing Element	
		Zoning Ordinance Update	2022	
Hazard Mitigation Plan	Identifies historical and current hazards affecting the area and outlines recommendations and strategies to reduce these hazards.	Town of Windsor Local Hazard Mitigation Plan (LHMP)	2018	Identify climate change impact to existing and any new hazards – HMPs updated every 5 years, so can include updates to best available climate science. Recommend additional considerations and actions that can be taken to adjust to projected changes in vulnerability to particular hazards.
		Sonoma County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP): Windsor Annex	2021/2022 The Windsor Annex to the MJHMP supersedes the LHMP.	
Specific Plans	Provides guidance on the development of a particular geographic area within the Town. Implements the general plan by providing a special set of planning policies and development standards.	Shiloh Road Village Vision Plan Update		Identify current and future climate hazards in specific geographic areas that need to be addressed in planning. Include considerations of climate impacts on new development and ongoing maintenance.
		Station Area/Downtown Specific Plan		
Emergency Operations and Management Plan	Outlines processes and procedures to protect life and property during an emergency. Identifies how the Town and County can continue to operate or rapidly resume mission critical services and functions during and after emergencies.	Emergency Operations Plan	2020	Identify hazards impacted by climate change and the potential impacts to emergency response, management, and planning. Include potential future vulnerable structures, routes, etc. identified in the vulnerability assessment that may impact emergency operations.
		Sonoma County Continuity of Operations Plan	Wildfire Scar Response 2020	
Water Management Plans	Improves stormwater management, including drainage and infrastructure. Outlines water infrastructure assessments and needs. Describes water supply sources, historical and projected water use, and water transmission systems.	Water Master Plan	2019	Identify climate change-related stormwater or flooding hazard areas. Direct new infrastructure to less vulnerable areas. Helps direct and prioritize funding to protect or improve existing development in flood prone areas. Identify potential projects to infiltrate storm water as a
		Storm Drain Master Plan	Phase 1: 2017 Phase 2: 2020	
		Urban Water Management Plan	2021	

		Russian River Watershed Association Storm Water Resource Plan	2018	water resource. Identify water demand reduction measures and levels of water shortages the Town can use during drought periods. Identify strategies for increasing recycled water use in Windsor.
		Water Shortage Contingency Plan	2021	
		Recycled Water Storage and Use Study	2022	
		Wastewater Treatment Master Plan		
Multi-Modal Transportation Plans	Improves road, pedestrian, transit, and bicycle connections and infrastructure. Prioritizes safety for families and students traveling to and from schools.	Old Redwood Corridor Enhancement Plan	2022	Identify and improve weak links in transport networks more vulnerable to climate change impacts. Identify potential issues in transportation network during emergencies caused by or exacerbated by climate change. Prioritize transportation network improvements that improve connections for Communities of Concern.
		Bicycle and Pedestrian Master Plan	2022	
		Class I Bicycle and Pedestrian Trails Study	2030	
		Complete Streets Design Guidelines	2027	
		Windsor Safe Routes to Schools Report	2025	
Restoration and Conservation Plans	Identifies ways to preserve the natural and scenic resources which contribute to the general welfare and quality of life for residents and visitors.	Riparian Corridor Wildfire Fuel Management Plan	2020	Identify potential issues in natural systems due to climate impacts and ways in which systems can restored or preserved to reduce current and future impacts. Prioritize projects that reduce the vulnerability of natural systems and have co-benefits for these systems and the vitality of the community of Windsor as a whole.
Public Services and Recreation Plans	Provides guidance and policy direction to local government decision makers regarding the community's vision and changes/improvements to existing community services, facilities, and resources. Assesses future needs concerning parks, recreation, open space, and greenways.	Parks & Recreation Master Plan Update 2030	2015	Include climate resilience actions that have co-benefits for the community and those that align with the community's vision. Identify community and public facilities and services vulnerable to climate change and retrofits or improvements that can be made to reduce these vulnerabilities. Consider Communities of Concern when planning for new or retrofitting existing facilities or public services.
		Civic Center Visioning Study	2017	
Local Economic Development Plan or Strategy	Identifies Town's long-range capital needs and priorities. Identifies ways in which the public sector, business and civil society can work collectively to create better conditions for economic growth and employment generation. Identify ways to build up economic capacity of the Town to improve its economic future and the quality of life for all.	Capital Improvement Program	2021-2026	Reduce economic burden on Communities of Concern and vulnerable groups. Promote climate-friendly or green development opportunities. Prioritize projects that reduce vulnerability and have co-benefits for the community. Include a staff member who is knowledgeable about resilience and hazard mitigation in the development of the capital improvement program and annual budget.
		Economic Development Strategic Plan	2008	
		Latino Business Outreach Strategy		

Considerations:

- **Use consistent community goals and objectives to coordinate strategies and policies among the various plans.**
- **The Resilience Plan, with actions at multiple planning horizons and developed with cross-sector buy-in, can be a reference document when updating multiple plans.**
- **Develop a standing team of diverse representatives from various planning efforts.** Meet regularly to keep coordination consistent and ongoing. This helps to build understanding of each plan, overcome sector silos, gain buy-in from multiple agencies, and transfer knowledge.
- **Integrate the same actions and risk reduction strategies in multiple plans.** For example, resilience strategies from local planning documents can also be used as mitigation actions in a local hazard mitigation plan. At a minimum, cross-reference plans.
- **Coordinate plans (when possible) with other cities and counties, and regionally, to identify risks and opportunities for integrated management and incorporate most current best practices.**
- **Ensure consistency (in language, projections, goals, etc.) among other local plans and legislation, including, comprehensive plans, capital improvement plans, integrated regional water management plans, and transportation plans.**

Integrating climate change into local and regional planning efforts is a way to ensure consistency and harmony between resilience planning and other local planning mechanisms. It can help identify conflicts and inconsistencies among implementation tools, such as municipal codes and other ordinances. It also provides opportunities to advocate for a particular planning goal or project to fulfil multiple requirements, so that limited resources within the Town are maximized and duplication of efforts is avoided.

OPPORTUNITIES FOR ACTION

Integrating Resilience into Planning: A Workshop

As previously discussed, increasing community resilience requires embedding climate change and adaptation principles into existing and future planning. Unfortunately, while this is a goal for many municipalities, most lack the opportunity for planners across sectors, departments, agencies, and organizations to interact, and many of these individuals and groups have different goals - sometimes conflicting ones. This is partly due to a siloed government structure. The State of California, Sonoma County, and the Town of Windsor have already identified the need to address the climate emergency and prepare Town functions and its residents for these hazards and impacts. Sometimes the top-down effort to integrate these actions can be onerous, time consuming, and rigid, ending in planning efforts that do not meet the needs of the community. It is far more effective when planners within the Town government and community leaders and organizers come together organically and take it upon themselves to address these issues and bridge the gaps between the departments and entities.

Developing and conducting a workshop can help bring local planners and specialists together to share about their work and brainstorm ways to address climate vulnerabilities and solutions to increase resilience in the community. The following section provides some ideas, tools, and resources for a workshop or training session where planners and specialists can learn about each other's work and build on each other's expertise and experience.[37]

The Workshop

This can all be done at little cost, in person or virtually, as long as individuals across departments, organizations, and sectors are represented.

- **Identify and invite participants.** It is essential to 1) identify the Town Departments, agencies, and community organizations/groups that need to be involved in the process in order to ensure its success, 2) obtain buy-in from senior leadership in the departments and groups on staff participation in this workshop, 3) identify the right individuals within each department and entity to represent their colleagues and then motivate them post-workshop to continue the hard work, and 4) motivate these individuals to attend and actively participate in the discussion and activities.
- **Prepare materials for the workshop.** Significant effort upfront in preparation for the workshop is essential to achieve the goals of this process. Before the workshop, it is important to compile:
    - A list of the main priorities of each of the attending departments and organizations involved in the workshop. This can help to identify synergies or misalignments and prime attendees for discussion.
    - Information on the Town's vulnerability to climate hazards (see the Town of Windsor's Community Vulnerability Assessment). This information can help seed discussion.
    - Key terminology from planning and climate adaptation/resilience.
- **Choose the right workshop format.** The best format for this workshop depends on how much time can be set aside for this workshop: half-day, full day, multiple days. It is important for any format to set the stage for the workshop with an overview of the principles of adaptation/resilience planning and urban planning and provide examples or case studies of how municipalities have "cross-walked" between the two sectors. The remaining time should be spent focusing on brainstorming activities around ways to integrate work, specific projects, and/or identifying future collaborative work departments can do by identifying key gaps between departments as well as overlapping goal areas. The workshop format should be tailored to the amount of time that can be allocated to this workshop as well as the level of detail that the attendees are prepared for.
- **Clearly define the workshop's goals and objectives.** It is important that the participants define together the goals and objectives of the workshop. It helps to establish buy-in, ensures that participants feel their work priorities are considered, and helps demonstrate the connection between climate change and every participant's work.
- **Capture concrete follow-up actions or next steps from the workshop discussions.** Towards the end of the workshop, be sure to determine the next steps that will keep the

[37] Workshop framework and organization adapted from C40 Cities (2020) Integrating Climate Adaptation toolkit. See reference for more details.

momentum gathered during these discussions going. Help participants identify ways in which they can take the information they learned back to their respective departments and colleagues.

- **Create a space where participants and additional staff can continue to collaborate.** This workshop should not be a one-off event. The intent is to catalyze continued involvement of more individuals, departments, and organizations in these discussions. Creating a space to foster these ongoing conversations is essential for success and building resilience in the community. Creating this space allows for ongoing sharing on progress, space for continued discussion on integration and collaboration, and an avenue for continued learning.

Support neighborhood connections to enhance self-reliance and support during extreme weather events, particularly for residents in Communities of Concern.

STRATEGY SUMMARY

Building social connectedness is an effective way to empower individuals, neighborhoods, and the community to prepare for and manage extreme weather events. It is essential to establish programs and processes to formalize neighborhood groups across the Town to ensure that all communities are supported equally. Especially during an emergency or extreme weather event, it is important for neighbors to understand how to work together and support those who need assistance.

Town Strategy Lead(s):	Key Partner(s):
Planning Parks and Recreation	• Homeowner Associations (HOA) • Neighborhood Groups • El Mercadito Group • Faith-based groups • Citizens Organized to Prepare for Emergencies (COPE) • Northern Sonoma County Community Emergency Response Team (CERT)

Metrics of Success

Successful implementation of this strategy means that in the medium-term, most of the Town residents are members of and participating in a neighborhood group that covers disaster preparedness and safety. It is essential that Communities of Concern are engaged and participating. This strategy would increase the ability of community members to respond and protect themselves through their own autonomous actions and through cooperation with their neighbors and first responders. This translates to the following:

- Community members form and maintain a neighborhood organization via COPE or a separate entity such as a HOA group.
- There is a clear organizing lead for each neighborhood who takes responsibility for being the liaison between the Town and neighbors.
- There is a comprehensive communications plan and tools to ensure that no one is left behind, including Communities of Concern.

Considerations for Communities of Concern

- The development of new COPE initiatives should prioritize Communities of Concern such as mobile home parks and neighborhoods with predominantly Spanish language speakers.
- Communication and education materials should be easy to understand in both English and Spanish
- The Town collaborates with local community-based organizations who has ties to the community or neighborhood and maintain on-going meetings and connection in neighborhoods.
- Community leaders are involved with strategy development and implementation.

Challenges to Implementation

- Capacity, interest, and time to create partnerships with fellow neighbors.
- Recruiting and maintaining neighborhood leaders.
- Reaching Communities of Concern in effective and meaningful ways.
- Distrust or apprehension around local government.

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
General Plan Hazard Mitigation Plans Emergency Operations Plan	• CivicSpark/AmeriCorps Fellow • AB 1500 Safe Drinking Water, Wildfire Prevention, Drought Preparation, Flood Protection, Extreme Heat Mitigation, and Workforce Development Bond Act of 2022 • SB-45 Wildfire Prevention, Safe Drinking Water, Drought Preparation, and Flood Protection Bond Act of 2022

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Implement a coordinated communications system that provides clear, fast, and accessible communication with the Town to elicit cooperation, instill public confidence and trust, and enhance self-reliance.	Near-Term < 2-year
Promote annual neighborhood block parties that bring people together to meet each other and to share information and resources for emergency preparedness on a regular basis.	Near-Term < 2-year, Ongoing
Identify and maintain neighborhood leaders through COPE and other neighborhood groups to inform the community about emergency events in real time.	Near-Term < 2-year

Establish the equivalent of a Neighborhood Group Coordinator Position to help the Town and community partners distribute emergency preparedness resources in an organized, coordinated, and timely manner. There would be enough work for this to be a full-time staffed position, but if resources are limited, these tasks could be distributed among existing staff or phased in over time.	Near-Term < 2-year
Maintain a voluntary registration system for neighbors with additional assistance requirements to receive the help they need during emergency situations.	Near-Term < 2 years
Continue to host emergency preparedness events at common Town events to share routine information about evacuations, COPE, and more (e.g., booths at the Farmer's Market and Summer Nights on the Green)	Near-Term < 2 years

STRATEGY DETAILS & ADDITIONAL MATERIALS

The community of Windsor loves its small-town character and has a desire and need to establish more robust and intentional social cohesion to improve the Town's resilience. Building social connectedness is an effective way to empower individuals and the community to be prepared for and manage extreme weather.[38] To ensure that connections are not ad hoc and support all the communities equally, it is essential to establish programs and processes that integrate existing neighborhood groups and formalize new ones across the Town. In order to effectively meet the climate challenges head on, collaborating with and involving residents will be an essential part of implementing successful action. It is important for neighbors to understand how to work together and to support special assistance needs or address and solve communication barriers. It is equally important that the Town involve and utilize community members in planning efforts, dissemination of information, and implementation of adaptation actions.

Areas of Opportunity for Action

To create unity and cohesion across Windsor and in individual neighborhoods, the Town should leverage existing partners and look to successful models of creating community. The six main steps for implementation in Windsor are described below:

Implement a Coordinated Communications System

Implementing a coordinated emergency communications system that allows for two-way communication between the Town and residents is critical to ensure the safety of the public. To effectively respond to emergency events, the community must have clear, fast, and accessible communication with the Town to elicit cooperation, instill trust, and generate self-reliance. Communication must also be proactive, when possible, to ensure that people are prepared to respond to these events. Messaging from the Town might include evacuation directions and other information that might impact response and recovery. Emergency information, especially news

[38] (Townshend et al., 2014)

pertinent to specific neighborhoods can be communicated via a messaging system to neighborhood leaders (as coordinated by COPE) and other community group leaders that can serve as trained and trusted touchpoints between the community and the Town; and other agencies when necessary (i.e., National Guard). Communication to the Town from community leaders is equally important to provide on-the-ground updates and ensure that the recommended emergency response remains the best protocol or if additional assistance is needed. The Town, neighborhood leaders, community groups, and communities should convene and agree on the best way to share and receive this information.

To leverage all communication modes, all community members should be encouraged to sign up to receive emergency notifications from Nixle and follow the Town's social media accounts to stay up to date with important information from the Town and public safety departments.

To create a communication system that elicits cooperation and trust, the Town should:

- Ensure that all neighborhoods and communities have trained neighborhood leaders and/or community group leaders
- Establish a trusted communication protocol for neighborhood leaders that is accessible in both English and Spanish
- Execute communications tabletop exercises on a yearly basis and adjust protocol based on lessons learned

Identify and maintain Neighborhood Leaders

COPE has created an effective model for sharing resources before, during, and after emergency events. To inform the community about emergency events in real time, COPE relies on neighborhood leaders to message their community. Many neighborhoods lack neighborhood leaders to carry out this task, especially in Communities of Concern. To ensure that neighbors get the information they need, it is recommended that up to three neighborhood leaders are staffed for each neighborhood (depending on the composition and size of the neighborhood). Multiple leaders are critical to ensure that all outreach requirements are met and to reduce the burden on a single leader. To enact this task, the Town should work with COPE to:

> A **neighborhood leader** is a trained community member that creates and or manages neighborhood teams for the purpose of sharing information on emergency preparedness and coordinates emergency response (i.e., evacuations). All neighborhoods should have 2-3 neighborhood leaders. COPE typically trains neighborhood leaders.

- Utilize the Emergency Evacuation Zones and sub-Zones map to identify neighborhood borders
- Identify and sign up 1-3 Neighborhood Leaders for each neighborhood
- Develop incentives for neighbors to enroll as leaders
- Distribute recruitment materials and communications for neighborhood leaders
- Identify and promote the benefits and values of community leaders

COPE shares the following resources with potential Neighborhood Leaders:

- Neighborhood Leader Sign-up Sheet
- COPE Emergency Guidebook for Windsor
- Windsor COPE Neighborhood and Community Leader Handbook

Potential Incentives for Neighborhood Leader Uptake:

- Evacuation Packs
- Go Bags for leaders

Establish the equivalent of a Neighborhood Group Coordinator Position

Employing or creating adequate time and support for a Neighborhood Group Coordinator by distributing the following responsibilities and tasks among existing staff, would help the Town and community partners distribute emergency preparedness resources in an organized, coordinated, and timely manner. The Coordinator would be responsible for the following:

- Distributing regional resources on disaster preparedness, safety, extreme weather events, and insurance costs;
- Creating and sharing outreach calendars in multiple languages that are easy to understand, culturally sensitive, and timely;
- Coordinating with COPE, other Town departments, and jurisdictions to ensure that the information is appropriately targeted and relevant to the community and gets absorbed;
- Developing communication tools and materials for neighborhood groups to utilize. This toolkit of materials would include:
    - Agreed upon localized non-digital communication mechanisms including community billboards in common areas such as parks, libraries, fire stations, or similar public space
    - A digital contact and communication tools used for routine engagement and support
    - Communication templates, resources, meeting topics, and educational information

It is important to acknowledge that distributing the above responsibilities to existing Town staff creates additional work for those individuals, many of which are already busy with existing work. Thus, this approach would require shifting responsibilities to ensure that the individual(s) responsible for these efforts have the time and resources to be successful. Eventually, creating an additional position within the Town would provide a central point of contact for the community and be able to dedicate her/his time and energy to successfully supporting neighborhood level resilience and provide more coordinated oversight of activities.

Create and maintain a confidential and voluntary registration system

Some community members require special assistance during emergency events. For these neighbors to receive the help they need, they must proactively coordinate with their neighborhood network to create customized emergency procedures. Neighborhood leaders can create a voluntary and private neighborhood registry for community members to share details about their needs. These needs should be incorporated into the overall emergency response procedure. Information must be protected, kept confidential, and only shared as relevant to the neighborhood group leaders or emergency responders.

- Voluntary Emergency Registry
- Creating an Emergency Registry or Neighborhood Roster
- Neighborhood Roster Template (see Appendix A of the Guidebook)

Annual Neighborhood Block Parties

Connecting with fellow neighbors and learning about their capacities and needs is central to effectively enacting evacuation protocols during emergencies. Neighborhood block parties for

emergency preparedness can create cohesion within a neighborhood because planning them requires shared goals and relies on teamwork. For example, the City of San Francisco has invested in a block party program for neighbors to learn how to work together and to get trained on the basics of disaster resilience called Neighborfest.[39] Hosting annual neighborhood block parties in Windsor would help bring people together and share information and resources on a regular basis. Neighbors would have the opportunity to learn and understand evacuation maps, create emergency evacuation plans, develop strategies to help one another, share contact information, and distribute resources (i.e., Emergency Go Bags).

These events should be hosted at the neighborhood level and coordinated with the help of COPE and other key partners such as Sonoma County Fire District, Faith-Based groups, and the Spanish speaking community.

A yearly block party schedule is necessary for neighbors to sustain connections and to review educational materials. To complete this task, the Town should work with COPE to:

- Identify all neighborhoods that have COPE groups and those that do not;
- Help encourage formation of COPE groups and volunteers in neighborhoods that are not involved with the organization;
- Work with COPE groups and the Town to coordinate and host yearly block parties; and
- Engage HOAs who are not part of the COPE program, but interested and able to support and partner with the Town on these Block Parties.

Resources

- ECA Neighborfest Toolkit
- Neighborhood Block Party Kit
- Special Event Permit Application

Continue to host emergency preparedness events at common Town events

To help neighbors stay informed and provide new information on preparedness, the Town, and the Neighborhood Group Coordinator (or equivalent) will work with partners to distribute the information widely and on a regular basis. Events that should be frequented by the Town include the Farmers Market, El Mercadito, and Summer Nights on the Green. Booths can be used to share information about evacuations, connect locals with COPE, and more. To enact this strategy, the Town should:

- Hire a staff member to work on outreach efforts (likely the Neighborhood Groups Coordinator)
- Share key information and resources developed by COPE.
    - Windsor COPE YouTube Channel
    - Emergency Go Kit Supply Checklist
    - Neighborhood Leader Sign-up Sheet
    - COPE Emergency Guidebook for Windsor
    - Northern Sonoma COPE YouTube Channel
- Coordinate with event planners to host informational booths

[39] https://www.empowersf.org/neighborfest/

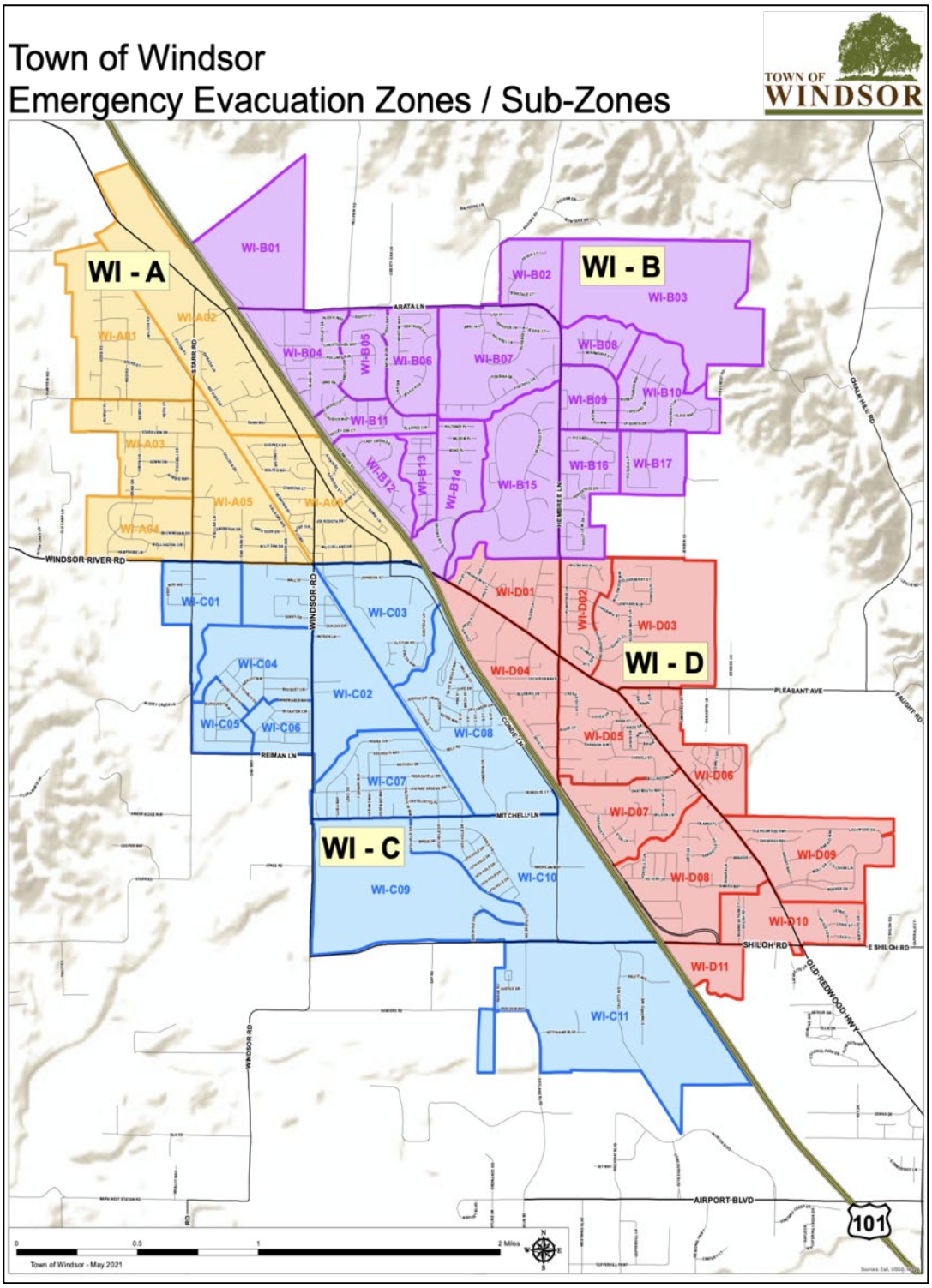


Figure 9. Map of Town of Windsor Emergency Evacuation Zones and Sub-Zones.

Identify opportunities to reduce the negative effects of poor air quality caused by wildfire smoke on human health.

STRATEGY SUMMARY

Wildfires near and far pose significant health risks to the Windsor populations in the form of air pollution from smoke and other combustion byproducts. Many recent studies demonstrate a variety of respiratory-related health effects of wildfire smoke exposure, several of which link cardiovascular-related health effects to short-term wildfire smoke exposures. Educating residents on the risk factors and strategies for preventing and reducing their exposure can help to limit negative health outcomes.

Town Strategy Lead(s):	Key Partner(s):
Fire Department Police Department Parks and Recreation	Windsor Unified School District Public Health Services (Hospitals, Care Facilities) Bay Area Air Quality Management District Bay Area Regional Energy Network (BayREN)

Metrics of Success

In the near-term, the Town has reached 90% of Windsor residents through its wildfire smoke education campaign (using social media and other outlets) and has updated air filtration systems in all public buildings. Within five years (long-term), the Town will complete an ongoing retrofit of a public facility that serves as a Resilience Hub and provides clean air during smoke events and other services during other extreme weather events and power outages and may identify other similar facilities to retrofit in that timeframe.

Considerations for Communities of Concern

- Particular attention should be paid to elderly and young populations, especially those in assisted living facilities and schools where occupants are often more physiologically sensitive to smoke.
- Outdoor workers and their employers should be a top focus for the Town when considering protections during smoke events and periods of poor air quality.
- Outreach and education materials should be advertised and made available in both English and Spanish.
- Resilience Hubs should be welcoming and accessible to all residents of Windsor and reflect the needs of the communities and surrounding neighborhoods it serves.

Challenges to Implementation

Air pollution from distant wildfires can result in profound impacts on Windsor residents, the economy, and the environment that persist for long periods of time. Combined with air pollution from other sources, wildfire smoke can exacerbate the negative health impacts of poor air quality. Because most residents cannot seek indoor shelter indefinitely, reducing exposure to tolerable levels can be challenging. Moreover, wildfire smoke events are generally not isolated events and are likely to occur simultaneously with other hazardous weather conditions or events. When combined with periods of extreme heat, which is a contributing factor to wildfire risk and therefore likely to occur concurrently to wildfire smoke, negative impacts are greatly exacerbated. For fires that occur very far from Windsor, including outside the state, there is very little if anything that the Town, Sonoma County, or even the State of California can do to address the cause of smoke, which shifts the strategy to one that is principally focused on impact reduction and adaptation.

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Hazard Mitigation Plans Emergency Operations Plan Community Wildfire Protection Plan Community Health Improvement Plan General Plan Building Codes Parks and Recreation Master Plan	• EPA • Department of Education • California Division of Occupational Safety and Health (Cal/OSHA) • FEMA

STEPS TO IMPLEMENTATION

Key Actions	Timeframe

Conduct annual pre-(fire)season PSAs, outreach events, or news and social media announcements to advise the public on preparing for the fire season.
• Host "Smoke Ready Week" on Town social media sources and local radio stations, to include information on:
  ○ Where to find local air quality information using multiple communication channels,
  ○ Recognizing health impacts of wildfire smoke and responding to associated health-related emergencies,
  ○ Ways to reduce exposure to wildfire smoke in the home (e.g., BayREN resources and rebates for healthy homes),
  ○ What to do during a smoke event, and
  ○ Other ways that households and businesses can reduce smoke exposure.
• Identify opportunities to support residents in constructing or retrofitting Clean Air Rooms in their homes to combat excess wildfire
	Near-term
	< 2 years,
	Ongoing

smoke, especially for residents with limited mobility or during a pandemic. • Coordinate with regional healthcare providers to enhance community outreach and education programs about the impacts of wildfires and smoke on physical and mental health. • Share links to real time air quality information using regional tools (BAAQMD), or sites like Purple Air to enable community members to see what air quality levels may be close to their homes. • Identify resources for outdoor workers and those who may need to be outside to have proper ventilation masks/equipment.	
Identify ways to better integrate existing wildfire, smoke, and red flag warning day forecasts and notifications into Town operations (i.e., PG&E's cameras and weather station information, National Weather Service Red Flag days, wind forecasts, humidity forecast, fuel moisture content, etc.) • Incorporate data on air quality levels and wildfire smoke forecasts into existing notification systems and networks to improve the accuracy and efficiency of information disseminate systems. • Establish alternate means to alert and otherwise communicate with residents and other community stakeholders who may not use traditional methods or sources	Near-term < 2 years
Work with willing partners to designate and fully equip a multi-hazard Resilience Hub in a strategic area of Town to serve as respite from various hazards, including wildfire smoke (Clean Center), extreme heat events (cooling center), power outages (back-up power sources), etc. These can be existing community spaces, such as schools, libraries, city/county buildings, shelters, and other trusted facilities. • Facilities that provide elevated protection from wildfire smoke and other threats to air quality may already exist in the community, but these must be identified and assessed. • Resilience Hubs to support air quality threats may require little more than retrofitting of air handling / HVAC systems, with consideration given to schools, libraries, city/county buildings, shelters, and other trusted community facilities • Engage with the community to help identify facilities that currently serve as centers for public respite from emergencies such as power outages and other extreme events • Identify existing and planned Town and community facilities that could be retrofitted or constructed to serve as a multi-hazard Resilience Hub during emergencies • Identify potential funding opportunities to establish and operate a Resilience Hub for the community	Medium-term < 5 years

• Ensure all Town buildings have particulate and smoke filtration systems with special attention to dedicated emergency evacuation shelters • Implement energy efficiency and weatherization upgrades to identified buildings to ensure that the indoor air is clean, that windows and doors have been effectively sealed, and that the HVAC systems are set up to support high indoor air quality • Explore the opportunity to establish one or more "Resilience Hubs" with a grid-connected microgrid to ensure ongoing power, communications, and water in case of a wide-spread power outage	

Prepare a wildfire/smoke/extreme heat communication plan or program. This plan should include details as to:
• The community smoke communication plan or program should include details as to:
  o Who should be given specific information regarding smoke events,
  o When that information should be delivered, and
  o What communication channels to use to deliver the information.
• The plan or program should anticipate what information will be needed to communicate effectively to specific populations, especially those in senior/nursing homes, those who speak English as a second language (or not at all), and students.
• The aspects of this plan/program could be included as an element in another emergency planning document and does not necessitate the creation of a new plan.
For example, this plan should cover protocols for cancelling/limiting community and school outdoor events and activities, restricting outdoor work for public employees, providing safety equipment for essential workers when air quality is at a certain level, and distributing information to the public in a timely manner.
	Near-term
	< 2 years

Reduce other localized sources of air pollution and emissions. Air pollutants and particulate matter generated from wildfires is exacerbated by existing air pollutants from point sources within the Town and surrounding region. Collaborating with the County and working to implement mitigation strategies recommended in the Sonoma County Climate Action 2020 and Beyond plan can help reduce the health impacts of wildfire smoke. • Identify other sources of smoke/air pollution (e.g., limits to vehicle idling). • Consider policies to limit unnecessary emissions during smoke events.	Medium-term < 5 years

STRATEGY DETAILS & ADDITIONAL MATERIALS

Wildfires in California and across the region have increased in severity and intensity, particularly in the last few years. In addition to the direct destruction caused by these fires, they also produce heavy amounts of smoke. The smoke can impact the entire region and blanket whole communities for days or weeks at a time; this creates public health issues from exposures to particulate matter and air toxins for people living within and traveling through these communities. Because of this, wildfires near and far pose significant health risks to Windsor residents in the form of air pollution from smoke and byproducts of combustion. Many recent studies on the health effects of wildfire smoke exposure consistently demonstrate a variety of respiratory-related health effects, and some studies also provide evidence of cardiovascular-related health effects in response to short-term wildfire smoke exposures.

Wildfire smoke is a mixture of air pollutants, with particulate matter being the principal threat to public health. Extensive evidence has demonstrated health effects in response to daily particulate matter exposure ranging from eye and respiratory tract irritation to more serious disorders including reduced lung function, bronchitis, exacerbation of asthma and other respiratory diseases, and exacerbation of cardiovascular diseases. Short-term exposure (days to weeks) to fine particulate matter is associated with increased risk of premature mortality and aggravation of pre-existing respiratory and cardiovascular disease.[40] Exposure to fine particles can also irritate the respiratory system, causing persistent cough, phlegm, wheezing, and difficulty breathing, even for healthy people (those without preexisting conditions). While most of the public health focus on wildfire smoke exposure is on short-term (daily to weekly) exposure, it is important to consider the health effects of cumulative exposure, whether it is from multi-day exposure or multiple consecutive fire seasons. While there is little information on potential health impacts from these long-term exposures, there is concern that these exposures (at sufficient concentrations and durations) might contribute to overall lifetime risk for heart disease, lung disease, and cancer.[41]

Fortunately, most healthy children and adults can recover quickly from smoke exposure and experience only temporary effects. However, young children and older adults, pregnant women, those suffering from preexisting health conditions (especially asthma and COPD), populations of lower socioeconomic status, and outdoor workers are most likely to be negatively impacted by exposure to smoke and particulate matter. There is extensive evidence that demonstrates increased risk of emergency department visits and hospital admissions for asthma and COPD from exposure to fine particles, such as those found in smoke.[42] See Table 3 for a summary of vulnerable populations potentially at higher risk of health effects from wildfire smoke.

[40] (Reid et al., 2016; Tinling et al., 2016; Wettstein et al., 2018)
[41] (U.S. Environmental Protection Agency, 2019)
[42] (U.S. Environmental Protection Agency, 2019)

Table 3. Summary of life stages and populations potentially at risk of health effects from wildfire smoke exposures. This table is taken from Wildfire Smoke Guide for Public Health (EPA, 2019).

At-risk Lifestage/ Population	Rationale and Potential Health Effects from Wildfire Smoke Exposure
People with asthma and other respiratory diseases	Rationale: Underlying respiratory diseases result in compromised health status that can result in the triggering of severe respiratory responses by environmental irritants, such as wildfire smoke. Potential health effects: Breathing difficulties (e.g., coughing, wheezing, and chest tightness) and exacerbations of chronic lung diseases (e.g., asthma and COPD) leading to increased medication usage, emergency department visits, and hospital admissions.
People with cardiovascular disease	Rationale: Underlying circulatory diseases result in compromised health status that can result in the triggering of severe cardiovascular events by environmental irritants, such as wildfire smoke. Potential health effects: Triggering of ischemic events, such as angina pectoris, heart attacks, and stroke; worsening of heart failure; or abnormal heart rhythms could lead to emergency department visits, hospital admissions, and even death.
Children	Rationale: Children's lungs are still developing and there is a greater likelihood of increased exposure to wildfire smoke resulting from more time spent outdoors, engagement in more vigorous activity, and inhalation of more air per pound of body weight compared to adults. Potential health effects: Coughing, wheezing, difficulty breathing, chest tightness, decreased lung function in all children. In children with asthma, worsening of asthma symptoms or heightened risk of asthma attacks may occur.
Pregnant women	Rationale: Pregnancy-related physiologic changes (e.g., increased breathing rates) may increase vulnerability to environmental exposures, such as wildfire smoke. In addition, during critical development periods, the fetus may experience increased vulnerability to these exposures. Potential health effects: Limited evidence shows air pollution-related effects on pregnant women and the developing fetus, including low birth weight and preterm birth.
Older adults	Rationale: Higher prevalence of pre-existing lung and heart disease and decline of physiologic process, such as defense mechanisms. Potential health effects: Exacerbation of heart and lung diseases leading to emergency department visits, hospital admissions, and even death.
People of low socioeconomic status	Rationale: Less access to health care could lead to higher likelihood of untreated or insufficient treatment of underlying health conditions (e.g., asthma, diabetes). Less access to measures to reduce exposure (e.g., air conditioning) could lead to higher levels of exposure to wildfire smoke. Potential health effects: Greater exposure to wildfire smoke due to less access to measures to reduce exposure, along with higher likelihood of untreated or insufficiently treated health conditions could lead to increased risks of experiencing the health effects described above.
Outdoor workers	Rationale: Extended periods of time exposed to high concentrations of wildfire smoke. Potential health effects: Greater exposure to wildfire smoke can lead to increased risks of experiencing the range of health effects described above.

Wildfire Smoke and Air Quality Resources

Weather conditions such as wind, temperature and humidity dictate the way a wildfire behaves and how smoke can accumulate and be distributed. Winds can help "fuel" fires and direct them to new areas. Strong winds can increase the intensity of a wildfire and cause it to grow rapidly. Winds can also move smoke away from the wildfire's vicinity and carry it long distances to communities far away from the areas directly affected by the wildfire.

There are many resources available to communities and individuals to monitor air quality in their area and within the State of California. The U.S. Environmental Protection Agency (EPA) provides an online real-time air quality monitoring website, AirNow.gov, where anyone can check the current air quality index (AQI) and AQI forecast where they live and in the surrounding region.[43] It should be noted and taken into consideration that air quality at a specific

[43] The Air Quality Index (AQI) provides data for a snapshot in time, and individuals should take into consideration the potential impacts of prolonged exposure and at which levels to take precautions.

location may differ than the AQI at the nearest station. The website also provides a fire and smoke map for ease of tracking and planning. The Center for Disease Control and Prevention provides resources on reducing exposure to wildfire smoke during the COVID-19 pandemic and provides resources and instructions for how to create "clean air spaces" in homes and buildings. The State of California Air Resources Board also has extensive online resources for information on wildfires and wildfire smoke as well as ways in which individuals can prepare their homes for wildfire smoke and protect themselves during a smoke event.

Windsor falls within the jurisdiction of the Bay Area Air Quality Management District. The Air District's website provides information and resources for wildfire safety and air quality, including informational videos with tips and advice for protecting individual health when wildfires are impacting air quality in the Bay Area. The Bay Area Urban Areas Security Initiative has also put together the Bay Area Regional Air Quality Messaging Toolkit, a collaborative project developed to provide guidance to the public on preparedness and protective health measures before and during air quality incidents. This resource includes graphics, FAQ sheets, and relevant messaging regarding air quality and communication.

Best Practices for Protecting Public Health During Low Air Quality Events

There are many ways individuals and communities can prepare for wildfire smoke events and reduce exposure to air pollution and wildfire smoke inhalation:

- **Stay indoors.** The most common advisory issued during a smoke event is to remain indoors, where people have more control over the air quality. However, the effectiveness of this action depends on how well the building is protected from smoke and how air pollution is minimized. In general, a home that is well sealed and has central air conditioning that is recirculated is well protected, yet smoke can enter the home whenever windows or doors are opened. It is recommended to use HVAC filters (rated MERV 13 or higher) to reduce particle concentrations indoors.[44] Leaky homes and buildings are cause for concern, as outdoor particles can easily infiltrate indoor air quality and create a similar air quality as the outdoors. During periods of respite when AQI improves, even temporarily, individuals are encouraged to get outside and "air out" their homes to reduce air pollution. For people who do not have adequate air conditioning in their homes, it is advised that they visit family members, neighbors, or public buildings with appropriate air filtration during high smoke conditions.
- **Reduce Activity.** People can increase their air intake 10-20 times when exercising, so reducing physical activity during times of poor air quality can lower the exposure to and dose of inhaled air pollutants. This is specific to outdoor activities during smoky periods; individuals are encouraged to get outside when air quality improves and to continue physical activity indoors in places with adequate ventilation and acceptable air quality.
- **Reduce other sources of air pollution indoors.** Smoking cigarettes, spraying aerosol products, frying food, burning candles, and vacuuming can all increase indoor air particle levels and further reduce indoor air quality. Even small sources, such as candles, can produce surprisingly large amounts of indoor particulate matter, so they should not be used during smoke events.

[44] California Air Resources Board, https://ww2.arb.ca.gov/protecting-yourself-wildfire-smoke

- **Use air filters and air cleaners.** It is important to prepare for smoke events before they happen, which includes upgrading filters in central air systems, conducting regular maintenance on filters and ventilation systems, stocking up on filters, and understanding how to create clean air spaces in homes, public buildings, and businesses. There are many resources on indoor air filtration and air cleaners to use at home and guidance for building operations about indoor air filtration and these measures can also help reduce the spread of COVID-19. Residents can be provided with information on creating their own "do-it-yourself air cleaners" (ideas on how to do this can be found at https://pscleanair.gov/525/DIY-Air-Filter.)
- **Wear respiratory protection.** Respiratory protection (or masks) can be useful for reducing personal inhalation of wildfire smoke or ash. Respirators are widely available and can offer protection if used properly (incorrect sizing or use can be detrimental). Information on how individuals can determine how to correctly select masks to best protect themselves from smoke inhalation can be provided (the following fact sheet provides insight into the information residents may require: https://www.airnow.gov/publications/wildfire-guide-factsheets/protect-your-lungs-from-wildfire-smoke/).
- **Stay informed.** It is important to stay informed of local air quality and closures happening in the community. Limiting travel to certain times of the day when smoke level is lowest can allow for the continuation of certain daily activities. Local officials can close public centers, schools, or cancel events during times when smoke levels are highest, so it is important to stay informed as to what is happening in the community. This requires that the Town create and implement a wildfire smoke communication plan to keep their residents informed through different channels as to what is happening in the community and directing residents and visitors to available resources.

Additional Opportunities for Action

Public health impacts from poor air quality can be significantly reduced with careful preparation and planning. These preparations can be done at both the individual and municipal levels, and the Town can help residents become more knowledgeable about the potential health impacts, feel more prepared when smoke events happen, and feel like they know where to go to access resources and find respite from poor air quality.

There are many areas of opportunity for the Town to take action to better protect the public health of the community. These areas include: 1) conducting education and outreach, 2) retrofitting municipal buildings and public facilities, 3) ensuring adequate emergency management and response plans are in place, 4) coordinating with healthcare providers and regional partners, and 5) providing support and incentives to individuals and businesses.

Outreach and Education

- Conduct pre-(fire)season PSAs or news and social media announcements to advise the public on preparing for the fire season (*see below section: Smoke Ready Week*)
- During smoke periods, conduct public advisories based on certain air quality levels and impacts to "sensitive groups".
- Identify ways to better integrate existing wildfire, smoke, and red flag warning day forecasts and notifications into Town operations (i.e., PG&E's cameras and weather

station information, National Weather Service Red Flag days, wind forecasts, humidity forecast, fuel moisture content, etc.).
- Collaborate with the Windsor Unified School District, daycare centers, and senior facilities to identify air quality thresholds, which, when reached, would trigger changes to operations, indoor recess, etc., and establish protocols for how changes are communicated to the community.[45]
- Collaborate with local businesses to educate outdoor workers on ways to protect their health and safety during smoke events.
- Check/monitor regional fire risk monthly (or more frequently during wildfire season) and communicate, especially if high, to the public.

Retrofitting Buildings
- Designate and fully equip a multi-hazard Resilience Hub in a strategic area of town to serve as respite from wildfire smoke (Clean Center), extreme heat events (cooling center), etc. (*see: Resilience Hubs Strategy*)
- Assess and upgrade as necessary all Town administration buildings with HVAC and air filtration systems to protect the health of workers (and in the case of evacuations, residents) from wildfire smoke.

Emergency Management and Response
- Assess and identify who in the community is most vulnerable to smoke events.[46]
- Integrate air quality and smoke tools (e.g., Bay Area Air Quality Management District and EPA Smoke Ready Program) into operations planning.
- Prepare a wildfire smoke communication plan/program.
- Identify and designate clean air shelters (e.g., school gymnasiums, civic auditoriums, etc.) for people who are displaced by wildfire or smoke and need a place to take refuge overnight or for extended periods.
- Identify and designate clean air spaces (e.g., library, shopping mall, senior center, etc.) for people to find temporary relief from wildfire smoke and/or extreme heat.
- Implement workforce protections that include guidance for inspectors/supervisors for outdoor workers during smoke events.[47]
- Identify community transportation needs and potential access issues to clean air centers/Resilience Hubs.

Coordination and Partnerships
- Establish partnerships with important partners or stakeholders (e.g., air quality agencies, local health providers, the media).

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[45] AirNow provides a guide for schools (U.S. EPA, 2014) on ways to keep children active while protecting their health when air pollution reaches unhealthy levels.
[46] See *Town of Windsor Community Vulnerability Assessment* for more information on Social Vulnerability Index (SVI) and Windsor's communities of concern.
[47] On July 18, 2019, the California Safety and Health Standards Board adopted an emergency regulation for a Cal/OSHA standard to protect workers from hazards associated with wildfire smoke. This standard, Title 8 California Code of Regulations Section 5141.1, effective on July 29, 2019, and will be followed by a process to develop a permanent regulation.

- Coordinate with Sonoma County Fire District to enhance community outreach and education programs about the impacts of wildfires and smoke on physical and mental health.
- Coordinate with regional healthcare providers to enhance community outreach and education programs about the impacts of wildfires and smoke on physical and mental health.
- Coordinate with the BayREN County lead to gather information and resources about available upgrade rebates, technical assistance, and financing tools for residents, commercial buildings, and public facilities.
- Work with regional partners and universities to develop a "Clearinghouse" of effective new and existing technical solutions to improve fire/smoke monitoring, communications, evacuations, and other health/fire activities that are available, in-development and in concept stage.
- Work with local employers to ensure outdoor workers are protected when working outdoors during smoke events.

Support and Incentives

- Distribute low-cost smoke filtration systems to strategic locations (i.e., emergency evacuation shelters or homes) and provide guidance on how to use them.
- Identify opportunities to support residents in constructing or retrofitting Clean Air Rooms in their homes to combat excess wildfire smoke, especially for residents with limited mobility or during a pandemic.
- Distribute information about BayREN rebates for better indoor air quality and circulation.

OPPORTUNITIES FOR ACTION

"Smoke Ready Week" - Public Outreach Campaign

Preparedness and knowledge are paramount in reducing negative health effects from wildfire smoke. Hosting a public education and outreach campaign — "Smoke Ready Week"—via social media and public media outlets can encourage residents to prepare for the annual (and increasingly longer) fire season. The Town can host this educational campaign, but the effort to plan for and implement this effort should be collaborative and include regional agencies, healthcare providers, emergency management, faith-based organizations, businesses, civic organizations, and community and neighborhood leaders.

Campaign Structure and Content

The intent of this education campaign is to provide information and resources on preparing for wildfire smoke and where residents can access relevant information/updates to emergency planning and notification. All this information should be able to be shared via social and various other public media channels. Each day for a week a unique theme with related tips should be provided. Topics could range from wildfire smoke characteristics, potential health impacts, DIY activities, and safety advice.

Such a campaign should occur annually before the wildfire season begins.[48] This can help remind residents to prepare themselves, their homes, and their businesses for wildfire and smoke events. This outreach can also provide residents with resources and any new information regarding local safety protocols they should be aware of (e.g., updates to closure notifications, etc.). This campaign could be done in partnership with BayREN or BAAQMD and support and promote upgrade or rebate programs. These daily updates can involve cameos, narratives, or testimony from emergency responders (police and fire department), Fire Safe Sonoma, community and cultural leaders, Town government, etc. via social media, websites, public radio, local television, or other public information sources.

The CDC has put together a Health Communicator's Social Media Toolkit for how to use social media for health messages and contains information on lessons learned and best practices. While the toolkit is tailored for use by the CDC, it can be useful for the Town to reference when creating social media content.

When planning this outreach campaign, the Town should consider the following:

- Media Platforms and Content Needs:
    - What social media platform(s) can the Town use to best reach all community members?
    - How can public radio be incorporated?
        - Advertising before the campaign week
        - Sharing resources and information during the campaign
    - Can the Town partner with other community organizations to advertise the campaign or share/distribute the information?
    - Will there be pre-recorded videos? Live Facebook/Instagram feed?
    - Will the campaign involve creating new content? Sharing existing content and resources?
        - Who will create this content?
        - Could public schools be leveraged to have students participate in a contest for campaign logo/slogan/etc.?
- Campaign Hosts, Partners, and Collaborators:
    - Who will be responsible for running the campaign?
    - Who can Town Staff partner with to put on the campaign and share responsibility and resources?
        - Community organizations? Local agencies? Police/Fire Departments? Businesses?
- Marketing/Advertising:
    - How will the Town advertise this campaign?
    - When will advertising begin to capture the attention of the community when it occurs?
- Associated Events:
    - Can the Town use this outreach campaign to address other outreach needs?

[48] The timing of this campaign should be evaluated on an annual basis as the typical wildfire "season" is continually expanding and changing.

        - Wildfire evacuation information? Emergency protocol changes? Public safety events?
    - Will there be an associated public in-person event?
        - Is there an opportunity to have a community event (new or existing) that can draw attention to this campaign?

The social media campaign can be used to attract and direct community members to a central website for particular resources for further distribution. This central website could be the Town's website[49] or that of another agency or organization that can provide appropriate wildfire smoke information. For the success of this campaign, focus on posting simple messages that reflect the needs of the community at that time; these needs, and the selected daily "themes", may change from year-to-year. Be sure to stay consistent with links and logos/graphics that are repeated across all outreach materials, so that when the public sees it, they will immediately recognize the information.

A few examples of potential daily "themes" are:

- Wildfire Smoke: What is it and how might it change with climate change?
- Public Health Impacts of Wildfire Smoke and Poor Air Quality
- How to Protect Yourself and Your Home from Smoke
- Who is Most at Risk from wildfire smoke?
- Wildfire Smoke Preparedness: How to Prepare Yourself in case of an Emergency
- Wildfire Smoke Resources: Where can I find information on smoke events, receive notifications, or learn more?
- Indoor Air Quality
    - Different Types of Filters
    - Filter Maintenance and What you Need to Know
    - DIY Fan & Filter
- Best Practices and Advice for High AQI Days
- *Special Topics* - These topics might change from year-to-year and highlight certain groups or topics that might be of particular community interest or concern
    - Schools: What to know about wildfire smoke events and school activities?
    - Local Businesses/Tourism: How can local businesses best position themselves during smoke events?

Examples of Social Media Campaign Content/Products:
Check out these Twitter accounts for some example resources that can be shared in the off-season, used as advertisement/hype for the Smoke Ready Week, or modified and used during Smoke Ready Week efforts.

- https://twitter.com/AIRNow
- https://www.facebook.com/airnow
- https://twitter.com/CDCenvironment
- https://twitter.com/CDCemergency

[49] This option would require a wildfire smoke "landing page" on the Town's website that could consist of resources or links to other websites or notification networks.



Figure 10. Example social media posts (4 total) from Montana Wildfire Smoke[50] education campaign for a single day. The theme focuses on improving indoor air quality in homes and commercial spaces.

[50] (Montana Wildfire Smoke, 2021)

Monday – How to find current air quality information.

Knowing where and how to access current air quality information is important. During wildfire season, air quality can change hour to hour. There are several ways to get air quality data, including online, phone apps, and text and email alerts. Visit SpokaneCleanAir.org or AirNow.gov for current air quality. For statewide air quality and wildfire updates Washington State Smoke Blog: https://wasmoke.blogspot.com/

Tuesday – Wildfire smoke and how it harms health.

Smoke is made up of gasses and microscopic particles. When inhaled, these particles bypass our bodies' normal defenses, traveling deep into the lungs and even entering the bloodstream. Breathing in smoke can have immediate health effects, including the following:

Coughing	Trouble breathing	Stinging eyes	Scratchy throat
Runny nose	Irritated sinuses	Wheezing	Chest pain
Headaches	Asthma attack	Tiredness	Fast heartbeat

Wednesday – Who is at most risk from wildfire smoke?

Inhaling wildfire smoke can be harmful to anyone, but it is especially harmful to these vulnerable groups: people with heart and lung disease, people with chronic respiratory conditions, infants and children, pregnant women and adults 65 and over. People in these high-risk groups need to follow their health care team's instructions for taking medications and follow their respiratory management plan. If symptoms worsen, they need to call their health care provider.

Thursday – Minimize smoke exposure at home.

Learn about your home's heating, ventilation and air conditioning system. Ensure the best filters for the system are used and change filters more often when it's smoky. If you have an air conditioning system in your home or vehicle, switch from "fresh air intake" to "recirculate.".

Friday – More ways to protect yourself from smoke.

Create a cleaner-air room in your home using a portable HEPA room air cleaner. Expect prices to start around $300. If purchasing a portable room air cleaner isn't in your current budget, there are do-it-yourself instructions for building a "box fan filter." These are fairly simple to assemble and cost around $50. View a tutorial to create a box fan filter.

Figure 11. Spokane, Washington's "Smoke Ready Week"[51] daily themes and content from June 14-18, 2021.

[51] (Spokane Regional Clean Air Agency, 2021)

Work with neighborhood groups to create Resilience Hubs.

STRATEGY SUMMARY

Resilience Hubs provide a safe place for community members in the event of an emergency. A Resilience Hub can serve as an evacuation center, cooling center, or charging station during extreme heat or weather events. It can provide clean indoor air in the case of regional wildfires, respite during power safety shut off events, resources, and information for residents on emergency management and preparedness, and a location that supports community values and events on a daily basis.

Town Strategy Lead(s):	Key Partner(s):
Parks and Recreation Public Works Planning	Windsor COPE Neighborhood/Community Leaders Community Groups Youth Groups Churches and Religious Groups Windsor Unified School District Bay Area Regional Energy Network (BayREN)

Metrics of Success

- By the end of 2022, Windsor Town staff and community members have worked together to identify at least two locations for Resilience Hubs.
- In the medium-term, the community has completed any necessary retrofits or renovations and has at least one Resilience Hub up and running.

Considerations for Communities of Concern

- Resilience Hubs need to be accessible for the populations they are intended to serve. It is important to assess the suitability of hub location to ensure that residents with special transportation needs (e.g., they do not own a vehicle) have adequate facility access. Hubs must also be handicap accessible.
- Resilience Hubs should provide year-round benefits for residents and serve to build social cohesion and social equity within the community. Particular attention should be paid to the function and use of the facility during non-emergency times, and resources and funding should be made available to provide programs and services that are needed for particular Communities of Concern.
- Resources and emergency response and preparedness alerts and materials should be made available in Spanish.

Challenges to Implementation

Ideally, Resilience Hubs are established as independent and trusted community-centered facilities that are managed and supported by community members and groups. However, it can be difficult to find the resources to successfully staff, support, and run these facilities. Retrofitting existing Town facilities to function as Resilience Hubs is potentially more feasible from a resources (funding and staffing) perspective but risks making the Hubs less accessible to some populations (not in the needed neighborhoods) or less likely to be utilized by certain groups (less trusted facilities).

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Emergency Management General Plan Capital Improvement Program Parks and Recreation Master Plan	California State Climate Resilience Funding (via S.B. 155 and S.B. 170) PG&E Resilience Hubs Grant Program CDBG-DR Grants BRIC Grants FEMA Hazard Mitigation Grants

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Continue to participate in regional discussions on Resilience Hubs. Participation in regional networking and discussions on Resilience Hubs can ensure that Windsor's needs are considered in the broader planning context. Sharing resources and efforts in planning for and implementing Resilience Hubs can reduce expenditures by the Town.	Near-term < 2 years, Ongoing
Identify Town facilities, such as recreation centers, that can be retrofitted to serve as a community Resilience Hub. In many instances, it is financially and logistically more feasible to retrofit existing Town facilities (and those facilities that may already be serving many of the functions of a Resilience Hub). Identifying existing facilities that either already fit the criteria (or can be easily retrofitted) is important to reduce the resources and effort needed to establish a Hub.	Near-term < 2 years
Work with the community (neighborhoods, community groups, etc.) to identify existing trusted community facilities that could serve as Resilience Hubs. The Town should engage with the community at the beginning of the planning process to learn about priority needs. For a Resilience Hub to be successful, it has to be utilized for its intended purposes, so involving those people the Hub will serve in the early planning process is essential to making the projects successful and truly useful.	Near-term < 2 years

Pursue funding opportunities to establish a Resilience Hub or pilot projects. The window of opportunity to receive funding for Resilience Hubs in the State of California is now! Aggressively pursuing funding opportunities can position the Town to successfully plan for and implement Resilience Hubs in a timely manner.	Near-term < 2 years

STRATEGY DETAILS & ADDITIONAL MATERIALS

Resilience Hubs are "community-serving facilities" that are emerging in cities across the country to enhance community resilience by enhancing community cohesion during non-emergency times and functioning as a centralized location for distribution of services before, during, and after a natural hazard or emergency.[52] Residents of Windsor understand how frequent power shutoffs, prolonged wildfire smoke events, wildfire evacuations, and other extreme weather events can put stress on community members, emergency responders and services, and local infrastructure. Co-designing and co-creating Resilience Hubs with community members offer a unique opportunity for Windsor to work together on climate mitigation, adaptation, and equity in a holistic way that also builds community resilience and well-being.[53]

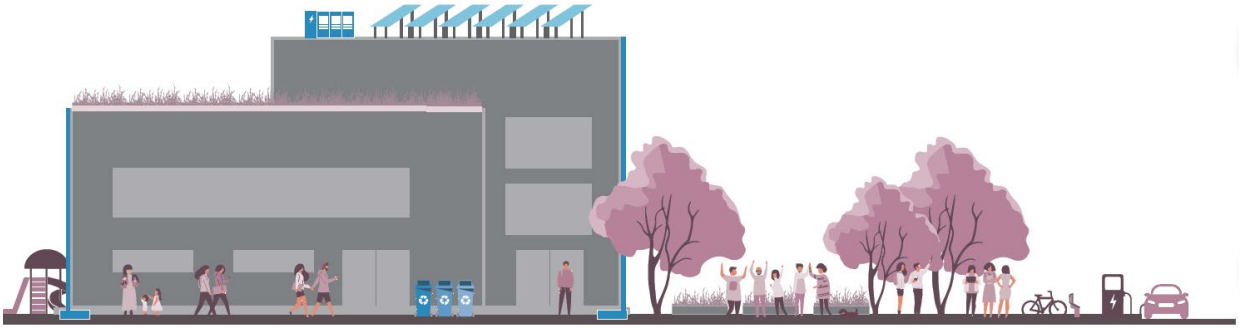


Figure 12. Depiction of an ideal Resilience Hub including the above components. Source: USDN Resilience Hub Guidance

Key components[54]:

- **Community Support** - A Resilience Hub will only be effective if community members are actively engaged in the whole process, beginning with inception. They must understand the services and resources provided, understand how the Hub can benefit themselves and their neighbors, visit the location on a regular basis, and trust the people managing it. Ensuring there is desire and support from the community is the most important factor to consider before moving forward with the development of a Resilience Hub.
- **Buildings** - The best locations to house Resilience Hubs are trusted community locations in different neighborhoods throughout the community. Ideal buildings are in good condition and can support necessary retrofits and upgrades (including solar and other

[52] (Baja, 2019)
[53] *Resilience Hubs* http://resilience-hub.org/
[54] (Baja, 2019)

energy storage and backup systems). Qualities of appropriate facilities include the current or potential ability to: be ADA accessible, have air-conditioning and heating capabilities, be earthquake resistant, be equipped with air filtration systems, have kitchens, and provide enough space to shelter residents in case of an emergency. Examples include community centers, recreation facilities, faith-based centers, churches, and schools. In addition, Hubs should be in safe areas away from (or above) flood plains or high fire risk areas.

- **Meet Community Needs During Emergencies** - Hubs should be able to provide clean air, communications, shelter, and electricity as well as supply fresh water, food, ice, refrigeration, charging stations, and basic medical supplies during a crisis. The amount of supplies needed at the facility is based on the extent and severity of the hazards and the size and number of people likely to be utilizing the location. Ideally, the Hub could supply power for at least 72 hours via renewable sources (solar with battery storage). These energy systems can reduce the use of fossil fuels on normal days (and thus reduce GHG emissions) and support critical services during emergencies.
- **Supporting Additional Community Uses** - Hubs should serve the community year-round and not only provide value to the community during times of disaster. They can support community activities, after school programs, health screenings, and other important community functions. In addition, Hubs can provide critical communication and education functions that can inform the community members about potential hazards and engage residents and help them prepare for, respond to, and recover from extreme weather events and disasters. The functions of the Hubs should be defined by the members of the community and should meet the unique needs of organizations and individuals in the neighborhood. They can act as safe spaces for community members to gather, strengthen relationships, and foster an inclusive year-round community. These investments will pay off in times of emergency as neighbors continue to find opportunities to support each other.

Regional Context and Progress

Spurred by work from the Urban Sustainability Directors Network and the NorCal Resilience Network, Resilience Hubs are gaining traction and interest in the Bay Area and municipalities throughout the region are researching, planning, and implementing Resilience Hubs in their communities. As previously discussed, Resilience Hubs should be designed with the community members in the neighborhoods where they are located, making the design and implementation needs unique to each hub.

Recent and ongoing efforts in the region, spearheaded by Bay Area Regional Energy Network (BayREN), to investigate the desire and need for Resilience Hubs in the Bay Area have found varying definitions, scopes, needs, and approaches to the idea of Resilience Hubs within the region. BayREN is undertaking an effort to determine the ways in which different levels of government are defining the geographic scope (who is being served by the facility) and identifying primary needs and functions (which hazards/disasters will be addressed by the facility).

Case Study: Boyle Heights

Just south of Downtown Los Angeles is the Boyle Heights Art Conservatory. The facility has served as a multicultural gathering place since 1925 and now serves as an example of a Resilience Hub, a trusted space that is deep-rooted in culture and supports disaster preparedness. The conservatory includes cooling and heating facilities, has been retrofitted for earthquakes, is outfitted with water filtration systems, and has drought-tolerant landscaping. The facility also has available back-up power in the event of a power outage or other disaster.[55] This Resilience Hub is deeply connected to the diverse community it serves; it provides resources in both English and Spanish and is hoping to expand its current programming to include education in native plants and gardening.

Nearly 100 years since its opening, the conservatory "provides a focus on career development for historically disenfranchised and impacted youth who are interested in pursuing careers in film, television, broadcasting, music and digital content creation".[56] This year-round benefit for the community is essential to its success as a trusted facility within the community and a location where people want to visit. As community and disaster preparedness needs grow and change, Boyle Heights Art Conservatory will continue to serve its community members with time, money, and labor necessary to keep up with those changes.

OPPORTUNITIES FOR ACTION

Considerations for the Town of Windsor

As the Town moves forward in planning for Resilience Hubs, it is important to discuss and answer the following questions about the scope, location, and partnerships necessary to successfully address the community's needs and provide essential services.

- **Scope**
  - Who is being served by the Resilience Hub? (Is it a single neighborhood or multiple neighborhoods?)
  - What are the primary functions for the Resilience Hub? (Does it serve as a universal hub for multiple/comprehensive hazards? Or is it, more specifically purposed for certain hazards? Is it connected to a broader regional "network" of Hubs?)
- **Buildings/Location**
  - Which facilities can best function as Resilience Hubs? (Is it a small facility focused on serving a neighborhood or a larger facility for multiple neighborhoods? Can it be effectively and affordably retrofitted?)
  - Who owns/manages the building? (Is it a public facility or a private or non-profit location?)
  - How many Resilience Hubs are needed in the community?
  - Are the Hubs located out of climate hazard risk zones?

[55] (NorCal Resilience Network)
[56] (*Boyle Heights Arts Conservatory*)

- **Partnerships/Funding Sources**
    - Which stakeholders need to be involved in planning and implementation of Resilience Hubs?
        - Sonoma County Energy & Sustainability Division
        - Sonoma County Department of Emergency Management
        - Emergency Responders/Managers (Town/County)
        - Trusted neighborhood leaders
        - Community Leaders
        - Community Organizations
        - Neighborhood Groups
        - Faith-based Groups
        - Youth Organizations
        - Schools
    - Where will funding and supplies come from?
        - Town of Windsor
        - Sonoma County
        - BayREN
        - Local organizations
        - State funding/grant sources
        - Federal grant sources
    - Can the Town coordinate/facilitate/provide resources but allow for community dissemination and distribution of resources and information?
    - Can the Town provide basic training in community organizing to elevate community leadership?

Potential Funding Opportunities

Developing a network of functioning Resilience Hubs can be facilitated by leveraging local and regional funding from BayREN, PG&E, and Sonoma Clean Power, all of which have extensive incentive programs to upgrade buildings. The key initial step is to work with community members to identify potential facilities in the community that may be well suited to a Hub and then work with these partners, the Town's Public Works Department, and Finance Department to scope and identify what needs to be done to upgrade the facilities to meet the needs of a truly resilient building. Concurrently, the social and political elements should be addressed to fund and operate the facilities over the lifetime of their operation - typically 50 or more years. Aligning with current funding sources will enable these facilities to operate with current staffing resources, or with the addition staff as needed.

Creating the "perfect" Resilience Hub network will take time. However, the community can move forward together by answering the questions provided above and identifying the facilities that best serve community members' needs. Windsor could simultaneously continue to participate in regional conversations around larger planning efforts while beginning to select and retrofit existing community facilities to serve specific functions and provide services in times of need. This work will help strengthen community connections, build trust, and increase resilience. With the current State budget surplus and funding available specifically for the creation of Resilience Hubs, this is the time to act.

Enhance community evacuation planning and execution.

STRATEGY SUMMARY

For Windsor to be a resilient community it needs to be able to plan and execute a partial or community-wide evacuation when necessary. This requires multi-jurisdictional collaboration and enhanced communication with community members as well as clear roles and responsibilities during an emergency event. A tabletop exercise is an effective method for testing the Town's capability to execute a timely and effective evacuation when needed.

Town Strategy Lead(s):	Key Partner(s):
Police Department Fire Department Town Manager	Public Works Business Owners Neighborhood Groups Sonoma County Health Department Town School Officials Town Water Department Town Engineering Department Town PIO County Sheriff's Office County Department of Emergency Management County Fire Marshall CAL Fire Cal OES Fire Safe Sonoma

Metrics of Success

Complete a Tabletop exercise in Fall 2022 (focused on Wildfire), with the new full-time Town Manager. The Tabletop exercise brings together key representatives from all associated departments and organizations who would be involved in the Emergency Operations Center, clarifies roles and responsibilities, establishes lines of communication, and tests equipment and approaches. Debrief both exercises and adjust as necessary. The exercise will be led by a facilitator with experience in tabletop exercises and Emergency Operations Center (EOC) operations.

Considerations for Communities of Concern

When planning for an evacuation - it is important to consider communications channels and approaches that will work for all residents, especially non-English speakers and seniors. Transportation for community members with functional disabilities will require specific attention as will protocols for evacuating schools and other community critical facilities.

Challenges to Implementation

Successful communication during extreme weather events and evacuations requires coordination and cooperation among various Town, County, and State government and non-government organizations and officials. Pre-Disaster coordination (for example, during a Tabletop exercise) can help ensure that everyone knows their roles and responsibilities, have clear lines of communication, and agrees on identified and trusted sources of information.

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Emergency Operations Plan (will be updated in 2022)	FEMA National Exercise Program Cal OES Exercise Program

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Conduct a tabletop exercise. A discussion-based exercise in response to a scenario, intended to generate a dialogue of various issues to facilitate a conceptual understanding, identify strengths and areas for improvement, and/or achieve changes in perceptions about plans, policies, or procedures. SOURCE: The Homeland Security Exercise and Evaluation Program (HSEEP) document published by the U.S. Department of Homeland Security in January 2020.	Near-term < 2 years
Establish a community-wide notification system. Provide a coherent and consistent system to support evacuation communications within the Windsor government and with community members. Consider expanding use of Apps, Nixle, or sirens.	Near-term < 2 years
Formalize the Town evacuation plan. Involve all government and non-government officials, community members, the media, and neighborhood groups in the creation of a detailed evacuation plan that incorporates and uses the new evacuation zones. For each zone, identify evacuation routes, staffing needs, use of staggered zone evacuations, management of areas with only one-way-in and one-way-out, traffic control locations, and new street design.	Near-term < 2 years

STRATEGY DETAILS & ADDITIONAL MATERIALS

Windsor residents are highly vulnerable to wildfire due to both the exposure of the Town and the impact to the health and safety of residents. Several subsets of the Windsor population are Communities of Concern and particularly sensitive to the impacts of wildfire. Across the region and state, wildfires are becoming hotter, more intense, longer lasting, and capable of occurring at any time of the year. They are also proving to be increasingly more deadly. Today, nearly all of Sonoma County is at risk of wildfire. Planning and preparing for the risk of wildfires for the community requires a coordinated and multi-faceted approach (see pg. 34 of the *Windsor Community Vulnerability Assessment*).

The need to issue and support both partial and full (community-wide) evacuations in response to approaching wildfires is becoming increasingly more likely as climate change exacerbates wildfire risk factors (e.g., temperature, precipitation, fuel load, wind). There are several ways that the Town can increase the preparedness for and capacity to conduct a successful evacuation.

Enhance Evacuation Communication

Providing a coherent and consistent system to support evacuation communications within the Windsor government and with community members and visitors is critical to successful evacuations. In previous events, residents were alerted by a combination of both traditional and technological notification methods and systems.

- Traditional (non-technical) notification methods and systems included: the strong smell of smoke, visible flames, Police and Fire sirens and loudspeakers, emergency personnel knocking on doors, neighbors knocking on doors, and neighbors using their car horns and megaphones.
- New and emerging technologies were also utilized to varying extents, including:
    - Nixle: This is a contracted (proprietary) alerting service used by both Windsor Town and Sonoma County. Residents can subscribe to SMS text-based alerts or can see them on a dedicated alerting website. The sign-up process requires residents to specify their geographic region and select the types of information they would like to receive. A low number of community members were subscribed to Nixle alerts at the onset of wildfires in 2017 and 2019.
    - SoCoAlert: This is a contracted (proprietary) product that provides mass voice-based notifications and alert messages to residents in defined geographic areas. The database supporting SoCoAlert includes both explicit sign-ups and data from other sources, such as registered landlines. If the original alert call has less than a 60% connection rate, second and third calls are made to the non-connecting numbers.
    - IPAWS (Integrated Public Alert and Warning System): This is a government-run service (FEMA and the FCC) that has the capacity to issue Wireless Emergency Alert (WEA) warnings. The IPAWS alerts are sent as SMS text messages to cell phones within a specific transmission range of selected mobile cell towers.[57]

[57] (Sonoma County Civil Grand Jury, 2018)

Enhancing these communication efforts for residents could include a variety of actions to continue to build awareness and participation in the alert systems. This would ideally start by:

- *Conducting an analysis of existing notification systems* within Windsor to determine the best method(s) for notifying community members of an evacuation order. Consider evacuation Apps (like Alert Marin), fixed location sirens (Outdoor Warning Sirens: Frequently Asked Questions - National Weather Service), and other approaches.
- *Citizen Preparedness* – Outreach around notification systems can also be an opportunity to educate community members on how to best prepare for a neighborhood or community-wide evacuation (e.g., Make a Plan, Build a Kit, and Be Informed). Ensure that all members of the community are included in these preparedness efforts, especially those community members with functional and access needs including seniors, children, non-English speakers, and individuals with physical and cognitive disabilities. Consider identifying trusted informers among these groups to facilitate communications from the Town concerning evacuation preparedness and execution.
- *Develop guidance for how existing evacuation zone maps and evacuation routes are to be used* including staggering evacuation efforts. Four evacuation zones and associated general evacuation routes have been established in the Town of Windsor. There is a need to identify how best to guide the use of the evacuation routes, consider the use of staggered zone evacuations, determine how to better manage evacuating areas with only one ingress/egress road, identify traffic control locations, and work new street designs into the evacuation notification systems. The evacuation routes for each zone were developed separately from this project through a collaboration between the Windsor Police Department (Sonoma County Sheriff's Department) and representatives of the Sonoma County Emergency Operations Center and are shown below.

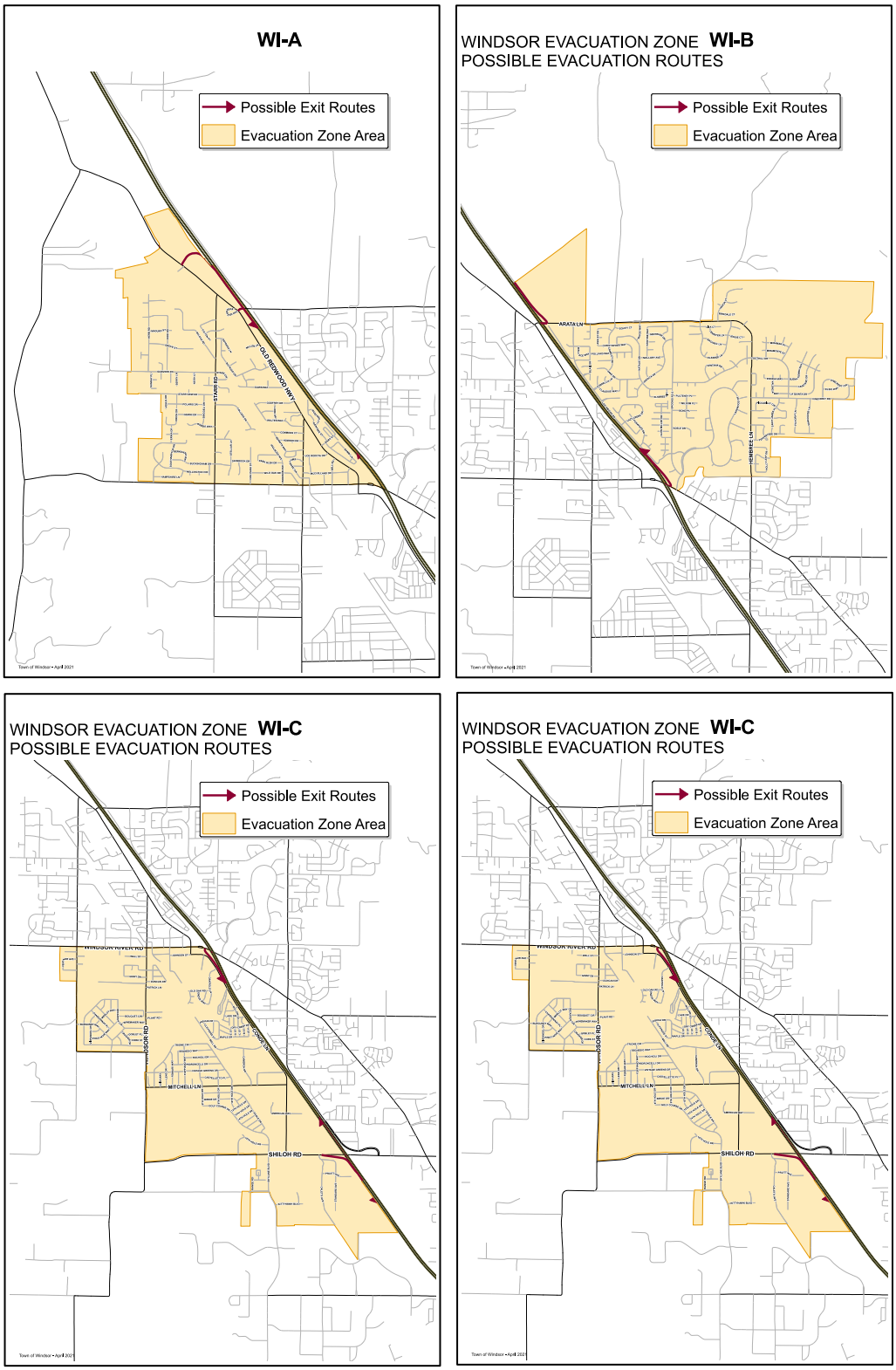


Figure 13: Town of Windsor Evacuation Zones and associated evacuation routes for each zone. The evacuation routes were developed separately from this project and can be incorporated into emergency planning and preparedness efforts.

Evacuation Preparedness Program

Building off the on-going work by Sonoma Fire and the neighborhood COPE programs, the Town can enhance the evacuation preparedness program by ensuring that all residents and visitors know how the evacuation plan works. Town and county staff can partner with neighborhood groups, social groups, and community organizations to identify community members who need additional assistance and be clear on what information each community member needs to have to effectively evacuate.

Coordination and collaboration around community preparedness will involve inter-agency planning and communication. The following organizations will likely be involved in evacuation planning efforts in Windsor, notably where wildfire evacuation is concerned:

- Cal OES
- Sonoma Department of Emergency Management
- Windsor Town Council, Mayor, and Town Manager
- CAL FIRE
- Sonoma County Sheriff's Office
- California Highway Patrol.

Collaboration will be required to reduce or eliminate any uncertainty that exists regarding assignment of responsibility for tracking of hazard conditions that inform evacuation decisions, issuing an evacuation order, managing the evacuation function, and facilitating community evacuation operational needs.

OPPORTUNITIES FOR ACTION

Conduct Two Tabletop Exercises Focusing on Evacuation

In some cases, evacuation will be the best way to prevent injuries and the loss of life. However, because these efforts are complex and require a large number of agencies and individuals to work collaboratively in a time constrained environment, plans must be accurate and effective. Because it is impractical to conduct a community-wide full-scale evacuation exercise, a Tabletop Exercise is the best way to validate evacuation plans and prepare those tasked with evacuation responsibilities.

The tabletop exercise should ensure compliance with the US Department of Homeland Security Exercise and Evaluation Program (HSEEP).[58] Its purpose must be to generate discussions of the issues surrounding evacuation, and not just evacuation alone. Facilitators will support a conceptual understanding of the function, identify strengths and areas for improvement, and where necessary, achieve changes in perceptions.

[58] (U.S. Department of Homeland Security, 2020)

Tabletop Exercise

1. Structure:
   - Scenario is presented to describe an event at a simulated time
   - Participants apply their knowledge and skills to a list of problems presented by the
   - facilitator
   - Problems are discussed as a group, and resolution may be reached and documented for later analysis
     - The facilitator will lead discussions around each situation and/or topic
     - Follow-up actions, successes, and lessons learned are presented are summarized and presented to participants
2. Participant Goals:
   - Enhance general awareness
   - Enhance roles and responsibility understanding
   - Validate plans and procedures
   - Discuss concepts and/or assess types of systems in a defined incident
3. Conduct Characteristics:
   - Requires an experienced facilitator
   - In-depth discussion
   - Problem-solving environment
   - All participants should be encouraged to contribute to the discussion and be reminded that they are making decisions in a no-fault environment
4. Outcomes:
   - Recommended revisions to current plans, policies, and procedures
   - An After-Action Report (AAR)/Improvement Plan (IP) [59]

Logistical considerations in the design and execution of two tabletop exercises in Windsor:

- Dates: Fall 2022 and Spring 2023 with the new full-time Town Manager.
- Proposed location: A room with a conference table large enough to seat all exercise participants together.
- Participants: To be determined, but to include stakeholders in the public, private, and nonprofit sectors.
- Scenario: The hazard will be wildfire, but the scenario should reflect the characteristics of the Town and its community members.
- Facilitation: An experienced facilitator should be hired to design, manage, and conduct the tabletop exercise.
- Materials: Tailored facilitator and participant guides and display materials and audio-visual materials and equipment must be developed.
- Staffing requirements: The facilitator will require support from town staff to design, plan, socialize, host, and conduct the tabletop exercise. Support from key Town officials will help to ensure the exercise is prioritized by invited participants.

[59] (U.S. Department of Homeland Security, 2020)

- Questions: Questions and other prompts will be determined according to the existing planning gaps and challenges and will be worded to ensure that plan contents are validated.
- Evaluations: An evaluation process should be designed, and an independent evaluator should be hired to observe and evaluate the exercise and assist in the development of a lessons learned document.
- Debrief: Capacity development is achieved through the conduct of a post-exercise briefing that highlights the contributions from all participants and captures comments and concerns.

Additional considerations:

- Exercise design official or team to look for examples that are relevant to evacuation scenarios most similar to wildfire for Windsor.
- Conduct a mock press conference(s) as part of the tabletop exercise led by the Town PIO and to possibly include real reporters asking questions.
- PIO to develop media materials (e.g., radio blurb/announcement, etc.).
- Consider a phone tree communication method for communicating to community members.
- Review public notification procedures including- scheduling regular briefing calls, being on alert for new developing information, drafting messaging, verifying messaging to confirm accuracy, getting approval on messaging, translating messaging to Spanish, delivering messaging.

Exercise Discussion Questions: To design and conduct a tabletop exercise concerning executing a timely and efficient evacuation, Windsor officials should consider the following questions:

- Why does the Town need to be ready to evacuate?
- What information sources will be considered in making the decision to execute a partial or community-wide evacuation?
- Which official(s) will make the decision to execute a partial or community-wide evacuation?
- How will the evacuation decision be communicated to Town officials and community members?
- What guidance is there for how the Town will evacuate each of the four designated evacuation zones?
- Where are potential traffic chokepoints and areas with only one ingress and egress roadway?
- What type(s) of assistance will be provided to community members with functional needs to assist in their evacuation?
- Who makes the decision to allow community members to return to their homes and businesses and what is that decision based on?
- How will the return home message be communicated to community members who have evacuated?
- What lessons learned do officials hope to gain through the tabletop experience?
- Other questions?

Additional Community Strategies

Work with regional and state partners to enhance greenhouse gas reduction efforts.

Resilience Value: In the medium and long-term, the only way the Town's resilience efforts will be effective is if it also invests in greenhouse gas (GHG) emissions reduction efforts to slow and stop climate change. While not the focus of this resilience plan, GHG mitigation efforts are ultimately critical to the success of this plan. The Town, region, and State have robust emissions reduction goals and the Town should commit to meeting those goals and potentially moving even more quickly to limit the long-term impacts of climate change.
Potential Partners: BayREN
Timeframe for Implementation: Medium-Term

Enhance evacuation education for all residents and visitors.

Resilience Value: The Tubbs and Kincade fires have shown the need for all residents and visitors to be ready to evacuate if needed. The Town can build on the newly updated evacuation maps, local alert and notification systems, and proactively identify and address gaps in their evacuation communication and messaging. This includes translating materials to Spanish and ensuring that they are accessible to all residents. Fire Safe Sonoma and other regional and local entities to make sure that residents have access to and are engaging in their wildfire preparedness and evacuation programs.
Potential Partners: Windsor COPE, Fire Safe Sonoma, and other regional and local entities play a vital role in reaching residents where they are and ensuring that they have access to and are engaging in their wildfire preparedness and evacuation programs.
Timeframe for Implementation: Now

Develop an extreme heat preparedness and response program.

Resilience Value: While historically not a significant issue, extreme heat events will undoubtedly get more frequently and more severe over the coming decades. Extreme heat events exacerbated by urban heat islands - developed areas that experience significantly warmer temperatures due to the built environment - can impact the health, safety, and wellbeing of community members. They can create particular challenges for older residents, outdoor workers, and other Communities of Concern. Efforts could include creating a heat alert program, assessing urban heat island effects, and developing policies that reduce heat impacts in town. Incorporating plans for extreme heat into Town operations can help ensure that it is prepared to deal with extreme heat events that will become more frequent in the future.
Potential Partners: National Weather Service, Emergency Planning, School Districts, Senior Living Facilities.
Timeframe for Implementation: Near-Term

Increase public awareness and understanding about local flood risk, especially among Communities of Concern.

Resilience Value: Education remains one of the cornerstones of community preparedness. Flooding is a frequently overlooked hazard for the Town, and it is important to ensure that it isn't overlooked as residents, business owners, and others work to be prepared for extreme

weather events. Communities of Concern are often those that are in flood prone areas and will be the ones affected first by those events. These community members also frequently have the least resources to prepare for or recover from flooding events. Customizing educational materials (and ensuring that they are available in Spanish) will be important if this action is to be successful.
Potential Partners: Working closely with faith-based organizations, local non-profits, Windsor COPE and others will be critical in ensuring that the Town can meet the community members where they are and meet their needs.
Timeframe for Implementation: Near-Term

Invest in community pre-disaster recovery planning efforts.

Resilience Value: Good pre-disaster planning requires continuous engagement and coordination with regional partners. This includes defining roles, creating formal agreements, reviewing and improving communication mechanisms, refining protocols, and institutionalizing future projections for risk in regional planning efforts. Even in a small community, effectively preparing for a disaster is a complicated and challenging task and more proactive investment in coordination and planning will ensure that both disaster response and recovery go well.
Potential Partners: Sonoma Fire, CAL EOS, surrounding municipalities
Timeframe for Implementation: Near-Term

Work with regional partners to enhance availability and access to health care for Windsor residents.

Resilience Value: As the old saying goes: "An ounce of prevention is worth a pound of cure". This is true for health care in underserved and under-resourced populations. Access to preventive and regular care can help reduce long-term stressors and make individuals better able to both respond during an emergency, but also less affected by those stressful events. It can also reduce or limit the need for severe interventions such as reliance on durable medical equipment, which can increase the sensitivity of these individuals to power outages or make evacuation more difficult.
Potential Partners: Local emergency care facilities, hospitals, State of California, Chamber of Commerce, Small Businesses
Timeframe for Implementation: Medium-Term

Work with regional and local health providers to provide mental health services for residents following extreme weather events.

Resilience Value: Extreme weather events can have significant impacts on mental health (e.g., PTSD caused or triggered by wildfires and evacuations), and this connection is often challenging to integrate into local or regional planning efforts. Yet, it is critical that this issue receives dedicated attention and resources. There are several organizations that specialize in providing mental health services, before, during, and after traumatic events. These include the Psychological First Aid (PFA), Skills for Psychological Recovery (SPR), and the Good Grief Network.
Potential Partners: Local health providers
Timeframe for Implementation: Near-Term

Enhance access to healthy and affordable food choices for all residents.

Resilience Value: Thinking broadly about individual and community resilience, healthy food (like health care) provides long-term resilience value. Access to healthy and affordable food (especially for Communities of Concern) can help stave off more severe medical issues (such as diabetes and heart disease) and make residents and families more able to respond to and less vulnerable to extreme weather events.
Potential Partners: Community Food Bank
Timeframe for Implementation: Medium-Term

Enhance multi-organizational coordination to support people during extreme weather-related events (with a focus on pre- and post-disaster resilience and recovery).

Resilience Value: It can be a challenge for individual residents to navigate the variety of programs, departments, and organizations that can provide services on a daily basis. This challenge is enhanced when thinking about preparing for and recovering from a disaster. Frequently, each department can provide different support services and finding who does what and how to access those services can be hard if not impossible (this is particularly true for Communities of Concern that have less time and resources to put into preparedness or recovery). Starting now and investing in ways to better connect and streamline services to support residents during and after extreme weather events can help those residents bounce back quickly.
Potential Partners: TBD
Timeframe for Implementation: Near-Term

Goal 2

RESILIENT INFRASTRUCTURE

Support community health and safety by climate-proofing critical infrastructure, enhancing the multi-modal transportation network, and supplementing public services across the Town.



Enhance the multimodal transportation network.

STRATEGY SUMMARY

Making strategic investments in projects that improve the existing transportation system (i.e., the roads, bike paths, pedestrian paths, sidewalks, intersections, bus stops, bus routes, etc. that Windsor residents use to move around) can enhance the quality of life for residents and visitors, support the ability to live in an environmentally sustainable manner, and help avoid or limit the impacts of extreme weather and changing climate conditions. Near-term strategic investments include addressing obvious traffic flow bottlenecks that could trap neighborhoods during evacuations and flooding events and finding ways to enhance daily mobility. Medium-term strategic investments include developing strategies to improve neighborhood coordination and preparation for evacuation and other forms of emergency response. Long-term strategic investments include enabling the transformation of the area's road network in ways that reduce GHGs, eliminate transportation-related risks, and improve the health and well-being of the Windsor community and those who visit it.

Town Strategy Lead(s):	Key Partner(s):
Public Works Planning	Parks and Recreation Economic Development Sonoma County Transit Sonoma County Transportation and Public Works Sonoma County Health Services Sonoma County Human Services Department Caltrans Federal Highway Administration

Metrics of Success

- Consistent with the Town of Windsor 2040 General Plan, the Town will improve multimodal travel and evacuation efficiency in single family neighborhoods with limited ingress and egress within five years.
- Within five years, the Town has applied for and been awarded funds for planning, design, and construction of intersection improvements for circulation and safety.
- The multimodal infrastructure goals identified in the 2040 General Plan are achieved: increasing the opportunity and appeal of public transit, pedestrian, or bike travel; reducing reliance on personal vehicles for Windsor residents and visitors; and reducing greenhouse gas emissions and air pollution associated with transportation.

Considerations for Communities of Concern

- All transportation infrastructure investments should engage residents during the planning and design process, particularly those with limited access to personal vehicles, limited physical mobility, or other constraints that limit their ability to utilize transportation systems both during evacuation and on a daily basis.
- All transportation infrastructure investments should incorporate the need to communicate clearly and directly with communities that do not speak English as their primary household language.

Challenges to Implementation

Community engagement: Inclusive community engagement is needed to discuss, refine, and ultimately prioritize potential investments. While these investments represent promising opportunities to improve the safety and well-being of community members, specific improvements have not yet been broadly discussed or refined in collaboration with community members. Community members and organizations representing the diversity of Windsor should be involved in the planning and design of transportation improvements.
Collaboration: Some investments will require direct collaboration with Homeowners Associations, property owners, or other regional entities to be completed successfully.
Funding opportunities: There are several federal, state, and regional funding programs to support transportation improvements that have a positive impact on climate resilience. However, many or most of these programs are over-subscribed during each funding cycle.

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Capital Improvement Program	Measure M Transportation Development Act Article 3 Sustainable Transportation Planning Grants Highway Safety Improvement Plan Local Partnership Program

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Update the Transportation Capital Improvement Program and other "living" Town planning documents with the recommendations in this plan. The recommendations from this plan should be reflected in the biennial Transportation Capital Improvement Program for consistency and coordination of planning efforts.	Near-term < 2 years, Ongoing

Continue to engage partners, stakeholders, and community members to refine the recommended list of improvements. Working with community members and Town staff will be critical in reviewing the list of potential projects provided below and determining which interventions will be implemented first and how those projects should be designed.	Near-term < 2 years
Make strategic investments in intersections and additional connections. Prioritize and complete investments in key intersections and additional transportation network connections, particularly for traffic sheds with high structure to exit ratios.	Near-term < 2 years
Continue to apply for funding to support planning, design, and construction of improvements. Several federal, state, and regional funding sources exist to support improvements related to multimodal, complete streets, and climate adaptation and mitigation (see Appendix B). The Town should work with agency and community partners to seek funds for the improvements identified in this plan.	Medium-term < 5 years
101 North Ramp at Arata Lane. Identify funding, design, and construct a north-bound on-ramp to Highway 101 at Arata Lane. This will decrease traffic bottlenecks in the northeast part of town and create alternative evacuation pathways for residents as well as improve travel times to Healdsburg and areas further north.	Long-term > 5 years

This plan considers two types of investments: 1) the development of new connections to open alternate routes during emergencies, and 2) the improvement of existing intersections, both for the purposes of improving daily traffic flows and reducing the risk of bottlenecks during evacuations. Each type of investment includes a short description, map of potential investment locations, and a table summarizing each investment and the completed multi-criteria analysis.

STRATEGY DETAILS & ADDITIONAL MATERIALS

The transportation network for the Town is vital to the movement of people, goods, and services throughout the community and to/from the broader region. The network in Windsor includes state Highway 101, local roads, sidewalks, on-street and off-street bicycle network, Sonoma County Transit bus service, Sonoma-Marin Area Rail Transit (SMART) rail services, ridesharing and non-profit transportation providers. This multimodal network is critical to both everyday quality of life for Windsor residents and the ability of the community to withstand and respond to hazards (such as floods, extreme heat, drought, and wildfires). Some of the key challenges for the system and the people who use it, particularly during an evacuation, come from the development of subdivisions with limited access, the limited number of state highway interchanges, and three main cross-town (East/West) roadways (Arata Lane, Old Redwood Highway, and Shiloh Road). Details on the vulnerabilities in the Town's transportation infrastructure during extreme weather or climate events and the potential impact on residents can be found in the *Community Vulnerability Assessment*.

Setting the Stage

The project team and the Technical Working Group identified enhancements to the multimodal transportation network as a critical intervention in the short- and medium-term to enhance the Town's resilience. Transportation investments at the neighborhood-level can reduce congestion during emergency evacuation and everyday travel by 1) increasing access into neighborhoods, and 2) improving the flow of travel at existing intersections.

Two types of interventions are discussed below: 1) the development of new transportation network connections to open alternate routes during emergencies, and 2) the improvement of existing intersections, both for the purposes of improving daily traffic flows and reducing the risk of bottlenecks during evacuations. These investments are designed to respond to the vulnerabilities identified in the Climate Vulnerability Assessment. The specific locations for investments are not exhaustive but were selected for further analysis based on input from the project team and the Technical Working Group, their ability to address needs identified by the "traffic shed analysis," and consideration of all four evacuation zones for the Town. The list contains a mix of potential investments across evacuation zones. The identified investments have the potential to significantly improve the functionality of the multimodal traffic system on both a daily basis and during emergencies.

Each potential infrastructure investment includes an evaluation based on the criteria outlined in the tables below. While this analysis does not lead to a specific priority ranking, the multi-criteria analysis can be used to inform future decisions by the Town, both supporting funding applications and updates to the capital improvement plan.

- ***Investment Location*** - The physical location of the investment.
- ***Description*** - Brief description of the type of investment necessary in that location.
- ***Evacuation Zone*** - Labeled A, B, C, or D based on location of the investment.
- ***Neighborhood*** - Identification of the neighborhood location for the investment.
- ***Co-benefits*** - Highlights of key additional benefits or value of the investment beyond the goal of increased access or enhancing evacuation.
- ***Structures per Exit Ratio*** - Current ratio of structures to exits in the "traffic-shed".
- ***Cost Estimate*** - Categorization of initial costs estimates of construction for the project (cost estimates are only construction costs; they do not include land acquisition costs that may be necessary for any given project).
    - Low = < $1,000,000
    - Medium = between $1,000,000 and $5,000,000
    - High = > $5,000,000
- ***Social Vulnerability Index Score*** - A normalized relative vulnerability score (as compared to the United States) of the traffic shed being served by the investment.
    - Low = < 30th Percentile
    - Medium = 31st-50th Percentile
    - High = > 51st Percentile

- ***Feasibility within Five Years*** - Categorization of the feasibility of the project to be designed and completed within five years.
    - Low = not at all feasible or extremely unlikely
    - Medium = more likely than not; potential to obtain or dedicate funding
    - High = funding readily available; high political will and/or alignment with other efforts
- ***Co-Benefit Value*** - Categorization of the extent of potential co-benefits with a focus on daily use and quality of life.
    - Low = little or no utility except for during emergencies
    - Medium = enhancements to safety, ease of travel, aesthetic beauty, or other quality of life features
    - High = significant enhancements to safety, ease of travel, or aesthetic beauty, or other quality of life features that people experience on a daily basis
- ***Funding Opportunities*** - Potential funding opportunities identified for each infrastructure strategy. This suite of funding opportunities is described in more detail in Appendix B and represents a mix of local, county, State, and Federal funding sources.

New Transportation Network Connections

New roadway connections in neighborhoods where current routes in and out of the neighborhood are limited will provide redundancy and support efficient evacuations. The potential investments (identified in Figure 13 and Table 4) are designed to support residents who live in neighborhood areas with a large number of structures and only one or two roadway connections to connect to the broader regional road network. There are three types of investments:

- Low impact and low-cost modifications of existing paths or informal access routes to create secondary evacuation routes and emergency vehicle access to the neighborhoods during special situations;
- Potential changes to neighborhood infrastructure or private property; and
- Development of new roads to provide new access and evacuation routes

The additional connections proposed here are not exhaustive but give a range of the types of different options the Town might look to develop as they continue to make investments in the transportation infrastructure. These recommended improvements also do not include already planned improvements and were identified based on the Trafficshed and wildfire risk analysis conducted as part of this project. It will be up to the Town leadership in collaboration with staff and community members to ultimately determine which investments to make and when to make those investments.

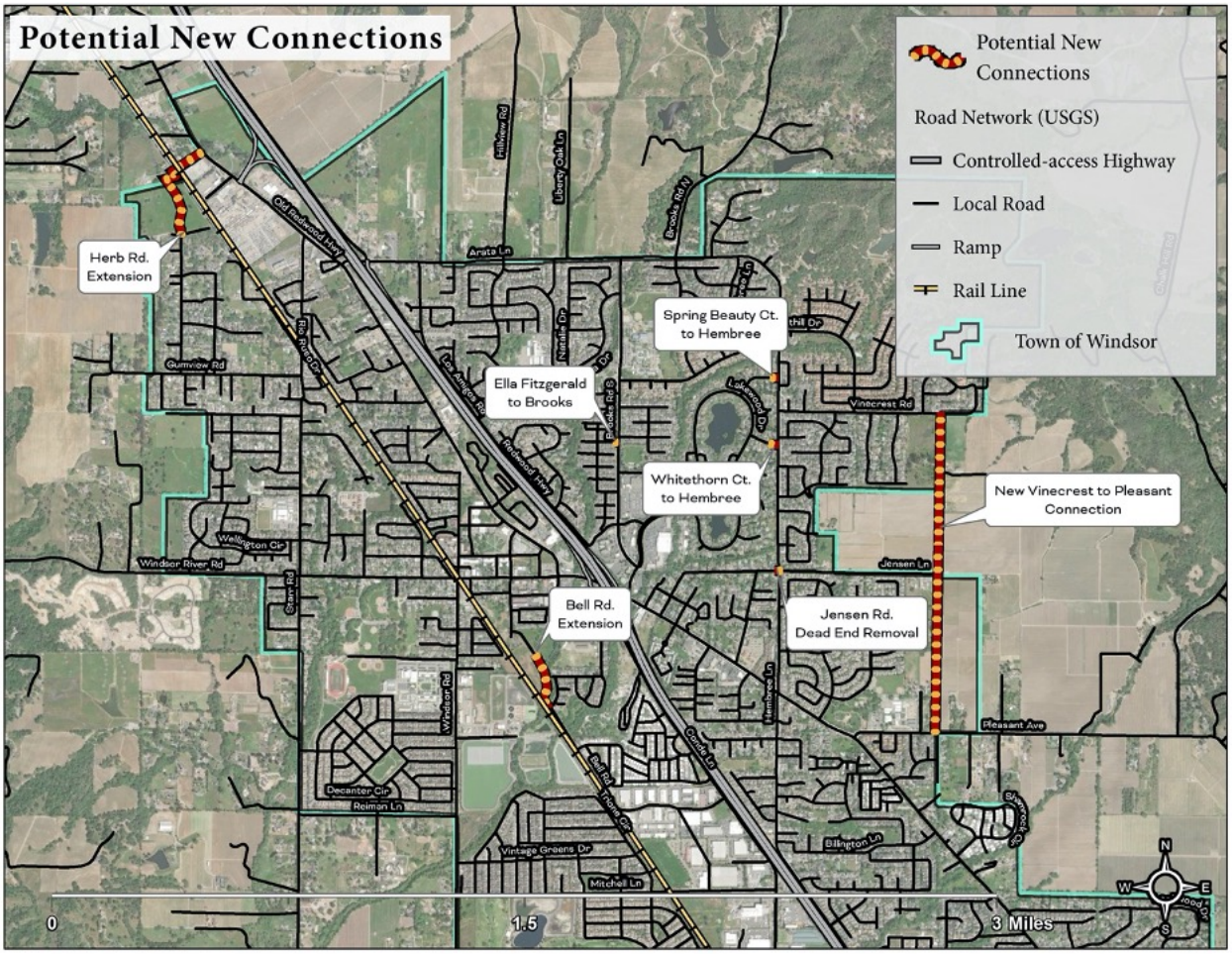


Figure 14. Potential New Connections for Neighborhoods with limited ways in and out. It will be up to the Town leadership in collaboration with staff and community members to ultimately determine which investments to make and when to make those investments.

Table 4: Additional potential transportation network connections for neighborhoods with limited ways in and out with associated evaluation criteria and rankings. It will be up to the Town leadership in collaboration with staff and community members to ultimately determine which investments to make and when to make those investments.

Additional Network Connections for Neighborhoods With Limited Ways In and Out									
Investment Location	**Description**	**Evacuation Zone**	**Neighborhood**	**Co-benefits**	**Structure per Exit** ratio by traffic shed	**Cost Estimate** **Low** = < 1,000,000 **Medium** = $1,000,000 to $5,000,000 **High** = > $5,000,000	**Social Vulnerability Index Score** (% relative to the United States) **Low** < 30th Percentile **Medium** = 31st-50th Percentile **High** > 51st Percentile	**Feasibility within Five Years** **Low** = not at all feasible or extremely unlikely **Medium** = more likely than not - potential to obtain or dedicate funding **High** = funding readily available, high political will or alignment with other efforts.	**Co-Benefit Value** **Low** = little or no utility except for during emergencies **Medium** = enhancements to safety and easy of travel, aesthetic beauty or other quality of life features. **High** = significant enhancements to safety, ease of travel, aesthetic beauty on a daily basis
Whitehorn Court to Hembree **Spring Beauty Court to Hembree**	Emergency Exit from Lakewood to Hembree	B	Lakewood	Active transportation plan that increases ped/bike to main roads or other locations at all times and for dispersed evacuation in emergency. Exit near transit stops are optimal.	185:1	Low	Low	High	High
Ella Fitzgerald Ct. to Brooks Rd.	Paved Emergency Exit from Ella Fitzgerald to Brooks, w/ Bollards.	B	Glen Miller Way	Secondary egress point for emergency service vehicles allowing more direct access to north end of Glen Miller Way homes.	124:1	Low	Low	High	High
West Jensen Ln. and Hembree Ln.	Create connection to Hembree at current dead end on western stretch of Jensen Ln.	B	West Jensen Ln.	Secondary egress point for emergency service vehicles allowing more direct access to Hembree, maintains pedestrian and bicycle access point.	Multiple traffic sheds directly affected	Low	Low	Medium	High
Herb Road Extension	Extend Herb Rd. to provide northern exit route for Gumview Rd. neighborhoods.	A	Gumview	Secondary egress point for neighborhoods.	295:1	Medium	Medium	Low	Low
North South Route from Jensen to Pleasant	Build out new connection to service future developments on the east side of town, connecting Vinecrest, Jensen, and Pleasant with a through road.	B	Most of Evac Zone B.	Increase accessibility in neighborhood area to disperse daily travel, reducing congestion at intersections.	Multiple traffic sheds directly affected	High	Low	Medium	Medium
Bell Road Extension	Extend Bell Rd. as part of planned development to allow secondary exit points for neighborhoods along Conde Ln.	C	Oakfield Ln. and Windsor Mobile Country Club	Increase accessibility in neighborhood area to disperse daily travel, reducing congestion at intersections.	Multiple traffic sheds directly affected	Medium	High	Medium to High	Medium
101 Onramp Northbound at Arata Lane	Create a new on-ramp connection between Arata lane and northbound lanes of Highway 101. Note: the new on-ramp would require realignment/extension of Los Amigos Road.	B	Most of Evac Zone B.	Increase accessibility to highway 101 and decrease reliance on local roadways for northbound evacuations. Reduce congestion on local roadways.	Multiple traffic sheds directly affected	High	Low	Low	Medium

Intersection Improvements

For Windsor, investments that improve the operation of major intersections can have a positive effect on both the daily well-being of residents as well as the ability of the community to respond to extreme weather events. The structural or operational improvements to the intersections (identified on Figure 14) support regional evacuation, improve traffic flows with new development, and reduce daily traffic congestion. Investments may include improved intersection control or the construction of roundabouts. As elsewhere, the sites listed here for potential investment are not exhaustive. These recommended improvements also do not include already planned improvements and were identified based on the Trafficshed and wildfire risk analysis conducted as part of this project. It will be up to the Town leadership in collaboration with staff and community members to ultimately determine which investments to make and when to make those investments.

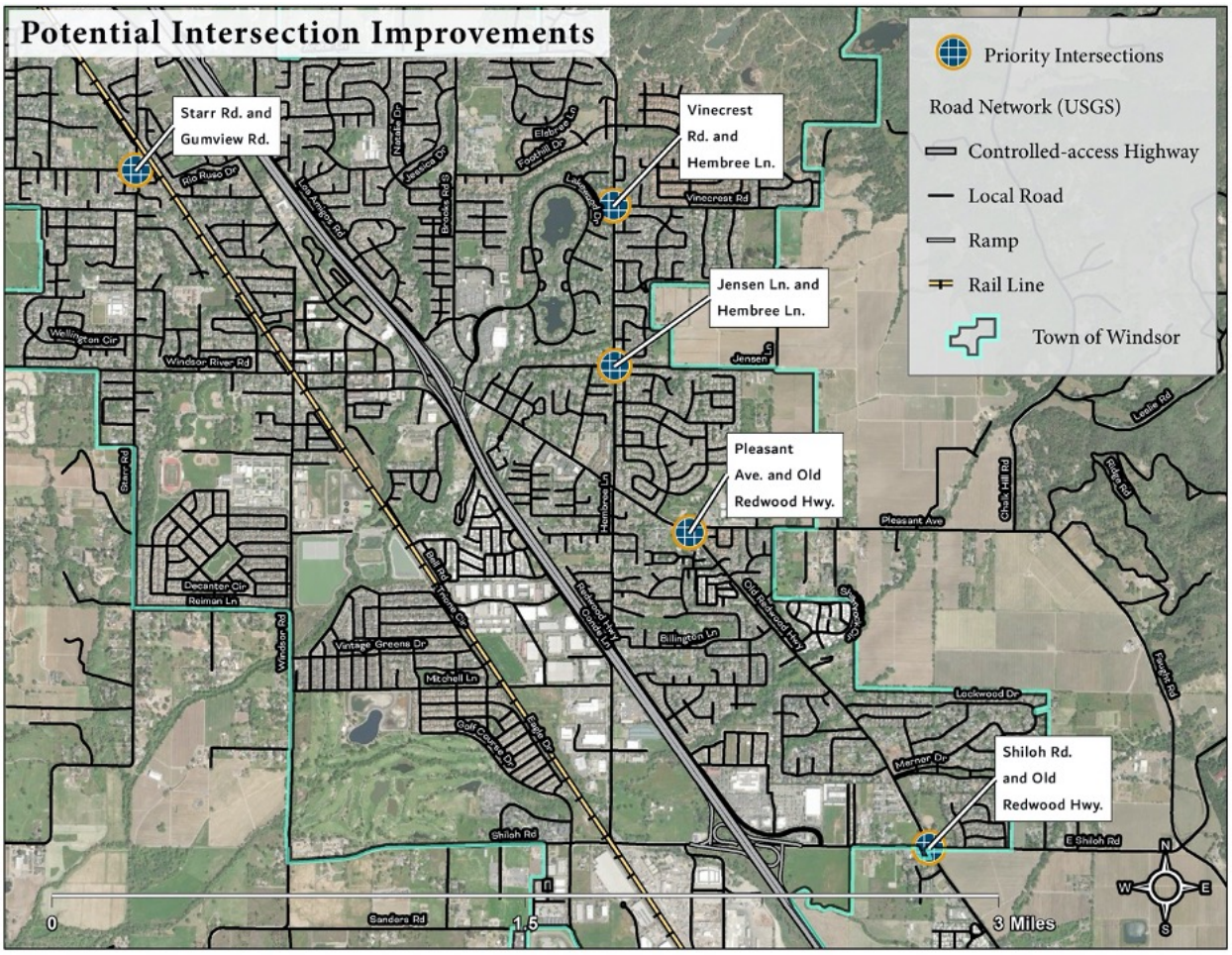


Figure 15. Potential Intersection Improvements to enhance the multi-modal transportation network. It will be up to the Town leadership in collaboration with staff and community members to ultimately determine which investments to make and when to make those investments.

Table 5: Potential intersections improvements to enhance the multi-modal transportation network with associated evaluation criteria and rankings. It will be up to the Town leadership in collaboration with staff and community members to ultimately determine which investments to make and when to make those investments.

Improvement or Modification of Existing Intersections									
Investment Location	**Description**	**Evacuation Zone**	**Neighborhood**	**Co-benefits**	**Structure per Exit** ratio by traffic shed	**Cost Estimate** **Low** < 1,000,000 **Medium** $1,000,000 to $5,000,000 **High** > $5,000,000	**Social Vulnerability Index Score** (% relative to the United States) **Low** < 30th Percentile **Medium** = 31st-50th Percentile **High** > 51st Percentile	**Feasibility within Five Years** **Low** = not at all feasible or extremely unlikely **Medium** = more likely than not - potential to obtain or dedicate funding **High** = funding readily available, high political will or alignment with other efforts.	**Co-Benefit Value** **Low** = little or no utility except for during emergencies **Medium** = enhancements to safety and easy of travel, aesthetic beauty or other quality of life features. **High** = significant enhancements to safety, ease of travel, aesthetic beauty on a daily basis
Gumview Rd. and Starr Rd.	Modify existing 4-way intersection into a roundabout	A	Multiple	Improves traffic flow overall, reduces accidents, and improves operational capacity during power failures or periods of high traffic.	295:1 (Gumview Neighborhoods)	High	Medium	Low	High
Pleasant Ave. and Old Redwood Hwy	Modify existing 4-way intersection into a roundabout	D	Mattie Washburn Elementary School; Hillside Neighborhoods East of Town	Improves traffic flow overall, reduces accidents, and improves operational capacity during power failures or periods of high traffic. Mitigates congestion from school pickup at M. Washburn Elementary.	Multiple trafficsheds directly affected	High	Medium	Medium	High
Shiloh Rd. and Old Redwood Hwy.	Modify existing 4-way intersection into a roundabout	D	Hillside Neighborhoods East of Town; Shiloh Rd. and S Old Redwood Neighborhoods	Improves traffic flow overall, reduces accidents, and improves operational capacity during power failures or periods of high traffic.	Multiple trafficsheds directly affected	High	Medium	Low	High
Vinecrest Rd. and Hembree Ln.	Improve/Upgrade to Controlled Signaling	B	All N Hembree users	Improve traffic flow and multimodal intersection safety through conflict reduction	Multiple trafficsheds directly affected	Low	Low	Medium	Medium
Jensen Ln. and Hembree Ln.	Improve/Upgrade to Controlled Signaling	B	All N Hembree users	Improve traffic flow and multimodal intersection safety through conflict reduction	Multiple trafficsheds directly affected	Low	Low	Medium	Medium

Other Considerations

New transportation network connections and enhanced intersections are just two types of interventions in a broader strategy to ensure that residents of and visitors to Windsor can move freely, efficiently, and sustainably as they live, work, and recreate in the area. This infrastructure investment focus should be complemented with additional operations-focused investments such as reviewing and updating the Town evacuation plan or enhancing collaboration with private sector companies, institutions, and regional partners to streamline evacuation protocols. For example, coordination between the Town, emergency services, and property owners on the development of emergency response plans for Communities of Concern (such as senior living facilities) can ensure that transportation needs are identified and planned for in advance of an emergency event.

Enhance local water conservation efforts to improve drought preparedness.

STRATEGY SUMMARY

California's periods of drought, some of which persist for years at a time, have highlighted the criticality of resilience in the water supply. Limited availability of water resources has several negative implications on Windsor residents, including the need for restrictive water use policies, decreasing water quality, and increasing costs to both the utilities and consumers. The threat of loss of ground and surface water supplies, resulting in town and private wells running dry, has become a frightening reality in the region.

Town Strategy Lead(s):	Key Partner(s):
Public Works	Neighborhood Associations/Homeowner Associations Bay Area Regional Energy Network (BayREN) Agricultural and Viticultural partners Sonoma Marin Water Savings Partnership Cal Water Efficiency Partnership Russian River Friendly Landscaping Sonoma Water Daily Acts California Department of Water Resources

Metrics of Success

- Water resilience in Windsor is the result of concurrent reductions in demand (through efficiency) and increases in supply (through water catchment, water recycling and new water sources), coupled with increased water independence.
- The Town has the capacity to ensure for residents and businesses alike that water will be available even during periods of extended and extreme drought.
- The Town has shown itself willing to implement, monitor, and enforce water conservation measures, and Town residents are accustomed to such measures.
- Day to day use of water places less stress on regional water resources and is more efficient in terms of both the water demanded and the energy required to supply that water. In that vein, success looks like:
  - Average individual indoor water usage rates are approximately 55 gallons per person per day.
  - All new homes are constructed with high efficiency appliances and other effective measures in place as detailed in the draft Urban Water Management Plan.
  - Expansion of the Town's ability to process and utilize reclaimed and recycled water continues, including in residential areas and by a range of business types.

- Transition from high water use landscapes such as lawns and non-native plantings to regenerative, native planting and landscapes.

Considerations for Communities of Concern

Threats to the Town's water supplies (including supply, cost, and quality), as well as increasing reliance on purchased water, present multiple challenges for Communities of Concern. These include:

- Financial considerations: As water supplies dwindle, costs increase. For households that subsist on limited budgets, water represents a resource that cannot be rationed on account of cost without associated negative impacts. As such, lower-income members of the community will need to reduce spending in other areas.
- Public health considerations: Degradation of water quality may accompany both flood and drought events in some wells. High flood waters have the potential to overtop and contaminate wells located in the Russian River flood plain. The Town has a policy of turning wells off before they are overtopped and does not turn them on without thoroughly flushing and decontaminating them. The Town switches to using water in storage tanks during these events. During droughts, there is less water in the Russian River, but the water that the Town pumps from river wells has been filtered through alluvial gravels and would only be degraded in extreme conditions. The only additional treatment the Town has had to do was increase chlorination after flooding events.
- Technical considerations: To decrease the Town's reliance on purchased water to address supply shortages, there must be a measurable increase in local sourcing, including through an increase in rainwater collection and water recycling (greywater systems) at the individual household and facility level. Many Communities of Concern will require significant public education as to the need for and the methods of assessing, purchasing, installing, and maintaining such systems on their properties or in their homes. Particular attention should be paid to Spanish speaking residents.
- Variable Water Needs and Costs: Some residents will require more water as a matter of health, age, living arrangement, or other factors. It may be difficult for these residents to comply with conservation measures, and such measures may represent an undue financial hardship especially when conservation pricing is applied.

Challenges to Implementation

General implementation challenges include:

- Economic Challenges: Each of the strategies that exist to increase water resilience and independence carry associated up-front public and private costs. While a payoff from these investments is all but guaranteed over time as water resources continue to become scarcer (with increased regional demand and decreasing replenishment due to climate change), present lack of funding or grant resources to retrofit existing homes, for instance, will cause many residents to see this strategy as lower priority.
- Challenges Associated with Residential Arrangement Type: Homeowners have many incentives to invest in capital improvements associated with water resilience, including rainwater collection, water efficient appliances, systems, and fixtures, and greywater systems; however, some may lack the capacity to maintain these systems without professional assistance. Renters, however, lack either the legal ability to make such changes to the home they inhabit or will not reap the financial benefits of making such

improvements. Landlords are unlikely to invest in such improvements because the financial benefits would be enjoyed by the tenant, and there is not a likely increase in their revenue potential as there would be with other capital improvements.

- Legal Challenges: While the Town currently has the right to enough water to meet current demand the amount of water supplied may be curtailed during droughts. It will be important to continue to invest in conservation, expanding recycled water, additional storage, and diversification of water sources to ensure that it has the legal right to enough water for Town residents during extreme droughts.
- Communication Challenges: Getting the word out about the benefits of water conservation, or educating residents about conservation programs (including requirements, conservation pricing, and/or incentive programs) will require a wide variety of messaging methods, communicators, and channels. Depending on the preferences of specific populations, this might be a mailer, a social media posting, an advertisement on print or voice media, or some other method relied on by each of the different groups that represent Windsor's diverse population.

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Urban Water Contingency Plan Water Efficient Landscape Ordinance Annual Water Loss Audit Monthly/Annual Reporting to State	Drought Incentives

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Enhance outreach and education around local water conservation efforts to improve drought preparedness and response. The community has already identified a wide range of residential and commercial investments that would help conserve water. Yet, building awareness and understanding will take a wide range of partners and a significant investment in outreach and education	Near-term < 2 years
Expand municipal water reclamation. The Town is continuing to expand its core recycled and reclaimed water system in conjunction with new construction. Continued investment in individual properties will be required to make the most of this system across the community.	Medium-term < 5 years
Continue to revise and update the Water Efficient Landscape Ordinance to enhance water conservation. The Town already limits decorative lawns on new and redevelopment but can consider whether to promote or require landscaping that requires less water use to maintain can have a significant impact on water consumption.	Medium-term < 5 years

STRATEGY DETAILS & ADDITIONAL MATERIALS

California's periods of drought, some of which persist for years at a time, have highlighted the resilience value of water independence.[60] Reliance of Windsor's municipal water system on multiple sources that have shown in recent years a propensity to dwindle to historic lows during periods of extended drought (e.g., the Russian River, Lake Mendocino)[61] suggests significant vulnerability exists for households, businesses, and agriculture. Limited availability of water resources has several negative implications on Windsor residents, including the need for restrictive water use policies, decreasing water quality, and increasing costs to both the utilities and consumers. The threat of a total loss of ground and surface water supplies, resulting in town and private wells running dry, has become a frightening reality in several California towns.[62] Water disruptions, poor water quality, and economic strains can exacerbate existing personal and household stresses, especially for Communities of Concern.

The volume of water available for purchase from the Sonoma County Water Agency (SWCA) may be affected by climate change and droughts. The Town's Urban Water Management Plan (2020) noted that with climate change the Town may experience shortages in single dry years beginning in 2035 or multi-year droughts in the 2040s.[63] The Town is investigating drilling two off river groundwater wells that could produce and additional 10% of the water needed for the community.

Windsor has already implemented several key measures to increase water independence and to build resilience in the face of decreasing water stores as part of a comprehensive urban water management strategy. Voluntary and mandatory water restrictions are now commonplace, including a temporary 20% water use restriction for all residents, businesses, Town facilities, and schools to respond to an emergency water shortage. Moreover, the Urban Water Management Plan contains conservation provisions for up to 70% daily reductions in demand if required by a water shortage emergency. Investment in the Water Shortage Contingency Plan along with continued investment in conservation, expanding recycled water, additional storage, and diversification of water sources help prepare for these extreme events.

Individual water use tracking capabilities are being supported through the release of an innovative app called WaterSmart, which assesses facility or household consumption and provides water conservation tips. The Town has also implemented a water conservation rebate program wherein residents can receive rebates for the removal of turf grass on their property, purchase efficient sprinkler systems, and request water efficient faucets and other devices at no cost. The Town has a capital project in 2022 to install Advanced Meter Infrastructure (AMI) which will allow customers to monitor their water consumption on a daily basis.

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[60] (Associated Press, 2017)
[61] (Callahan, 2021)
[62] (Becker, 2021)
[63] (Windsor Water District, 2021; Romero, 2021)



Figure 16. The Town Green could be re-envisioned as a native planting and regenerative landscape as a model for the community.

Several potential water sources to increase supply have been identified for the Town, including increasing the efficiency of existing sources, finding new groundwater sources, increasing the volume of water that is recycled, using regional water management and transfer strategies, and increasing conservation through demand reduction.

OPPORTUNITIES FOR ACTION

Enhance outreach and education around local water conservation efforts to improve drought preparedness and response. Windsor has already identified a robust suite of water conservation strategies administered by the Town's "Water Smart Home Program". This program includes inspections (on request) for indoor and outdoor fixtures and systems, advice to residents on reducing their monthly water costs, and supports efforts to decrease demand. Other public sector efforts which have implications for Windsor's long-term resilience include support for homeowner investment in more efficient irrigation (through the Water Efficient Landscapes (WEL) program), rebates for water efficient urinals, incentives for residential greywater systems, and the provision of low-flow shower heads and faucet aerators for free on request.

The Town should consider mechanisms to increase compliance with water conservation measures, including administering fines for conservation ordinance violation and mechanisms to curtail water use among high volume commercial and residential customers. Such mechanisms are reflected in the public draft of the Urban Water Management Plan but have yet to be adopted or implemented. Recent record low levels among each of the Town's natural water sources should be assessed in relation to the assumptions made in past plans to identify the extent of household demand reduction required and to prioritize alternative sourcing measures that are focused on household collection and recycling.

The Town can expand the existing programs so that the path to resilience is not so heavily reliant on surface water, ground water, and contractually purchased or acquired water. Options that have proven effective in other communities in the State and elsewhere in the country include rebates for rainwater harvesting by volume (e.g., Santa Rosa's program) and rebates for xeriscapes and other water-efficient landscape designs (e.g., Aurora Colorado's "Water-Wise Landscapes" program. Other innovative programs include the provision of mulch that supports weed suppression and water retention (noting that Windsor currently provides public education about the value of such resources) and installation of water pressure reducing valves (PRVs) to reduce household water waste (and increase the longevity of residential plumbing systems, and irrigation shutoff sensors).

Attention should be paid to creating or strengthening partnerships with local organizations and companies to help distribute information and improve awareness about both indoor and outdoor water conservation efforts. These partnerships may include homeowner associations, COPE networks, landscape companies and stores, plumbers, construction workers, and development companies. These partnerships will help ensure that customers get information from a variety of trusted sources and can help expand the reach of the Town's educational materials and efforts. All program materials should be developed in both English and Spanish and collaborations with key partners can help inform how these materials are created.

Expand municipal greywater infrastructure, water reclamation, and stormwater collection capacity. The Windsor Water District manages the Town's water reclamation efforts through the Windsor Water Reclamation Facility (WRF). The facility was constructed over 50 years ago (1964) to serve a population just one-fortieth of today's but expanded over the years to meet increasing demand. Approximately two thirds of the wastewater treated is recycled, half of which is used for energy production (with the rest being returned to the local watershed as effluent). At certain times throughout the year, the facility is permitted to deliver recycled water to designated customers for agricultural or landscaping purposes (e.g., vineyards, golf courses, Windsor High School, and others). System capacity is determined by several factors, including treatment capacity and capabilities, storage capacity, the cost of chemicals or other treatment technologies, permitting, and other factors.

As the cost of fresh water increases, and the availability of such water decreases, water reclamation facilities and projects will become comparatively more cost effective. Longer-term development strategies should consider climate trends in determining the feasibility of the different reclamation options presented in the Town's 2019 assessment of reclamation system modernization. Additionally, by increasing the opportunities for public sector, agricultural,

commercial, and household use of wastewater following tertiary filtration will reduce demand on freshwater resources and reserves. This will require significant investment in infrastructure and end-user equipment, policy, and permitting actions to enable implementation, and public education to support acceptance and drive demand. Water reclamation has been used to generate freshwater reserves through exchange programs with agricultural facilities. Expansion of such programs can occur in tandem to further incentivize uptake by high-volume consumers.

The capacity of Windsor's WRF to capture and reuse stormwater could be considered. If stormwater can be incorporated into existing potable and recycled water systems, it could potentially increase system capacity.

Additional Infrastructure Strategies

Diversify Town water supply resources.

Resilience Value: The Windsor Water District provides water to residential and commercial customers throughout the Town and had 9,830 municipal connections in 2020. The district provides potable water as well as non-potable water for landscape irrigation and other needs. The active potable water supply comes from two surface water sources - the Russian River Well Field and the Sonoma Water transmission system (aqueduct). While the Town has five additional off river wells, only one is currently active and is not used for potable water, only for irrigation. The Town is actively looking for additional groundwater resources that meet the water quality needs of the Town and the system as having additional water sources would diversify the Town's water supply and provide some redundancy in the event of a continued or extreme drought. The Town has submitted grant applications for well construction projects. Since the Town is already pursuing this strategy, it is not discussed in more detail in this plan.
Potential Partners: Department of Water Resources, Santa Rosa Plain Groundwater Sustainability Agency
Timeframe for Implementation: Medium-Term

Ensure Asset Management performance and investment estimates account for climate-related changes.

Resilience Value: From utilities to homes, all types of infrastructure are going to be affected by the ongoing climate changes. For the Town, developing (or augmenting) an asset management program to ensure that it accounts for climate risks is critical to ensuring that future construction is prepared for climate extremes. A recent report from OECD highlights the importance of designing climate-resilience infrastructure, stating that: "*New infrastructure assets should be prioritized, planned, designed, built and operated to account for climate change that may occur over their lifetimes*" (OECD pg. 3) and that existing infrastructure may need to be retrofitted or managed differently. Assessing current and future risk for each individual Town asset will be important in developing building or facility specific adaptation action. Since the purpose of asset management is generally sustainable service delivery and required balancing services and costs, adopting a resilience scorecard or rating system for assets can also provide insights into where to focus investments to enhance resilience. Asset management is already something the community does. Committing to climate-smart asset management can help the community proactive prepare for climate change, limit risks, and reduce liability.
Potential Partners: Public Works, Windsor Water District, School District
Timeframe for Implementation: Medium-Term

Continue to invest in key transportation corridors to ensure that infrastructure is in a state of good repair and can accommodate multimodal transportation demands.

Resilience Value: The Town is committed to continuing to invest in the community in ways that not only reduce climate related risks, but also address current issues and improve quality of life for all residents. The 2019 Report Card for California Infrastructure created by the American Society of Civil Engineers gives the State: a "C-" for transit and a "D" for roadways, noting a shortfall in nearly $80 Billion to bring roadways up to a state of good repair. Roadways and the associated multi-modal transportation services that they can provide are critical to reducing congestion, improving air quality, and decreasing greenhouse gas emissions. In California, the Road Repair and Accountability Act of 2017 set aside approximately $105 Million annually to keep transit services in a good state of repair. The recently passed Infrastructure Investment and Jobs Act will provide funding to enhance the Town (and the State's) transportation and transit programs. California is slated to receive $9.5 Billion for public transportation, $47.2 billion for roads, bridges, and ports and $600 million to help the transportation system prepare for extreme weather.
Potential Partners: SMART, Caltrans, Sonoma County
Timeframe for Implementation: Medium-Term

Maintain and enhance urban stormwater management systems.

Resilience Value: The Town of Windsor has a municipal separate storm sewer system (MS4) that includes approximately 120 miles of pipe and associated channels with and urban water management plans. The public works department is responsible for storm drain maintenance and debris removal programs focused on moving water away from infrastructure and into the local creeks. The purpose of these programs is to limit flooding, erosion, sedimentation, and pollution in the creeks and streams. The higher amounts of rainfall that are already occurring during atmospheric river events (See Nov 9, 2021, event) are likely to continue and get more intense with climate change. While there is already a robust stormwater program in place, that program will need to be modified and/or enhanced to keep pace with changing climate conditions. The Town already knows that to take a watershed wide approach to stormwater management to be successful and partnership with the Russian River Watershed Association and its new Streets to Creeks program highlight that this work is already underway.
Potential Partners: Sonoma Water, Russian River Watershed Association, Neighborhood groups.
Timeframe for Implementation: Near-Term

Work with Sonoma Clean Power and PG&E to enhance the resilience of electrical utility infrastructure.

Resilience Value: The electrical infrastructure and near constant provision of electricity is extremely important for the community. Resilient systems are diverse, have back-ups and redundancy, and are flexible and able to dynamically respond to extreme weather events, changing conditions, natural disasters, and other stressors. While the Town does not have direct control over this infrastructure, it can continue to collaborate and work closely with regional utilities to support their investments in resilient systems that support the health, safety, and wellbeing of all residents.
Potential Partners: Sonoma Clean Power, PG&E
Timeframe for Implementation: Medium-Term

Work with regional partners to enhance resilience and redundancy of cell, landline, radio, and other key communication infrastructure systems.

Resilience Value: Clear, effective, and reliable communication is key to effective collaboration and emergency response during extreme weather events. The California Public Utilities Commission (CPUC) found that 80% of calls to 911 originated from a wireless device. The recent Public Safety Power Shutoff events and other extreme weather events have highlighted the cascading impacts of loss of electrical power. During the October 28, 2019, PSPS event, Marin County had 57% of its 280 cellular towers out of service. In response, the CPUC began requiring that wireless providers in high fire threat districts must develop resilience strategies to ensure communication services and protect California residents. This decision includes a 72-hour back-up power requirement along with other resilience requirements. While the Town does not have direct control over wireless infrastructure, it can continue to stay abreast of requirements and work in collaboration with telecommunications providers in the region to support the resilience of the infrastructure.
Potential Partners: Telecommunication providers, CPUC
Timeframe for Implementation: Near-Term

Expand greywater infrastructure and water reclamation capabilities.

Resilience Value: The Town already operates a wastewater treatment system that includes a water reclamation plan which uses reclaimed water to irrigate parks, golf courses, residential landscapes, vineyards and provide for other non-potable uses. New developments are also required to plumb for the use of reclaimed water even if those developments do not currently use reclaimed water. As the climate changes, temperatures increase, and the length and intensity of droughts increase, it will be increasingly important to expand the use and reuse of water throughout the community. This reuse can reduce demand for potable water and diversify water uses throughout the community making it more resilient and less sensitive to changes in supply.
Potential Partners: State and Regional Water Control Board, Sonoma Water, Santa Rosa
Timeframe for Implementation: Medium-Term

Enhance collaboration with regional and state partners to ensure the regional multimodal transportation system is safe, equitable, and protected from climate hazards.

Resilience Value: The impacts of climate change do not stop at the Town's borders and neither does the Transportation System. A transportation network is only truly valuable if it links to other systems and provides opportunities for goods, services, and people to move to and from their destinations. This is true for daily commuting to and from work or school and for emergency evacuations. A safe, equitable, and reliable transportation system that supports multiple modes of transportation from pedestrian trails and bike paths to roads for cars and rail for trains can enhance the redundancy of the system. Being reliable will require preparing for future climate exposures (such as extreme rainfall and wildfire) and investing in protecting infrastructure as well as enhancing the redundancy of the network.
Potential Partners: Caltrans, SMART, Sonoma Transit, Sonoma County
Timeframe for Implementation: Medium-Term

Ensure that all new construction projects are built to climate resilient standards.

Resilience Value: The public works department, state of California, and federal government all play a role in overseeing construction of infrastructure. Considering the lifespan of a particular project and incorporating climate change considerations into that project will help ensure that the infrastructure is designed not just for the weather of today, but the weather of tomorrow. This will ensure that the infrastructure continues to function as designed and provide the services that it was designed for. Considerations may include planning for enhanced flood or wildfire risk and higher temperature.
Potential Partners: Construction firms
Timeframe for Implementation: Near-Term

Goal 3

RESILIENT BUILDINGS

Ensure that all new homes and buildings are designed, and existing buildings are retrofitted to reduce the impacts of extreme weather and climate change throughout Windsor.



Expand home hardening and retrofit efforts for all homes, buildings, and critical facilities.

STRATEGY SUMMARY

Windsor has made great progress towards ensuring the Town's housing infrastructure is protected from wildfires by adopting comprehensive building codes. The Town has helped to advance resilience goals by electing to enact protection measures that exceed what is required by the state or county; however, a concerning amount of residual risk to wildfire and firestorm related hazards remains.

Town Strategy Lead(s):	Key Partner(s):
Building Department	Sonoma County Energy and Sustainability Division Homeowners Associations North Coast Builders Exchange Sonoma County Alliance Contractors (e.g., home construction, fencing, landscaping) Permit Sonoma Sonoma County Fire District Sonoma County & Windsor COPE Fire Safe Sonoma CAL FIRE

Metrics of Success

- Within 3-years the Town has a comprehensive inventory and map of all structures and properties to inform wildfire preparedness efforts.
- All new construction uses 7A building products and a demonstration project exists to model effective wildfire protection for homes and buildings.
- All new commercial or residential developments meet the Town's building code requirements.
- Town residents inspire each other to apply home hardening and vegetation management measures out of an informed and collective concern.
- Within three to five years, grants have been secured to support and incentivize voluntary and directed retrofitting of legacy and nonconforming structures.
- Bi-annual updates to the building codes ensure that the Town keeps up with the latest and greatest updates for buildings in wildfire prone landscapes.

Considerations for Communities of Concern

Home hardening and retrofitting of homes, businesses, and infrastructure presents multiple challenges for Communities of Concern. These include:

- Economic considerations: Many households lack the cash or credit required to finance home hardening retrofits. Fire resistant construction is required for actions requiring permits (e.g., upgrading the home to greater than 50 percent of home value, renovating roof vents, residing the home), but many of these upgrades are not required as a condition of sale. Homeowners of legacy homes may lack the motivation or incentive to pay for mitigation measures if they have limited financial means to pay them. This will be a significant challenge in lower income neighborhoods where most homes predate the present-day codes.
- Legal considerations: Those who are in a rental arrangement may have little control over whether home hardening or retrofitting measures are conducted on the structures they inhabit. The same is true for commercial real estate, where a business may have little to no control over what upgrades the property owner makes.
- Technical considerations: Action requires awareness of both the existence of a threat and methods of threat reduction. Whether due to barriers of education, language, marginalization, or other issues, many groups will require assistance in navigating every step of the path through this strategy. Residents with disabilities may be more reliant on additional support to implement actions.
- Administrative Concerns: Neighborhoods differ with regards to the application of building codes and land use ordinances. Senior housing communities may lack a management structure capable of addressing the complexities of code modernization efforts, especially where retrofits are necessary, and even when grant support is available.

Challenges to Implementation

- Data Challenges: Many homes were constructed prior to the Town's 1992 incorporation. As such, detailed records on construction materials and other categories of data typically contained in building department databases that have relevance to home hardening are lacking. There is, therefore, no means to quickly prioritize structures for retrofit incentive programs.
- Attitudinal challenges: Great variance in the wildfire risk perceptions held by homeowners, businesses owners, and those tasked with managing public and private infrastructure exist. In such cases where perceptions held about wildfire risk is low, individuals will resist most efforts targeting retrofits even if the upgrades are fully financed by outside sources of assistance. Such attitudes are difficult to sway except in the face of a realized disaster. Communications methods that apply social marketing and/or chains of authority and trust are typically needed.
- Economic challenges: Enhancing building codes to reduce risk will typically increase associated construction costs. Residents, developers, and others may be opposed to these additional upfront costs even though they will lead to reduction in disaster recovery expenses resulting from future wildfire events. In many cases where funding is made available to low-income communities for this type of project, Windsor is ineligible for such funds.
- Challenges associated with ownership arrangement: In situations where the occupant is a tenant, especially where the landlord property owner is not local to Windsor, there may

be both a lack of appreciation for the need to invest in resilience measures, and the capability (technical and/or economic) to make those changes by the tenant who will not reap the equity-related rewards of their efforts or who may not have the legal authority to make such changes.

- Challenges associated with the scope of required actions: Home retrofits require a significant investment in time and capital. Some homeowners who have recently invested in upgrades that do not address fire risk, such as a new fence, may be unwilling to make retrofits until the vulnerable materials require replacement due to age. As such, this strategy will require a dedication of much more time than many other strategies.

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Building Codes Hazard Mitigation Plans Community Wildfire Protection Plan Land Use Plans Permitting	FEMA Hazard Mitigation Grant Program FEMA BRIC Grant Program Cal Fire Cal OES PG&E California Fire Safe Council Bay Area Regional Energy Network (BayREN)

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Inventory, evaluate, and map vulnerable structures including homes, commercial buildings, government buildings, and other infrastructure. The sensitivity of any individual building depends on the construction of that building and how it has been maintained over time. A detailed structure by structure evaluation of buildings can help target the use of limited resources to areas where they will provide the most value.	Near-term < 2 years, Ongoing
Assess and update development policies and building codes to address residual vulnerabilities. As wildfire and building science continue to change, it will be important to incorporate the best available science into building codes and find ways to encourage proactive retrofits of structures.	Near-term < 2 years
Expand, support, and incentivize building retrofits. Retrofitting homes can be expensive. Thus, grant and block funding programs could be used to help offset homeowner costs to make upgrades to their properties.	Medium-term < 5 years
Promote Action Through Education and Direct Technical Support. Coordinate with existing organizations to help residents and building owners better understand the value of home hardening and defensible space in the Town.	Near-term < 2 years

STRATEGY DETAILS & ADDITIONAL MATERIALS

Windsor has made great progress towards ensuring the Town's housing infrastructure is protected from wildfires by adopting comprehensive building codes. The Town has helped to advance resilience goals by electing to enact protection measures that exceed what is required by the state or county (e.g., requiring that all newly constructed or significantly upgraded homes, regardless of their location, meet construction standards typically limited to the WUI and wildland urban intermix). Despite these efforts, a concerning amount of residual risk remains on account of exemptions that enable pre-existing homes to remain below protection standards and an increasing exposure to wildfire and firestorm related hazards throughout the region. There is an ongoing need to identify and pursue additional home-hardening gains on account of the negative resilience effects of climate change on community wildfire risk. Continuing to conduct home hardening and the retrofitting of all exposed buildings will not only decrease the damage sustained by impacted structures, but it will also work collectively to slow or even halt the advancement of wildfires when they encroach on the Town.

OPPORTUNITIES FOR ACTION

Map and Evaluate Vulnerable Structures, Including Homes, Commercial Buildings, Government Buildings, and Other Infrastructure
All critical infrastructure, whether housing, medical facilities, schools, government buildings, utility networks, and others, vary considerably in terms of wildfire and firestorm vulnerability and risk. Assessment of wildfire exposure in Windsor helps to prioritize geographically where efforts might be focused, but without additional structure-specific data these measures do not determine sensitivity of these individual structures to those exposures. Awareness, risk reduction, and other support campaigns aimed at reducing wildfire and firestorm risk must therefore consider construction materials (e.g., decking, roof, siding, and windows) and design (e.g., protected vents, soffits, or eaves), in addition to defensible space, so that risk reduction efforts may be focused where the greatest gains are possible. By geotagging vulnerability factors by property and neighborhood, the Town can develop a spatial understanding of risk and use it to prioritize action and communication.

Historic and recent amendments to the Town's building codes dictate that any new construction, major renovations, or structures involved in real estate transactions are required to comply with a higher standard of fire prevention measures (including materials used in the construction of roofing and siding, and the use of certain fire prevention systems including sprinkler systems, in certain types of buildings). The focus of the structure inventory is therefore not the entire Town but rather those legacy structures (i.e., were constructed prior to 2008 and have not had major modifications and/or were transacted). A similar approach to mapping properties can include all properties and be used to help reduce wildfire risk from vegetation.

Windsor's Building Department maintains records on construction materials as they are reported during the permitting process. It is well-known that many of the Town's homes, as well as many commercial structures, were constructed using T1-11-style siding made of plywood, OSB, and

other similar materials (a smaller number of homes during this period were constructed using fire-resistant stucco). As many of these homes undergo renovation, information about upgrades and retrofits that bring the home into code compliance are reported, and these homes may be eliminated from any registry of potentially vulnerable structures. With a complete database on housing materials, the Town can create a subset of homes with possible vulnerabilities to follow up through curbside inventory. However, records on such data do not exist prior to Windsor's 1992 incorporation, and therefore only a partial understanding of such vulnerabilities can be established. The lack of complete data remains a challenge to the Town's capacity to target home hardening support.

Windsor stands to benefit from a more complete understanding of housing vulnerabilities that exist on account of building materials and construction methods that predate current codes. This will require a blend of data analysis and structure by structure validation when potential vulnerabilities are identified. Many mapping programs are eligible for support from the Hazard Mitigation Grant Program "5%-Initiative." Namely, this is an effort to fund: "GIS software, hardware, and data acquisition whose primary aim is mitigation. Other entities, such as the Marin Joint Wildfire Protection Authority[64] are conducting similar mapping efforts to develop a better and more nuanced understanding of their structure by structure or property by property wildfire risk.

Assess and Update Development Policies and Building Codes to Address Residual Vulnerabilities

Wildfire risk assessments in Windsor suggest that residential and commercial structures outside of the wildland urban interface are at risk of damage given the changing nature of wildfire and firestorm risk in Northern California. Especially in towns like Windsor, where the community character is defined in part by the high density of vegetation among suburban residential homes, and where homes are in relatively close proximity to each other, a dryer and hotter climate can translate to WUI-type risk even in suburban and urban zones. The Town can significantly increase resilience to future wildfire events, including those associated with climate change, by applying a 'community scale' approach to regulations typically limited to WUI-designated properties.

Effectiveness in the reduction of community-wide wildfire and firestorm vulnerability is achieved because of high levels of participation in wildfire mitigation programs. Much like vaccine 'herd immunity' which has become a familiar concept on account of the COVID pandemic experience, a phenomenon of 'herd resilience' occurs among structures in Windsor as a result of wildfire home hardening and building retrofits. With each structure that undergoes the vulnerability reduction process, a higher level of protection is offered to nearby structures (in that the mitigated home is no longer a significant source of wildfire ignition and spread). Thus, while one-hundred percent compliance is not achieved, the sheer number of structures that have reached a resilient state establishes a higher general level of community resilience. In doing so, the ability of firefighting resources to control wildfires increases in that the anticipated number of individual points of ignition that occur during an ember-case or firestorm is lowered to a point that does not exceed capacity. Given there is no way to definitively predict at which point the

[64] Marin Wildfire Prevention Authority, https://www.marinwildfire.org/

community has reached an acceptable level of 'safety', the goal will always remain one of achieving the highest possible participation levels.

As previously stated, amendments made to the Windsor building codes in 2008 rank them among the most stringent in the state (with regards to wildfire). The Town's codes, which are based on California's "7A codes" ("Materials and Construction Methods for Exterior Wildfire Exposure"), seek to reduce the wildfire risk in all parts of the town, not just the WUI (see relevant provisions reflected here). While requirements for roofing materials, sprinklers (in some structures), and the use of fire-retardant wood shingles and shakes have been adopted at a community level regardless of location, for other aspects of construction, provisions differ between the WUI and other parts of town. For almost all aspects of building codes related to wildfire, homeowners of structures constructed prior to 2008 are exempt from making required retrofits unless the property is sold or renovated.

Perhaps the greatest challenge to Windsor's home-hardening efforts is a lack of staff capacity to monitor and enforce compliance with codes. A more aggressive stand would be to require some 'legacied' homes, which utilize wildfire-vulnerable materials and construction methods, to retrofit the home to current protection standards. Communities have applied this measure to varying levels of success, with the provision of financial support being the primary success factor. Without funding to support such measures, these retrofits represent an 'unfunded mandate'. Accompanied by grant or other support mechanisms, acceptability among the impacted population can be dramatically increased. Big Bear Lake, for instance, passed an ordinance that classified homes with legacied wood shake shingle roofs to be a "severe fire hazard and danger" to the town. Owners of such homes were required to retrofit these roofs within 4 years. The program facilitated access to several grants through San Bernardino County, including from FEMA, Cal Fire, and Cal OES. Between 2008 and 2019, 245 of the 251 homes requiring upgrades were upgraded.[65]

Building codes could also encourage, and in some cases require, the complementary use of climate-resilient materials. Expanding building code requirements can help ensure that buildings and properties are better able to respond to or survive all types of extreme weather, not only wildfire. Ideally this will require an increase in both enforcement capacities and the funding to enable homeowners to make required retrofits. Retrofitting structures is critical as older or non-compliant structures create risk for surrounding homes. There is a need to enforce defensible space around homes outside of the WUI and Very-High Fire Hazard Severity zones.

Expand, Support, and Incentivize Building Retrofits

The most effective way to maintain a low vulnerability is ensuring buildings can withstand wildfire events. Recent wildfires have proven difficult to control, with suppression often coming only as a result of weather changes. To overcome the financial challenges to home and business owners associated with more stringent wildfire protection standards, Windsor can support efforts to access mitigation grant funding and provide mitigation-linked tax breaks, fee-based incentives, or low-interest loans (and other financial incentives).

[65] Mountain Area Safety Taskforce (MAST)

At the Federal level, the FEMA Hazard Mitigation Grant Program (HMGP) allows homeowners to request financial support for up to 75% of the retrofits to their home if they lead to a reduction in risk. This program, which currently offers more than $400 million in mitigation grant funding to California communities, requires that support be linked to mitigation priorities previously identified in the community Hazard Mitigation Plan (HMP). Windsor's HMP identifies several projects that address building retrofit support for homeowners, including:

- 1.1 – Distribution of information about hazards and ways to improve resiliency
- 1.6 – Conduct regular inspections of Town-owned critical facilities, especially water and wastewater systems and facilities, and retrofit facilities to reduce vulnerabilities to current and projected hazard conditions
- 1.7 – To the extent possible, avoid siting new Town-owned facilities in hazard zones, and work with other organizations to encourage similar siting standards for critical facilities not owned by the town
- 1.8 – Perform an annual inventory of supplies and locations that house emergency response supplies. Identify facilities in need of a retrofit to be more resilient to natural hazards or move emergency supplies to facilities that are more resilient.
- 1.10 – Work with utility companies and other service providers in Windsor to evaluate the resiliency of their infrastructure in the Town, and to repair or replace vulnerable infrastructure.
- 1.14 – In coordination with community organizations, assisted care centers, and medical facilities, develop programs to support emergency awareness and mitigation among elderly and disabled persons.
- 9.1 – Work with Sonoma County, the Windsor Fire Protection District, and the Rincon Fire Protection District to ensure compliance with vegetation management standards and other County fire safe standards to reduce wildfire risk in the area surrounding Windsor.

Community Development Block Grants (CDBGs), which are often used for flood mitigation, can also be used for community wildfire mitigation (including fuel breaks and reduction measures, defensible space, and hardening of infrastructure). Windsor can apply to the CDBG Mitigation (CDBG-MIT) funds through the State (the application must include a CDBG-MIT Action Plan).

One applicable grantmaking program at the State level is the CAL FIRE program Pathway to a More Resilient and Hardened California program. Like HMGP, this program offers financial assistance to support home hardening but on a case-by-case basis.

Windsor can also create a tax- and fee-based incentive program for business and homeowners that implement structural hardening or defensible space measures. Fees associated with wildfire management or other aspects of permitting and construction can be reduced or waived by meeting certain mitigation requirements. Additionally, low-interest loans may be provided to business owners or other Town stakeholders to make the required upgrades to the property and the buildings to reduce the community risk from these hazards.

Promote Action through Education and Direct Technical Support
Despite common knowledge about the risks associated with wildfires, there may be many home and business owners who do not take the required actions simply because they don't know the requirements, they don't understand or appreciate the value, or they lack the technical capacity to make required changes (or to work with a contractor or vendor to make them happen). Moreover, many opportunities exist to use adaptive technologies in the process of home hardening that provide dual protection or dual use benefits (such as reflective or heat-resistant surfaces and coatings that make the buildings more comfortable during extreme heat and reduce wildfire risks) and could be incorporated into retrofit plans.

There are many opportunities to support action by building awareness and conducting education and outreach. This begins with increasing coordination with (and support for) organizations that promote or have the potential to promote home hardening and defensible space in the Town. Two such organizations include:

- Windsor COPE: Windsor COPE may be a unique entry point to reach the neighborhood level, using communicators that homeowners trust. The Town can promote the benefits of retrofitting homes for wildfire risk at the neighborhood level, through COPE's network, by offering informal non-binding property wildfire risk assessments (of home hardening and defensible space, using the COPE guide and other similar guides as reference). Alternatively, COPE members can be trained in conducting walk through assessments and help create vulnerability inventories. Also, by increasing coordination between neighborhood groups using COPE and the town's HMGP project formulation process, it may be easier to identify opportunities to support homeowners with grant funds.

- Fire Safe Sonoma: Fire Safe Sonoma conducted a program in 2018, and perhaps in later years, where the group's members met with community groups and homeowners to conduct property "walk arounds". Fire Safe Sonoma may be willing to work with COPE to raise awareness of how to support homeowners in this or similar ways.

There exist several very useful guides to support home hardening and defensible space maintenance. Two effective guides include the Wildfire Home Retrofit Guide and the Windsor Citizens Organized to Prepare for Emergencies (COPE) Being Ready Together guidebook. Using these guides to increase awareness and support for action among at-risk homeowners and occupants will help create a vibrant network of partnerships with community organizations engaged in wildfire risk reduction and preparedness.

Enhance vegetation management and defensible space efforts for all homes, buildings, and critical facilities.

STRATEGY SUMMARY

The Town of Windsor and its regional partners continue to make progress in supporting homeowners as they work to understand and assume the responsibilities that accompany living in and adjacent to wildland areas. Due to the limited amount of Town lands that exist in the WUI, or wildland intermix, there are relatively limited opportunities for municipal staff to require and enforce vegetation management and defensible space work in the most fire-prone areas in the region. Yet, increasing wildfire risk for the Town due to a variety of factors (including climate change) presents notable risk for urban and suburban zones. Therefore, Town action requires that innovative planning and policy considerations are implemented at the local and regional levels to reduce wildfire risk for all Windsor residents. In addition, supporting education efforts on vegetation management and defensible space for all residents is critical to ensuring effective wildfire-adapted landscape stewardship practices.

Town Strategy Lead(s):	Key Partner(s):
Building Department Planning	Permit Sonoma Sonoma County Fire District County of Sonoma's Office of Recovery and Resiliency Division of Climate Action and Resiliency - Sonoma County Administrator's Office Sonoma County Agricultural Preservation and Open Space District COPE Northern Sonoma County Fire Safe Sonoma CAL FIRE North Coast Builders Exchange Association of Bay Area Governments Regional Climate Protection Authority Sonoma County Ecology Center Sonoma Valley Wildfire Collaborative Russian Riverkeepers Pepperwood Preserve Agricultural producers and individual landowners Universities (e.g., Santa Rosa Junior College and the Shone Farm)

	PG&E Lytton Rancheria Tribe Additional Tribes

Metrics of Success

In the next five years, the Town of Windsor adopts a "whole community approach" to wildfire risk reduction. Specific indicators of success include:

- Bi-annual updates to the municipal codes to ensure that the Town continuously updates vegetation management and defensible space requirements in wildfire prone landscapes.
- All new commercial or residential developments meet the Town's vegetation management and defensible space code requirements.
- Residents have access to a variety of funding sources needed to implement vegetation management and defensible space requirements.
- Within 3 years, the Town prioritizes the use of wildfire and drought resistant vegetation and trees (e.g., considering a moratorium on junipers) on all Town properties.
- Formalize partnerships with county and state partners to support vegetation management and defensible space work at a landscape scale.
- Within 2-years the Town has a comprehensive inventory and map of all structures and properties to inform wildfire preparedness efforts.

Considerations for Communities of Concern

Defensible space and vegetation management work presents multiple challenges for Communities of Concern. These include:

- Low-income residents who may not have the financial means required to pay for wildfire resilient landscaping, vegetation management, and defensible space work.
- Renters who may have little control over whether wildfire resilient landscaping, vegetation management, and defensible space work is completed. The same is true for commercial real estate, where a business may have little to no control over what upgrades the property owner makes.
- Residents with disabilities or other limitations to completing vegetation management and defensible space on their own properties.
- Individuals who do not speak English as their primary language may have limited access to technical assistance and education resources and tools to support the process.

Challenges to Implementation

- For individual homeowners, vegetation management and defensible space work requires a significant amount of time, money, and energy. In addition, other priorities for home upgrades or retrofits may take precedence.
- Developing strategies that address rentals and non-local landlords.
- The comprehensive approach needed to inform education efforts across the Town and County scales.
- At the Town and County levels, work to address vegetation management and improve defensible space work requires a significant amount of resources, staff, maintenance, and inter- and intra-agency coordination. In addition, enforcement of existing codes and policies is an ongoing challenge.

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Building Codes Hazard Mitigation Plans Community Wildfire Protection Plan General Plan Land Use Plans Permitting	CAL FIRE Fire Prevention Grants CAL FIRE Urban and Community Forestry Grant Programs California Office of Emergency Services Sonoma County Agricultural and Open Space District Matching Grant Program Sonoma County Resilience Fund Sonoma County Regional Parks - Foothill Regional Parks Funding Regional Partners Conservation Easement Programs (and other land-use related management programs)

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Expand, support, and incentivize vegetation management and defensible space efforts. ● Invest in wildfire resilient (and drought resistant) landscaping, vegetation management, and defensible space in strategic Town locations (e.g., key evacuation routes, neighborhoods adjacent to the wildlands). ● Identify opportunities to support regional partners (e.g., real estate companies, the private sector, insurance companies, and the State) to create a certificate that improves resale value and insurability for homes that have complied with vegetation management and defensible space requirements. ● Prioritize the use of wildfire and drought resistant vegetation and trees (e.g., considering a moratorium on junipers) on all Town properties. ● Identify and distribute a variety of funding sources to support residents and homeowners to meet Town vegetation management and defensible space work requirements. ● Invest in training staff, local landscape contractors, etc. in how to develop, manage, and maintain wildfire resilient landscapes (e.g., ReScape Training programs). ● Develop a strategic plan to identify and support residents to convert their properties to be more wildfire resilient (e.g., demonstration properties, outreach materials, engagement conversations).	Near-Term < 2 years

Support regional partners to scale up vegetation management wildfire fuel reduction work, especially in and near lands surrounding the Town boundaries. ● Consider opportunities to share resources, equipment, and crews with local and County entities to ensure vegetation management and defensible space work can happen more efficiently and effectively. ● Cultivate multi-jurisdictional partnerships that enhance the ability of property owners to complete vegetation management and defensible space work (e.g., Boulder County individual site assessments). ● Identify innovative opportunities to support regional wildfire risk reduction efforts that also promote additional benefits (e.g., expanding goat and sheep grazing program as a fuel reduction strategy). ● Cultivate public-private partnerships (e.g., tax incentives) to support local and regional forest waste management businesses that help reduce fire risk.	Medium-Term < 5 years
Assess, update, and enforce vegetation management and defensible space policies, zoning laws, codes, and regulations. ● Identify opportunities to enforce vegetation management and defensible space codes. ● Develop an effective monitoring system to support the enforcement of vegetation management and defensible space policies, zoning laws, codes, and regulations. ● Integrate tools and resources used in other wildfire-prone locations to monitor and assess compliance of vegetation management and defensible space practices (e.g., the use of the CAL FIRE Collector App by the Marin Wildfire Prevention Authority in Marin County). ● Update the Town's codes and regulations to include the "0-5' non-combustible zone" or "Zone Zero" rule.	Near-Term < 2 years
Support regional partners (e.g., Fire Safe Sonoma) in their efforts to effectively educate residents about defensible space, vegetation management, and home hardening efforts. ● Coordinate with Fire Safe Sonoma to integrate climate change and wildfire projections into all current educational materials and programs. Bi-annual updates to the municipal codes to ensure that the Town continuously updates vegetation management and defensible space requirements in wildfire prone landscapes. ● Formalize partnerships with county and state partners to support vegetation management and defensible space work at a landscape scale.	Near-Term < 2 years

STRATEGY DETAILS & ADDITIONAL MATERIALS

Expand, support, and incentivize vegetation management and defensible space efforts. Recent wildfire risk assessments for Windsor suggest that residential and commercial structures in Town boundaries are vulnerable to wildfires despite being outside of the wildland urban interface (WUI).[66] As recent wildfires defy existing and outdated wildfire risk classifications and models, municipalities are faced with tough decisions about how to effectively ensure the safety, health, and wellbeing of residents. Much of the Town is defined by high density vegetation among suburban residential homes and homes are in relatively close proximity to each other, resulting in increased risk of ignition due to radiated heat and potential flames.[67] The Town can increase its resilience to future wildfire events by expanding, supporting, and incentivizing vegetation management and defensible space efforts for residents. These efforts should be coupled closely with home hardening development and retrofit efforts.

According to the Wildfire Home Retrofit Guide published by a variety of organizations including CAL FIRE, there are three specific defensible space zones that homeowners should continuously maintain including: the ember-resistant zone; the lean, clean, and green zone; and the reduced fuel zone.[68] As shown in Figure 16, these zones have different requirements for wildfire resilient landscaping, clearing vegetation, and maintaining defensible space. The zones include:

- Zone 0 - The Ember Resistant Zone | 0-5 feet: Also known as the noncombustible zone, the immediate zone, or the zero zone, wildfire resilient landscaping practices should be used in this location to increase resistance to wildfire embers. For example, concrete, brick, or gravel should be used for walkways or other features, and this zone should not contain any flammable vegetation, mulch, or woodpiles. Trees should be trimmed regularly to make sure branches are a minimum of 10 feet from other trees, and vegetation and other flammable items should be removed from under decks.
- Zone 1 - The Lean, Clean, and Green Zone | 5-30 feet: This zone is intended to prevent wildfire from spreading to the home from surrounding trees or vegetation. Vegetation in this zone should not be grouped in a continuous manner and should have vertical and horizontal space between other shrubs or trees. In addition, flammable vegetation should be removed and well maintained.
- Zone 2 - The Reduced Fuel Zone | 30-100 feet: This zone requires that woodpiles, outbuildings (e.g., storage), and other structures are at least 30 feet away from the home, and all vegetative materials (e.g., shrubs, low tree branches, small trees) are removed to reduce wildfire spread.

[66] (*Town of Windsor Community Vulnerability Assessment*, 2021)
[67] (Restaino et al., 2020)
[68] (Restaino et al., 2020; CAL FIRE, 2021)

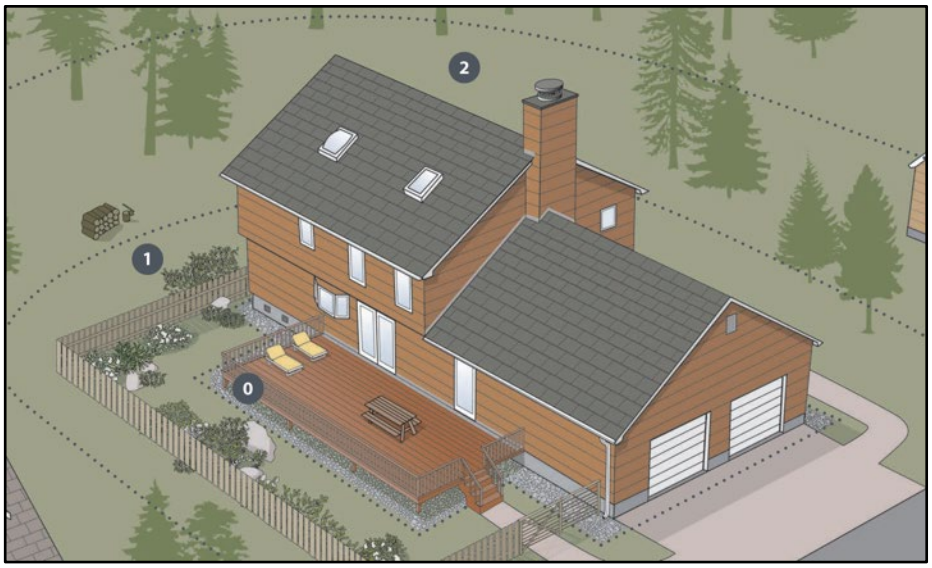


Figure 17. Defensible space zones as defined by the Wildfire Home Retrofit Guide.

Organizations like Fire Safe Sonoma and the Sonoma Ecology Center promote defensible landscaping practices for individual homeowners that also enhance biodiversity, conserve water resources, promote wildlife habitat, and are aesthetically pleasing.[69] For example, through the Resilient Landscapes Coalition, recommendations include planting specific vegetation types, plants, and tree species in the 0-5' zones, 5-30' zones, and in the 30-100' zones. They also indicate specific species to avoid due to high flammability, increased maintenance needs, and more. They specify the need for an initial investment in wildfire resilient and biodiversity promoting species, and the continuous maintenance of these species to ensure individual properties are more resilient to wildfire.

At the municipal level, identifying incentive programs (e.g., tax incentives) that encourage homeowners to understand the need for, and invest in, vegetation management and defensible space work on their own properties is important. In addition, identifying opportunities to support residents who may not have the financial, technical, or capacity resources to complete this work is essential. Public-private partnerships, chipper programs, and forest waste management business opportunities may all be viable options to support individual residents to complete this work. In addition, municipal investment in wildfire resilient (and drought resistant) landscaping in strategic areas (e.g., key wildfire evacuation routes and in neighborhoods directly adjacent to the wildlands) will provide a multitude of benefits including wildfire risk reduction.

One applicable grantmaking program to support community vegetation management and defensible space projects at the State level includes the 2022/2023 California Climate Investments Fire Prevention Grant Program. Applications are made at the community level to support fire prevention education or hazardous fuel reduction (clearing of wildfire fuels). Under this program, defensible space projects are eligible, as is community mitigation. The 2021/2022 application period closed in May, and awards were made on September 13 (see https://www.fire.ca.gov/grants/fire-prevention-grants/).

[69] (Insley, 2021)

Support regional partners to scale up vegetation management wildfire fuel reduction work, especially in and near lands surrounding the Town boundaries. Due to the miniscule amount of Town lands located in the wildlands, there are relatively limited opportunities for municipal staff to require and enforce vegetation management and defensible space work in the most fire prone areas in the region. Vegetation management work completed by a range of partners is ongoing at the county level surrounding the Town. For example, the Sonoma County Agricultural and Open Space District is actively undergoing wildfire fuel reduction work in Foothill Regional Park. In addition, PG&E has an active vegetation management and defensible space program specific to their electric utility equipment, including on the 60-70kV high tension transmission line that runs through the northeast corner of Windsor. Supporting regional partners in these efforts will enhance the resilience of the Town to wildfire.

Regional property owners that are not directly located in the Town's jurisdiction are required to follow County and State wildfire codes. Included in Chapter 13A of Sonoma County Codes includes the "duty to maintain defensible space and abate hazardous vegetation and combustible material."[70] These codes include a specific set of requirements, including specific vegetation management and defensible space requirements at specified distances around homes, structures, roadways, equipment, and more. Identifying opportunities to collaborate and support regional partners with vegetation management and defensible space compliance could be critical avenues to ensuring municipal and county codes and ordinances are being followed. Multi-jurisdictional authorities (e.g., Marin Wildfire Prevention Authority) can be an effective mechanism to ensure municipalities with limited capacity, time, and resources are supported by other municipal and county partners.

Assess, update, and enforce vegetation management and defensible space policies, zoning laws, codes, and regulations. Windsor residents must abide by Town,[71] County,[72] and State[73] wildfire codes. In 2008, amendments made to the Windsor building codes make them among the most stringent in the state (with regards to wildfire). The Town's codes, which are based on California's "7A codes" ("Materials and Construction Methods for Exterior Wildfire Exposure"), seek to reduce the wildfire risk in all parts of the Town, not just the WUI (see relevant provisions reflected here).

There is a need to assess, update, and enforce vegetation management and defensible space codes specific to homes in Town boundaries outside of the WUI and Very-High Fire Hazard Severity zones. One option includes adopting California's Assembly Bill No. 38, Chapter 391, AB 38, Wood. Fire Safety: Low-Cost Retrofits: Regional Capacity Review: Wildfire Mitigation requirements for all properties being sold, not just those in the Very High Fire Hazard Severity Zone. This would mean implementing a lower threshold to require a Defensible Space Inspection (DSI) for property sales.

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[70] Sonoma County – Municipal Code of Ordinances – Chapter 13A – Duty to Maintain Defensible Space and Abate Hazardous Vegetation and Combustible Material.
[71] Town of Windsor – Municipal Code of Ordinances – Title VII – Building and Housing, Chapter 2, Article 4, 7-2-413 – Section R337.1.3.5 (Ord. No. 2019-339)
[72] Sonoma County – Municipal Code of Ordinances – Chapter 13A – Duty to Maintain Defensible Space and Abate Hazardous Vegetation and Combustible Material.
[73] California Building Standards Commission – California Building Standards Code

Support regional partners (e.g., Fire Safe Sonoma) in their efforts to effectively educate residents about defensible space, vegetation management, and home hardening efforts. To ensure an efficient, effective, and consistent approach to wildfire risk reduction for the Town, policies must be balanced by consistent, clear, and equitable education and outreach. There are a variety of organizations in the region dedicated to supporting wildfire education initiatives and Town coordination and support would help ensure Windsor residents are adequately engaged. Methods include workshops, webinars, forums, door-to-door site visits, educational materials, and more. Regional studies suggest that the most effective method of educating residents about wildfire preparedness is on the ground from person to person in neighborhoods by education specialists (not firefighters).[74] Supporting the local and regional entities to find innovative, equitable, and locally specific ways to reach all residents is essential. This includes identifying and institutionalizing equitable approaches to community engagement that consider linguistic, racial, ethnic, socioeconomic, educational, and political factors that increase the sensitivity of Communities of Concern to climate change.

There are several opportunities to support vegetation management and defensible space action by building awareness and conducting education and outreach. This begins with increasing coordination with (and support for) organizations that promote or have the potential to promote home hardening and defensible space in the Town. Two such organizations include:

- Windsor COPE: Windsor COPE may be a unique entry point to reach the neighborhood level, using communicators that homeowners trust. The Town can promote the benefits of vegetation management and defensible space work for wildfire risk at the neighborhood level through COPE's network, by offering informal non-binding property wildfire risk assessments (of defensible space, using the COPE guide and other similar guides as reference). Alternatively, COPE members can be trained in conducting walk through assessments and help create vulnerability inventories. Also, by increasing coordination between neighborhood groups using COPE and the town's HMGP project formulation process, it may be easier to identify opportunities to support homeowners with grant funds.
- Fire Safe Sonoma: Fire Safe Sonoma conducted a program in 2018, and perhaps in later years, where the group's members met with community groups and homeowners to conduct property "walk arounds". Fire Safe Sonoma may be willing to work with COPE to raise awareness of how to support homeowners in this or similar ways.

Several useful guides have been designed to support home hardening and defensible space work and maintenance. These include:

- The Wildfire Home Retrofit Guide
- ReScape Training Program
- The CAL FIRE Defensible Space and Vegetation Management Guide
- The Windsor Citizens Organized to Prepare for Emergencies (COPE) Being Ready Together guidebook.

[74] (Marin County Civil Grand Jury, 2019)

Using these guides to increase awareness and support for action will help create a vibrant network of partnerships with community organizations engaged in wildfire risk reduction and preparedness.

Boulder County has been recognized nationally for their innovation in reducing community wildfire risk.[75] The Boulder County Community Wildfire Protection Plan identifies best practices for integrating wildfire hazard rating systems into regional planning efforts to encourage homeowner action on fuel hazard reduction. Lessons from these efforts that could be applied in the Town of Windsor include:

- A great deal of money, time, and effort is needed to collect, analyze, and display all the key information included in most wildfire hazard rating systems.
- Rating systems need a simple and cost-effective way to be updated.
- Results of scoring systems should be made available to neighbors.
- Peer pressure is an effective motivator for residents living in the WUI.
- Homeowners who take the recommended actions need to see a corresponding change in their score

A certification process could help reduce wildfire risk for the entire neighborhood, increase marketability for homes in the WUI that are for sale, or increase insurability for homes. Boulder County also created a public/private partnership to support property owners prepare for future wildfires by conducting individual site assessments. A customized report was provided to homeowners to identify priority risk reduction actions, financial rewards were offered to complete the necessary work, and follow-up inspections confirmed the work was completed.

[75] (Boulder County, 2011)

Additional Building Strategies

Update building codes to encourage or require the use of climate resilient materials.

Resilience Value: Windsor has made great progress towards ensuring the Town's housing infrastructure is protected from wildfires by adopting comprehensive building codes that require home hardening with fire resistant building materials, some defensible space, and emergency access and egress. Expanding these efforts to ensure that all new construction is built to the standards that the Town deems appropriate (both for wildfires and floods) will help ensure that this new development doesn't increase the climate related risks to the community and protects the residents.
Potential Partners: Construction firms, developers
Timeframe for Implementation: Near-Term

Enhance monitoring and compliance of building code requirements.

Resilience Value: While the Town already has strong building codes and land use codes and requirements, it doesn't not necessarily have the staff to monitor and effectively enforce all those codes. As the Town looks for opportunities to help community members and businesses retrofit their homes and buildings, it can be particularly useful to enhance investments in monitoring and compliance as these efforts can help identify properties in greatest need of investments and how best to target support and resources for those properties.
Potential Partners: Fire Safe Sonoma, County Fire Department, Contractors and Construction.
Timeframe for Implementation: Medium-Term

Review and update the operation and maintenance plans for all public and critical facilities to account for climate change projections.

Resilience Value: It is not just the design of a building that can make it resilient, but how that building is used and operated. Understanding how buildings function and how they are used by the public can be extremely informative in developing updates of modifications of those plans that will enhance the resilience of the facility. Higher temperatures and other extreme weather stressors may require more frequent facility inspections and maintenance. Physical plants (e.g., water treatment facilities) may require new approaches to monitor or manage intakes and outputs to ensure procedures remain effective, especially during extreme weather events.
Potential Partners: facilities management, schools.
Timeframe for Implementation: Medium-Term

Enhance flood risk reduction efforts for homes, businesses, and other structures located in the 100-year floodplain, 500-year floodplain, and areas of emerging flood risk.

Resilience Value: The Town has devoted a lot of attention to wildfire risk reduction outreach, education, and risk reduction measures, such as updating building codes, over the past few years. Relatively less attention has been paid to flood risk. By expanding discussion of flood risk (particularly in areas of emerging flood risk), the Town and its local partners can help residents better understand that infrequent but very real risk. Particularly in high exposure areas, residents and businesses can make a plan or complete some strategic investments to help reduce the impacts of flooding.

Potential Partners: Planning Department, Windsor COPE, Neighborhood Associations, Contractors and Construction workers

Timeframe for Implementation: Near-Term

Goal 4

RESILIENT ENVIRONMENT

Support and enhance natural protective solutions to limit the impacts of climate hazards, preserve and enhance natural resources, and foster community livability and sense of place.



Cultivate and support wildfire adapted landscape practices on Town and regional properties.

STRATEGY SUMMARY

The size, intensity, and duration of wildfires in the region and across the state are increasing on account of several factors, including increasing temperatures and extensive periods of drought. Wildfire has been a traditional 'pillar' of ecosystem health in the watersheds surrounding the Town of Windsor, yet climate change and historical and current fire suppression policies and increased development in the wildland urban interface have resulted in a change to local and regional wildfire dynamics. Supporting local and regional efforts to create wildfire-adapted landscapes will not only enhance the resilience of the Town, but it will protect the health, safety, and wellbeing of Windsor residents, enhance biodiversity on conserved lands, protect additional lands from development, and support the vitality of working lands across the region.

Town Strategy Lead(s):	**Key Partner(s):**
Planning Commission Planning Department	Sonoma County Fire Districts Sonoma County ● County of Sonoma's Office of Recovery and Resiliency ● Division of Climate Action and Resiliency - Sonoma County Administrator's Office ● Sonoma County Agricultural Preservation and Open Space District ● Sonoma County Regional Parks Sonoma Land Trust Sonoma Valley Wildlands Collaborative (e.g., Sonoma County Land Trust, Audubon, Regional Parks, Ag and Open Space, State Parks) Individual landowners (e.g., regional agricultural producers) Windsor Homeowner Associations Multi-Jurisdictional Hazard Mitigation Planning Team COPE Northern Sonoma County Santa Rosa Healdsburg FireSafe Sonoma Regional Climate Protection Authority

	Sonoma County Ecology Center Sonoma County Watershed Collaborative State of California ● CAL FIRE ● California State Parks ● California Department of Fish and Wildlife PG&E Lytton Rancheria Tribe Koi Nation Additional Tribes Landpaths Russian Riverkeepers Pepperwood Preserve Agricultural producers and individual landowners Universities (e.g., Santa Rosa Junior College and the Shone Farm) Daily Acts

Metrics of Success

In the next five years, as part of its "whole community approach" to wildfire resilience, the Town of Windsor actively participates in working groups and collaboratives focused on promoting wildfire-adapted landscapes across the region, ensures that land use planning and policies align with local and regional wildfire resilience goals, formalizes a wildfire risk reduction buffer zone strategy, and invests in wildfire risk reduction education and engagement with regional partners (e.g., Sonoma County Ag & Open Space, Santa Rosa, Healdsburg) and local residents.

Considerations for Communities of Concern

Cultivating wildfire-adapted landscape practices at a local and regional scale presents multiple challenges for Communities of Concern, mostly because wildfires disproportionately impact:

- Residents with lower incomes;
- Residents with limited ability to evacuate (e.g., those in neighborhoods with limited ingress and egress, individuals with disabilities, older adults, individuals in assisted living facilities, individuals without vehicles, individuals who do not speak English as their primary language, etc.);
- Individuals with preexisting health conditions (due to wildfire smoke); and,
- Residents in and surrounding the Town that do not have the resources to implement wildfire-adapted landscape practices on their own properties.

Challenges to Implementation

- Political, social, financial, and logistical challenges may create barriers to implementing wildfire-adapted landscapes on, and surrounding, Town boundaries. Most of the land surrounding the Town are privately owned parcels, therefore Town, County, Tribal, and State partners have little agency to inform decision-making on wildfire risk reduction efforts at a local and regional level.

- Urban growth requirements from the State and population growth in the region may act counter to Town wildfire resilience planning efforts. Development needs and pressures at the local, regional, and state levels can make it difficult to restrict development.
- Although funding is becoming more readily available at the regional, state, and federal levels, more funding is needed to support municipalities and counties to build resilience to wildfire.
- Some landowners may have limited resources, awareness, education, time, motivation, and ability to consistently implement wildfire adapted landscape practices on their properties in a meaningful way.
- Developing clear metrics for success for wildfire-adapted landscapes specific to Windsor is difficult and requires continuous updates.
- Creating a wildfire-adapted community requires long term and strategic action, continuous investment of resources, and adopting a "whole community approach" to understanding, thinking about, and living with wildfire.[76]

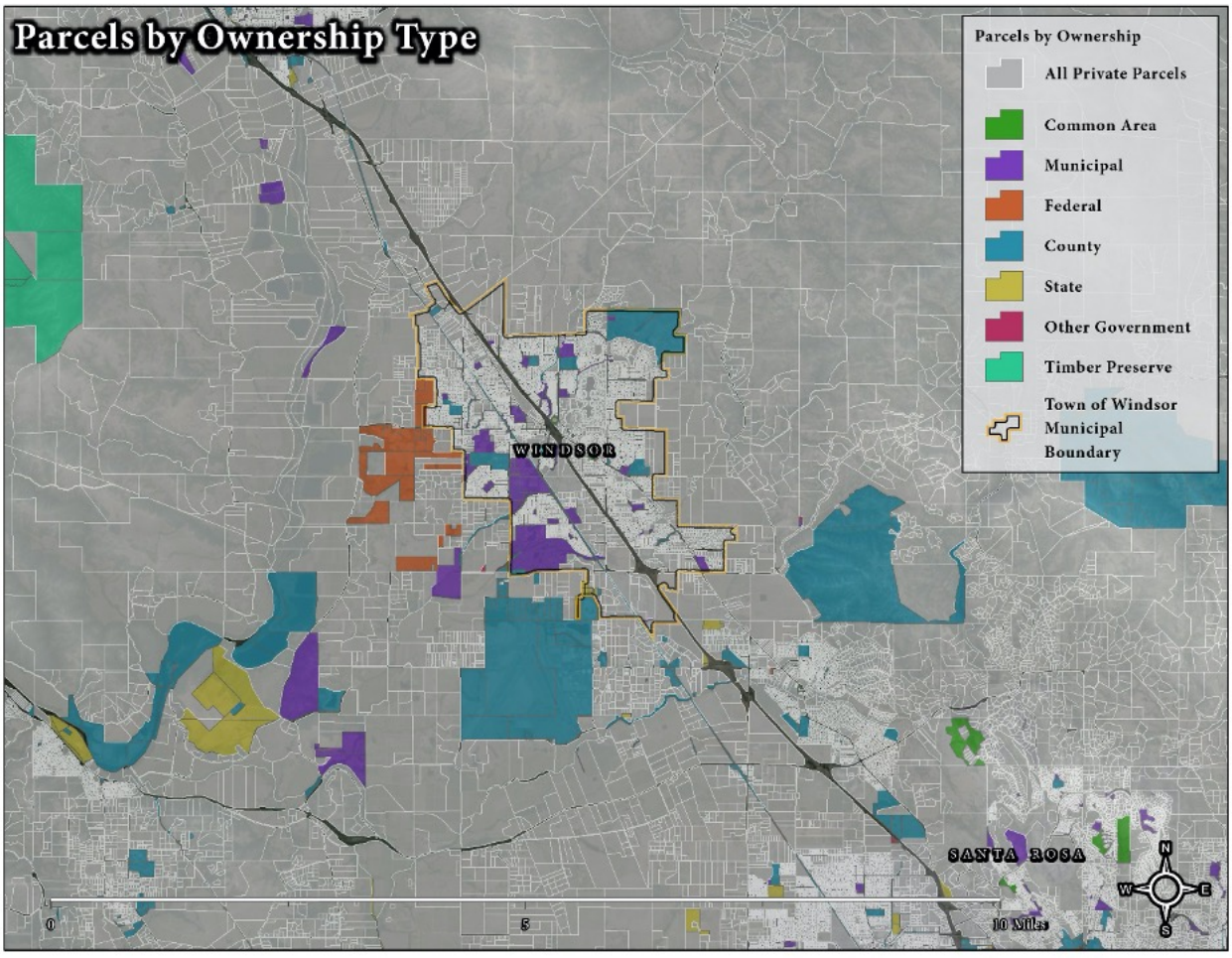


Figure 18. Parcels by ownership for the Town of Windsor and surrounding region.

[76] (Fire Adapted Network)

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Community Wildfire Protection Plan Hazard Mitigation Plans Emergency Operations Plan Land Use Codes	CAL FIRE Prevention Grants CAL FIRE Urban and Community Forestry Grant Programs California Office of Emergency Services Sonoma County Agricultural and Open Space District Matching Grant Program Sonoma County Resilience Fund Sonoma County Regional Parks - Foothill Regional Parks Funding Regional Partners Conservation Easement Programs (and other land-use related management programs)

STEPS TO IMPLEMENTATION

Priorities for the following potential actions will be determined by funding availability, staffing, opportunities for collaboration, and similar considerations.

Key Actions	Timeframe
Complete the Fire Adapted Community Self-Assessment Tool for Windsor.[77] The tool supports communities in their planning and decision-making when it comes to developing a more fire-resilient or wildfire-adapted community.	Near-term < 2 years
Collaboratively assess the potential role of current and additional Wildfire Risk Reduction Buffers (WRRBs) in reducing wildfire risk for the Town of Windsor. ● Review scientific and published literature from communities who have already undergone this process (e.g., Paradise). ● Identify and map existing and potential wildfire risk reduction buffer zones between the Town of Windsor and the wildlands. ● Consider what options exist (e.g., conservation easements, etc.) to expand the wildfire risk reduction buffer between the Town of Windsor and the wildlands. ● Create a working group with strategic partners (e.g., County, Vital Lands Initiative partners, other municipalities, regional landowners)	Near-term < 2 years

[77] (Fire Adapted Network)

to identify shared goals for wildfire protection, land use, and biodiversity goals across the region. ● Work with PG&E to explore the current and future potential of expanding wildfire risk reduction buffer zones on existing transmission line locations. Assess existing development projects to ensure that they support the Town's urban growth needs and vision for a wildfire risk reduction buffer surrounding the Town.	
Enhance and support wildfire-adapted landscape work being completed across the Town. ● Identify areas where the Town can enhance stewardship of wildfire-adapted landscapes. ● Develop a strategic plan for implementing wildfire-adapted landscape practices on Town properties. ● Identify areas where Town can enhance stewardship of wildfire-adapted landscaping for individual homeowners, particularly for homeowners near the wildlands. ● Enhance municipal land use management strategy to cultivate a wildfire-adapted community. Assess and revise land use codes so that they align with wildfire risk reduction buffer zone goals at the local and regional level.	Near-term < 2 years
Enhance and support wildfire-adapted landscape work being completed across the region. ● Work with regional partners to develop a strategic plan for supporting regional landowners and agricultural producers to implement wildfire-adapted landscapes on their own properties. ● Consider convening a regional property owner wildfire working group collaborative. ● Work closely with partners (like the Sonoma County Agricultural Preservation and Open Space District) to identify priority lands to be set aside as WRRBs (e.g., agricultural lands, conservation easements, multi-use recreational areas, open spaces, etc.). ● Work with Sonoma County Regional Parks to pilot wildfire-adapted landscape practices at the Foothill Regional Park and Shiloh Ridge Park. ● Promote active wildfire stewardship practices with regional partners, particularly on lands that are within (or directly adjacent to) the Town (e.g., Foothill Regional Park). ● Actively participate in a working group focused on wildfire-adapted landscapes (e.g., Sonoma County Watershed Collaborative). ● Identify opportunities to leverage funding with partners (e.g., Sonoma County, Santa Rosa, and Healdsburg) to support wildfire resilience. ● Identify and invest in opportunities to support education and	Medium-term < 5 years

outreach with key stakeholders (e.g., agricultural producers) focused on wildfire risk reduction measures (e.g., prescribed burns).	
Identify opportunities to support Town and regional property owners to reduce and process fuels on their properties annually (e.g., Town and/or County chipper program, hiring seasonal staff to conduct audits and/or clear properties). • Identify and promote regional examples of funding mechanisms that expand the Town and County's ability to implement wildfire-adapted community practices (e.g., Marin County Wildfire Prevention Authority).	Medium-term < 5 years

STRATEGY DETAILS & ADDITIONAL MATERIALS

According to the U.S. Fire Administration, a wildfire-adapted community is a "*human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire through preparation" (pg. 1)*.[78] It is a broad term that describes both an outcome and a process, with the recognition that wildfire-adapted practices encompass a wide variety of action areas (e.g., education, evacuation planning, vegetation management and fuel reduction strategies, land use planning and policy development, etc.) that are performed and maintained regularly over the long-term.

Wildfire is a known hazard across all of Sonoma County, and among Town and County officials, there is growing consensus that Windsor's wildfire risk is 'High' and continuing to increase due to climate change, increasing development in the wildlands (in the adjacent County-owned land), and historic and current wildfire suppression policies.[79] Becoming a wildfire-adapted community goes beyond climate change. For communities (like Windsor) that are surrounded by forested woodlands, ongoing investments in wildfire risk reduction, wildfire education and capacity building, and improving ecosystem health and function are central to the health and wellbeing of the Town. This includes integrating wildfire resilient approaches to landscaping at a local and regional level that account for the essential aesthetic, ecological, recreational, and cultural value that trees provide for the Town and region. Accommodating the increasing direct and indirect risks of wildfire requires a multi-jurisdictional and long-term strategic vision and approach to living with wildfire.

As a central part of creating a wildfire-adapted community, implementing "wildfire-adapted landscape" practices such as vegetation management and fuel reduction efforts throughout the community and on surrounding lands are essential. In addition, identifying and protecting existing (and potential future) Wildfire Risk Reduction Buffer (WRRB) zones surrounding the Town from development provides a multitude of benefits including wildfire protection.

[78] (U.S. Fire Administration, 2020)
[79] (*Town of Windsor Community Vulnerability Assessment*, 2021)

Successfully implementing wildfire-adapted landscape practices for the Town of Windsor means supporting and enhancing the education and work of individual homeowners, Town staff, regional partners, and county and state partners.

Best Practices and Current Conditions in Windsor

There are a variety of regional and national standards for defining whether the Town of Windsor is a wildfire-adapted community. For example, the U.S. Fire Administration (USFA) has seven actionable steps communities should follow to become a "wildfire adapted community."[80] In addition, the Fire Adapted Network uses four steps that closely resemble the USFA's approach. It also created a Communities Self-Assessment Tool to support communities in their planning and decision-making when it comes to developing a more fire-resilient or wildfire-adapted community. The Fire Adapted Network recognizes that creating a wildfire-adapted community is not about simply checking off steps on a checklist; rather, living safely with wildfire requires an ongoing and whole community shift in understanding, thinking about, and living with wildfire. In addition, regional partners have shaped wildfire resilience practices to fit the local and regional context from national scale tools. The following steps have been adapted from the Fire Adapted Community Self-Assessment Tool[81] and the U.S. Fire Administration.

Table 6. Summary table highlighting the steps to becoming a wildfire-adapted community and the Town of Windsor's current conditions specific to that step.

Wildfire Adapted Community Steps	Windsor Status
1. Create (and participate in) a collaborative working group that represents all stakeholders.	In Progress
2. Identify the community's wildfire risk and create a written assessment of the risk using a Community Wildfire Protection Plan or Natural Hazard Mitigation Plan.	Complete
3. Identify and prioritize actionable steps that will enhance the resilience of the Town to wildfire.	In Progress
4. Take action!	In Progress
5. Reevaluate the work completed, and the plan as needed and continue wildfire safety maintenance activities throughout the year.	In Progress

The five main steps to cultivating a wildfire-adapted community are described in more detail below. In addition, a summary paragraph underneath each step is intended to define the current conditions in Windsor specific to that step.

[80] (U.S. Fire Administration, 2020)
[81] (Fire Adapted Network)

Create a collaborative working group that represents all stakeholders. Due to the dynamic and regional nature of wildfires, wildfire-adapted communities must participate in ongoing and multi-jurisdictional collaboration that can provide a wide array of resources, tools, expertise, and areas of influence.

Windsor Current Conditions - In Progress
The Town of Windsor has (and is currently) engaged in a variety of working groups specific to wildfire risk reduction and resilience. For example, work has been completed in preparation for the publication of the Sonoma County Community Wildfire Protection Plan (CWPP), the Multi-Jurisdictional Hazard Mitigation Plan, Local Hazard Mitigation Plan, the Riparian Corridor Fuel Reduction Plan, Municipal Codes, the Emergency Operations Plan, and now, the Windsor Climate Resilience Plan. Through the development of the Windsor Climate Resilience Plan, the Town has also regularly convened a group of technical experts designed to support the resilience planning process.

Since 2017, a collective of private, non-profit, town, county, state, and federal entities, and organizations across Sonoma County have worked together to develop priorities and actions to enhance wildfire adapted landscapes in the areas surrounding the Town of Windsor. For example, the Sonoma County Agricultural Preservation and Open Space District (through their Vital Lands Initiative) is actively involved in efforts to protect vital agricultural and working lands that serve as wildfire risk reduction buffers (WRRBs) to municipalities from development through a variety of mechanisms including conservation easements. In addition, following the 2019 Kincade Fire, a collaborative known as the Sonoma County Watershed Collaborative made up of local, regional, and state partners convened and published a report that identified the work completed to date and future goals and priorities for wildfire resilience work across the Sonoma County.[82] In addition, the Multi-Jurisdictional Hazard Mitigation planning team has members from all participating agencies that are required to meet annually to review and revise the plan as needed. This creates an opportunity for collaboration that could support additional wildfire resilience work.

A regular working group of county, private, municipal, and state partners focused on wildfire protection has been identified as a need and the Town could play an important role in supporting those conversations. This is particularly true of partnerships with neighboring municipalities, like Santa Rosa and Healdsburg.

Identify the community's wildfire risk and create a written assessment of the risk using a Community Wildfire Protection Plan or Natural Hazard Mitigation Plan. Identifying and defining a community's risk to wildfire is essential to understanding how to best prioritize action. Developing actions to reduce that risk in standard planning documents (e.g., Community Wildfire Protection Plan) provides communities with a vehicle to measure progress and make continuous updates as needed. The Fire Adapted Network also encourages communities to complete the wildfire self-assessment tool to support a community's understanding of and relationship to a variety of factors including: wildfire hazard and response capability, residential and commercial properties at risk, community plans and regulations, wildfire mitigation/risk

[82] (Sonoma County, 2018)

reduction programs, resources and funding, public outreach and input, and landowner and other stakeholders.

Windsor Current Conditions – Complete
The Town of Windsor understands the immediate and long-term risks from wildfire due to past and current planning efforts, recent and historic wildfire events at the local and regional level, and additional analyses. The Town of Windsor relies on a variety of planning documents to support their wildfire-focused resilience work including: the Sonoma County CWPP, the Multi-Jurisdictional Hazard Mitigation Plan, Local Hazard Mitigation Plan, the Riparian Corridor Fuel Reduction Plan, Municipal Codes, Land Use Planning, the Emergency Operations Plan, and now, the Windsor Climate Resilience Plan. The Town is directly responsible for the implementation and updates to some of these plans (e.g., Local Hazard Mitigation Plan), and contributes to others happening at a more regional scale (e.g., Sonoma County CWPP). In addition, regional analyses completed by Sonoma County as a part of the forthcoming Sonoma County CWPP update have helped inform updated wildfire risk assessment maps that serve as the foundation for the Windsor Climate Resilience Plan.[83] These updated maps will serve as the foundation for current and future wildfire risk planning efforts across the Town. In addition, utilizing regional and national tools (like the Fire Adapted Network's community wildfire self-assessment tool) may be additional important assets in enhancing the Town's understanding of regional wildfire risk.

Identify and prioritize actionable steps that will enhance the resilience of the Town to wildfire. Once the wildfire risk assessment is complete, identifying and prioritizing steps to reduce the risk of wildfire provides the foundation to take near- and long-term action to reduce that risk. This includes identifying partnerships and resources needed, which are crucial to the success of wildfire-adapted communities.

Windsor Current Conditions - In Progress
Important historic events like the Tubbs and Kincade wildfires have set a foundation for better understanding, preparing for, and reducing wildfire risk through a variety of programs, policies, and projects at the local and regional levels. Actions have been developed through a variety of local plans focused on wildfire that the Town is actively implementing as well as the development of this Resilience Plan. For more regionally focused plans, the Town should continue to engage with and participate in the implementation of these actions. For example, the Sonoma County Watershed Collaborative identified specific priorities in the 2018 report titled "Living in a Fire-Adapted Landscape: Priorities for Resiliency" including: increase community awareness and preparedness for living in fire-prone landscapes; evaluate and implement practices that maximize the resilience of natural and working lands to climate change and future disasters; and permanently protect a network of lands that support biological diversity through changing climate conditions and prevent development in high risk areas, among others.[84] In addition, the Town of Windsor Riparian Corridor Wildfire Fuel Management Plan, published in 2017 in response to the Kincade Fire, set priorities for riparian corridor wildfire fuel reduction

[83] (Sonoma County, 2021)

[84] (Sonoma County, 2018)

and protection efforts.[85] These priorities and the associated actions provide a framework for the Town to engage in these discussions at a regional scale.

The Town of Windsor maintains existing partnerships at the local, county, and state level that support wildfire risk reduction efforts. Due to the significant amount of private land surrounding the Town, additional work is needed to cultivate existing partnerships with local and regional landowners.

Take Action. Once wildfire risk has been defined, priority actions have been developed and prioritized, it is time to take action! Additional funding, partnerships, and updates to existing plans will be required as actions are implemented.

Windsor Current Conditions - In Progress
The Town of Windsor staff and partners have been implementing wildfire resilience actions from a variety of guiding community plans including the Multi-Jurisdictional Hazard Mitigation Plan, the Sonoma County CWPP, and more. Priority actions from the Sonoma County Watershed Collaborative have been implemented at the local and regional scales and include the development of the County of Sonoma's Office of Recovery and Resiliency's Recovery Framework[86] and the Division of Climate Action and Resiliency. In addition, the Sonoma County Agricultural Preservation and Open Space District integrated additional priority actions into their Vital Lands Initiative[87] and wildfire adapted landscape and conservation work has been ongoing at a variety of scales.

Identifying additional opportunities to support County partners and regional landowners outside of the Town's boundaries to enhance the identification and preservation of wildfire risk reduction buffer zones surrounding the Town of Windsor critical. And despite current community plans already guiding the implementation of local wildfire resilience efforts, the Windsor Climate Resilience Plan is the first comprehensive analysis of the Town's vulnerability to climate change (vulnerability assessment) and the integration of strategies into strategic decision-making. Implementing actions from this plan will require the cultivation of existing partnerships at the local, regional, and state levels and the development of additional relationships needed to inform this work.

Reevaluate the work completed, and the plan as needed and continue wildfire safety maintenance activities throughout the year. This step requires that communities monitor, measure success of, and adjust the resilience actions that are being implemented.

Windsor Current Conditions - In Progress
As a part of the climate adaptation planning process, the Town of Windsor is in the process of developing an approach to implementing, monitoring, and evaluating the progress of resilience strategies. This work will require continuous investment and individual strategies will need to be adjusted as needed.

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[85] (Town of Windsor & Sonoma County Fire District, 2017)
[86] (*Sonoma County Recovery & Resiliency Framework*, 2018)
[87] (Sonoma County Agricultural Preservation and Open Space District, 2021)

OPPORTUNITIES FOR ACTION

Considering the Role of Wildfire Risk Reduction Buffer Zones (WRRBs) in Wildfire Resilience

What are Wildfire Risk Reduction Buffer Zones and Why are They Important?

Wildfire Risk Reduction Buffer Zones (WRRBs) - also synonymous with "greenbelts", "community separators", "community wildfire protection zones", or "landscape scale fuel breaks" - are areas of land that separate urban areas from wildlands at risk of burning due to wildfire. WRRBs can be green spaces, preserves, recreational areas, fields, infrastructure pathways, open spaces, agricultural lands, parks, orchards, or other low risk ignition land areas that support wildfire resilience by protecting urban areas from wildfires. These buffers can provide a multitude of benefits, including recreation, conservation, biodiversity, wildlife corridor, cultural, and agricultural benefits.[88]

WRRBs and the Town of Windsor

Buffer zones currently separate the Town at several borders from the wildlands and are mostly composed of agricultural lands, open spaces, and regional parks. For example, at the northern, western, and southern borders, agricultural lands surround the Town and along the northeastern and eastern edges of the Town borders lie regional parks. During the Kincade Fire of 2019, both Foothill Regional Park and Shiloh Ranch Regional Park served as important buffer zones for firefighters to protect neighborhoods from the wildfire spreading.[89]

[88] (Greenbelt Alliance, 2021)
[89] (Greenbelt Alliance, 2021)

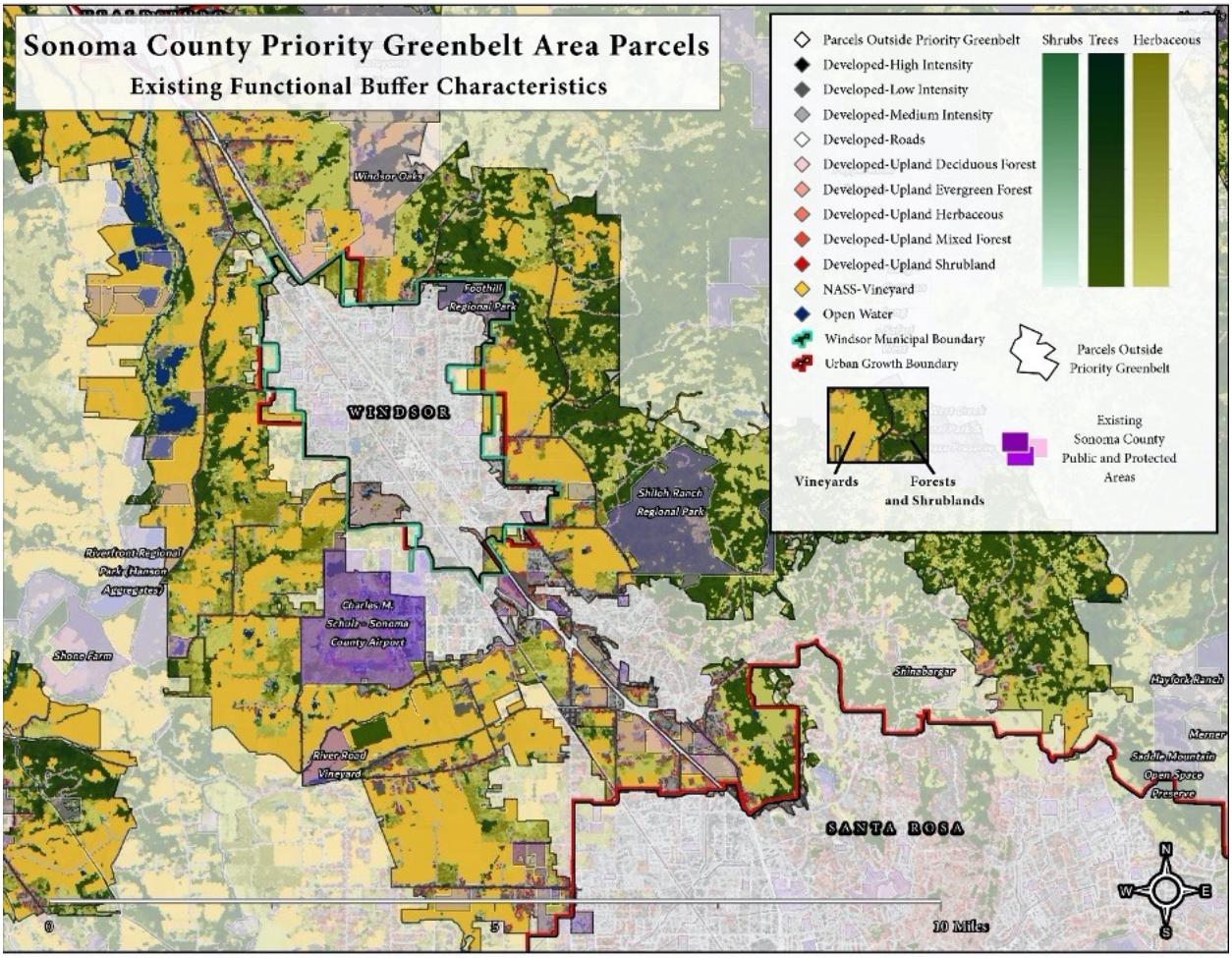


Figure 19. Map highlighting the priority wildfire risk reduction buffer around the Town of Windsor as defined by the County and shown by buffer characteristics.

According to a report published by the Greenbelt Alliance, a "voter-approved urban growth boundary" established a clear line just beyond the edge of the Foothills Estates Subdivision (which contains about 150 homes).[90] This clear delineation and its proximity to the Foothills Regional Park provided firefighters with a location to stage trucks, bulldozers, and equipment, as well as utilize wildfire protection techniques (e.g., create backfires and fuel breaks). Similar practices along the eastern border of the Town adjacent to the Shiloh Regional Park prevented wildfire from spreading to the Elsbree subdivision. In April of 2021, $500,000 of funding was provided to Sonoma County Regional Parks to support wildfire recovery and wildfire resilience work in Foothill Regional Park.[91] Funding is intended to support hardening of Foothill Regional Park structures, planning and implementing new trail systems and installing underground water lines to support wildfire protection needs, the development of wildfire education spaces, wildfire recovery efforts, vegetation management, and more.

[90] (Greenbelt Alliance, 2021)
[91] (Sonoma County Regional Parks, 2021)

In addition, the 710-acre Windsor Oaks woodlands, vineyards, and riparian area currently serves as a greenbelt on the North edge of Windsor between the Town and Healdsburg.[92] Similarly, the De Loach/Ziedrich properties which comprise 117 acres and include vineyards and scenic hillsides also serve as a buffer between Windsor and Healdsburg.

Although non-regulatory, ongoing efforts like the Sonoma County Vital Lands Initiative are in the process of protecting strategic lands that serve as potential WRRBs (and enhance biodiversity and working land goals) from development. In addition, regulatory mechanisms like the urban growth boundary (UGB) and community separators may play important roles in supporting WRRBs strategies in the region. In 2018, a voter-approved initiative extended the timeframe of the existing Windsor urban growth boundary until 2040 in alignment with the Windsor General Plan. Supporting County partners and working closely with neighboring municipalities to preserve and maintain WRRBs surrounding the Town is critical. Regional population growth and local, regional, and state development goals may present significant challenges to implementing land use planning and policy needs that support the preservation of WRRBs.

[92] (Sonoma County Ag + Open Space ArcGIS Storymap)

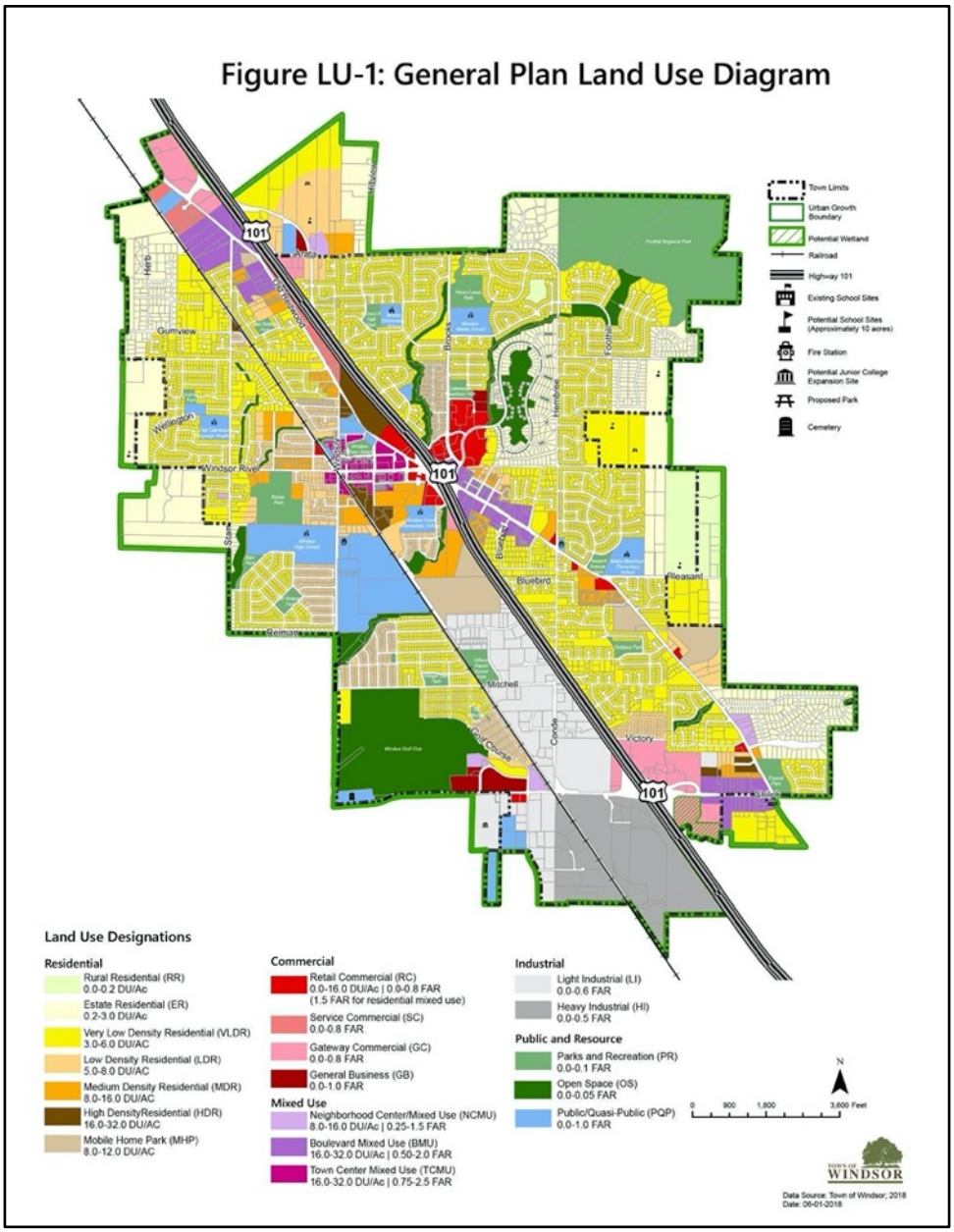


Figure 20. Figure from Windsor General Plan 2040 showing land use designations and potential future development plans.

Key Opportunities for Action

The Town of Windsor has some additional opportunities to preserve and enhance the way existing and new WRRBs could support wildfire protection efforts including:

- Review current land use planning requirements and identify areas that support the local and regional WRRB goals.
- Support regional partners (e.g., Sonoma County Ag & Open Space) in their investments in strategic WRRBs surrounding Town borders that enhance the Town's resilience to wildfire (e.g., Sonoma County Agricultural and Open Space District Vital Lands Initiative, PG&E High Tension Power Transmission Line Corridor, Santa Rosa, Healdsburg, etc.)

Ensuring that Windsor land use planning and policy designations in current and future plans support the development and maintenance of agricultural, grazing, recreation, and open space lands that surround the Town's urban growth boundary is critical. These lands not only serve as essential spaces for wildfire protection in the case of a wildfire, but they provide a variety of additional aesthetic, cultural, and recreational benefits.

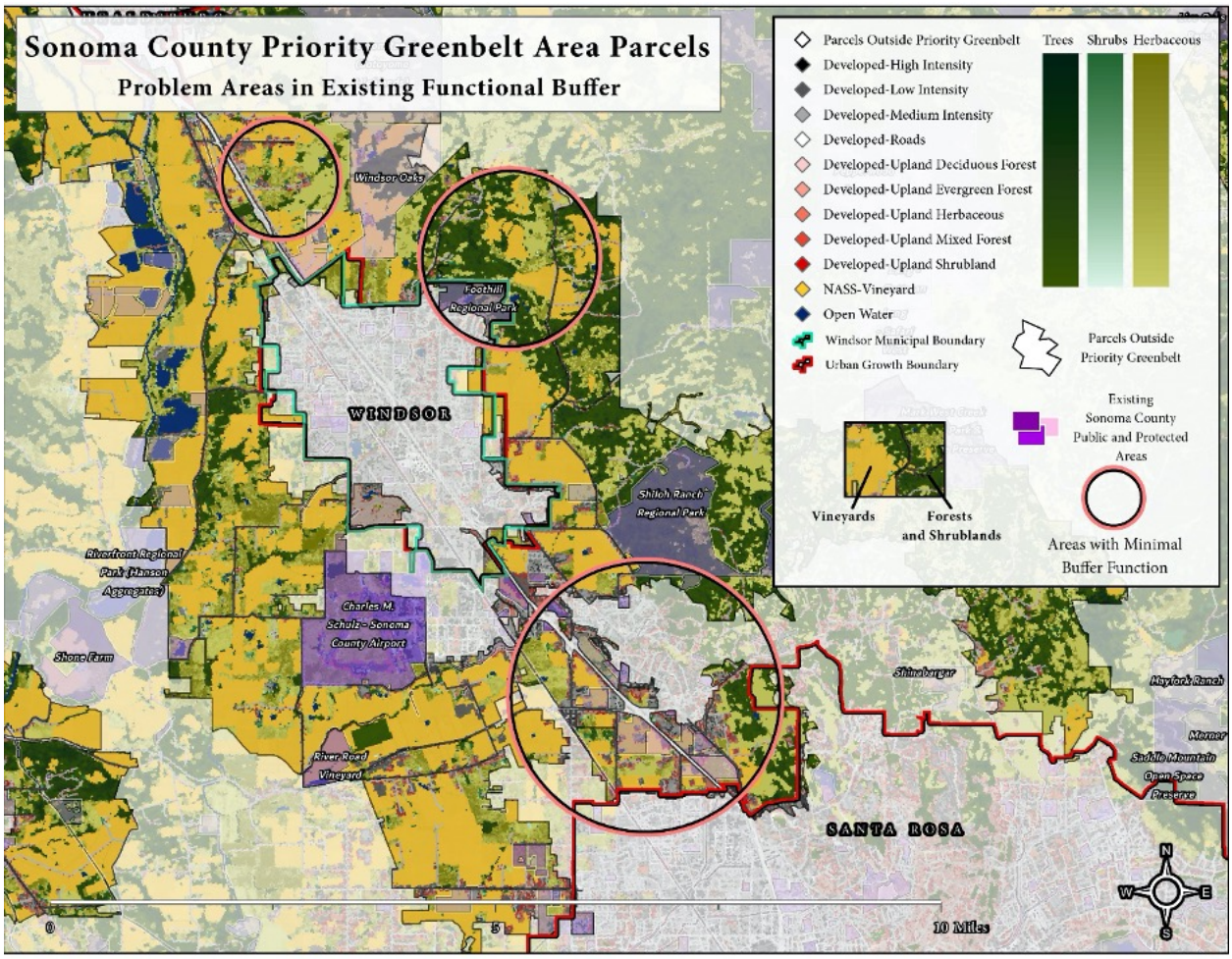


Figure 21. Map highlighting problem areas in the existing functional WRRB for the Town of Windsor. The WRRB highlighted in this map aligns with the priority WRRB areas from the County and are shown by land characteristics.

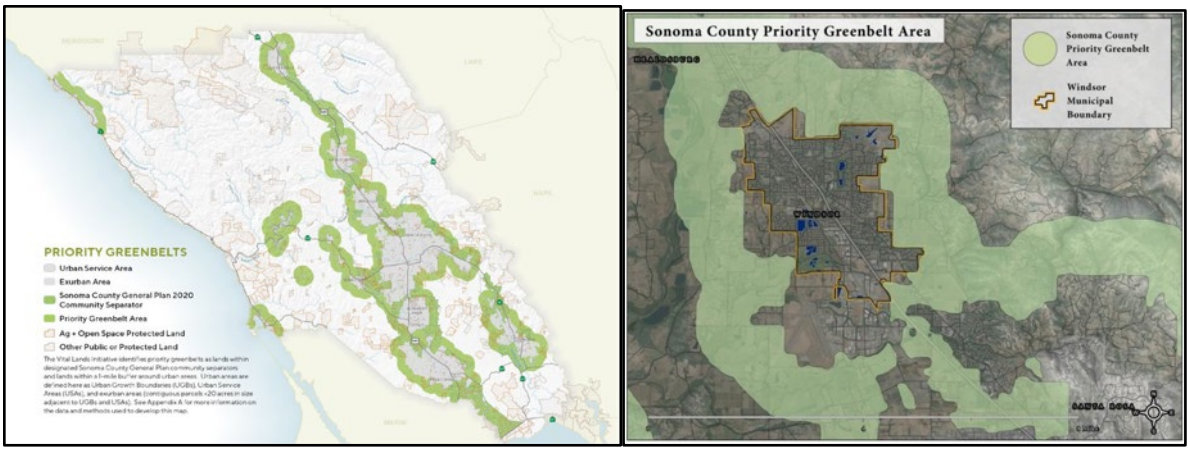


Figure 22. The map on the left shows the priority 1-mile-wide greenbelt buffers across the region as defined by the Sonoma County Vital Lands Initiative. The map on the right shows the priority greenbelt area specific to the Town of Windsor.

In addition, the PG&E high tension power transmission lines that run along the East, Northeast, and Northern edge of the Town provide both an opportunity and a challenge with regards to wildfire. Considering the geographic location of the PG&E high tension power line in the Town of Windsor and its proximity to the wildlands, enhancing existing vegetation management and fuel reduction work along this corridor may serve as an important synergy with the Sonoma County Vital Lands Initiative greenbelt priorities. Wildfire fuel reduction and vegetation management work is already being completed by PG&E's wildfire risk reduction teams. Although this corridor alone will not prevent wildfire ignition and spread during high wind days, it does have the potential to serve as a part of an important wildfire risk reduction buffer zone in combination with other land areas.

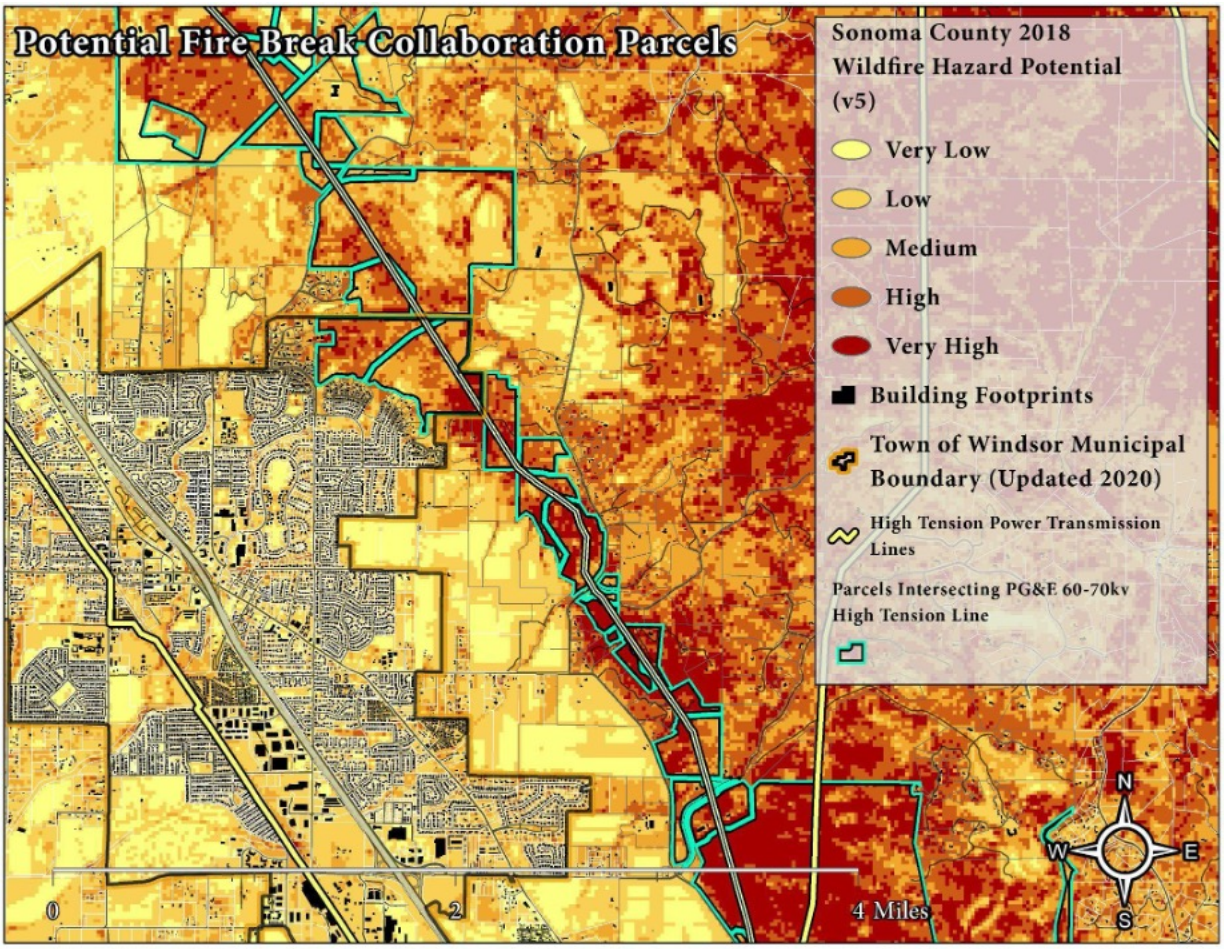


Figure 23. Parcels intersecting the PG&E 60-70kv high tension line are shown in neon green and may present an additional opportunity for future collaboration to support wildfire risk reduction measures.

Challenges

There are a variety of challenges that limit the ability of the Town to invest in, preserve, and maintain strategic WRRB's surrounding its boundaries. The lack of jurisdictional authority surrounding its urban growth boundary, continued loss of farm and grazing land, population growth and development pressures, escalating land costs (which are shifting land use needs), and tourism illustrate some of the local and regional pressures that may limit the Town's ability to maintain WRRBs. Importantly, the considerable amount of private land that surrounds the Town is not directly under the Town's jurisdiction and is unaffected by local land use planning policies and decisions.

Case Studies on the Use of WRRBs

There are a variety of important examples of communities designing and implementing WRRBs to provide a multitude of benefits to their communities (including wildfire risk reduction).

Following the devastating Camp Fire in 2018, Paradise, California identified, designed, and implemented WRRBs to protect its vital urban area as it rebuilds.[93] Working with partners, the Town of Paradise analyzed flammability of land cover, explored management scenarios, and used significant technical expertise and community engagement to identify WRRB. The buffers are designed to improve wildfire protection efforts, reduce wildfire risk for residents, and provide additional benefits. WRRBs include setting aside open space for recreation, providing staging and/or refuge areas for community members during emergencies or firefighting, and creating additional habitat for wildlife. Paradise planners identified five WRRBs (a total of 34,613 acres of public and private lands) that surround the most densely populated residential areas within the incorporated municipalities of Paradise, Magalia, and Concow-Yankee Hill.

Communities in Colorado provide a stark example of the potential that greenbelts can play in serving a variety of benefits to communities including wildfire protection.[94] In 2012, two wildfires ignited in unusually dry and hot conditions along the Front Range of Colorado in the cities of Boulder and Colorado Springs. The Waldo Fire started approximately 16 miles from Colorado Springs, a city of about ~460,000 people. No WRRB separated the city from the ridgeline where the wildfire broke out, and over 350 homes were destroyed and two people lost their lives. In contrast, the Flagstaff Fire erupted right around the same time in Boulder resulting in large-scale evacuations. Due to a 100,000-acre open space buffer made up of private and public land surrounding the city, firefighters were able to respond and protect the town and its residents from the wildfire. The open space was secured through a combination of conservation easements and a voter-approved tax that allowed the city to purchase and secure the land from further development. Not only does the buffer zone provide wildfire protection opportunities, but it also serves as essential grasslands and forest habitat for a variety of wildlife species with active land stewardship practices through prescribed burns, fuel reduction, and vegetation management practices to enhance the wellbeing of the ecosystems served and reduce the risk of wildfire.

Wildfire-Adapted Landscapes on Town Properties

Due to the unique geographic location and specific land use designations for the Town of Windsor, there are relatively limited opportunities to integrate wildfire-adapted practices on Town properties. The Town is not located within the wildlands and the parks within the Town's jurisdiction are not forested woodlands. Key opportunities for action mostly lie in cultivating and strengthening existing relationships with county and state partners already doing this work, as well as supporting regional landowners in their efforts to integrate effective land stewardship practices. Key opportunities may include supporting existing agricultural and grazing operations that also provide wildfire resilience and conservation benefits to the Town, limiting development in strategic areas that serve as WRRBs, and investing in existing partnerships at the regional level. Additional funding may provide opportunities to purchase private lands or support regional partners in creating conservation easements for landowners in strategic locations that also enhance the resilience of the Town to wildfire.

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[93] (Conservation Biology Institute, 2020)
[94] (Greenbelt Alliance, 2021)

Funding

Unique funding and multi-jurisdictional authorities have been used in a variety of locations across the state to enhance wildfire resilience for municipalities and counties. For example, the development of the Marin Wildfire Prevention Authority (MWPA) - a multi-jurisdictional joint powers authority (JPA) designed to fund proactive wildfire prevention and emergency preparedness efforts in Marin County for the next 10 years - has provided local municipalities with seed funding to support existing wildfire resilience efforts.[95] Through the passage of Measure C in 2019, (with over 70% support from voters across the county), approximately $21 million/year is allocated to a variety of wildfire resilience initiatives including: 1) vegetation management; 2) wildfire detection and evacuation program improvements; 3) grants; 4) public education; 5) defensible space evaluations; and, 5) local specific wildfire prevention mitigation. There are 17 agencies involved in the newly established JPA representing more than 98 percent of the land area and more than 96 percent of the residents of Marin County. Using a variety of mechanisms, including MWPA staff, an advisory committee, a board of directors, an operations committee, and the Ecologically Sound Practices Partnership (the ESP), the MWPA will redefine the work happening to address increasing wildfire risk across the region by serving as a funding mechanism for local agencies to complete mitigation efforts that are outlined in the mission or goals of the MWPA. That funding then directly passes through Central Marin Fire, who identifies and manages all the fuel reduction projects within Corte Madera and other municipalities. Funding is a continuous need.

[95] (County of Marin, 2019)

Additional Environment Strategies

Enhance and support regional and local drought contingency planning efforts.

Resilience Value: As droughts across the region continue to intensify and last longer due to climate change, coordinating with local and regional partners on long-term regional drought resilience will help ensure that it can continue to meet its current and future growth demands. The majority of the water demand for Windsor is currently met through the river well field and Sonoma County Water Agency purchase supply, and the Town is actively looking for additional groundwater resources that meet increased demand and to provide some redundancy in the event of a continued or extreme drought. Additionally, other regional partners, like Sonoma Water, are in the process of implementing drought contingency planning efforts through enhanced hydrology modeling. Continuing to build on these efforts are critical. A variety of strategies are needed, including the expansion of municipal greywater infrastructure, water reclamation, and rainwater collection capacity, enhanced outreach and education on water conservation measures, and increased coordination and drought contingency planning with regional partners.
Potential Partners: Sonoma Water, Sonoma County Water Agency, State Department of Water Resources, Agricultural partners, Cal Water Efficiency Partnership, BayREN
Timeframe for Implementation: Medium-Term

Increase stormwater retention/detention along the natural drainage basins on both public and private properties.

Resilience Value: Identifying areas where increasing the capacity of natural drainage basins (and investing in other green infrastructure and low impact design system components) on both public and private properties can provide a variety of benefits, including increased drought resilience through additional stormwater retention/detention, reducing temperatures in urban areas during hot weather, improve air quality, lower building energy demands in urban areas, mental health benefits, and improved system efficiency. Windsor's current stormwater system includes pipelines, open channels, and creeks, which all flow into the Russian River, yet existing flood-prone areas require additional investment. In the Windsor Stormwater Drainage Master Plan (2017), additional proposed projects have been identified, including the addition of additional infrastructure areas that continuously flood in Town, expanding beyond the Town's current limits and Urban Growth Boundary, and improved modeling capabilities.
Potential Partners: Public Works Department, Russian River Watershed Association, Sonoma County Water Agency, Sonoma Water
Timeframe for Implementation: Near-Term

Support the use of nature-based solutions in upstream and downstream floodplain management.

Resilience Value: Promoting nature-based solutions on private and public properties to enhance the efficiency and effectiveness of floodplain management can provide a multitude of benefits for residents and the Town. The Town of Windsor already requires low impact development features on projects creating or replacing 10,000 square feet or more of impervious surface. Finding additional opportunities to enhance and support the use of nature-

based solutions in upstream and downstream floodplain management will enhance the resilience of the Town to infrequent but important flood events now and in the future.
Potential Partners: FEMA (Flood Mitigation Assistance Program), Association of State Floodplain Managers (ASFM), Santa Rosa, Healdsburg, Sonoma County
Timeframe for Implementation: Medium-Term

Coordinate with Tribal, regional, and state partners to enhance the resilience of Windsor's watersheds.

Resilience Value: Due to the unique mosaic of land ownership and jurisdictional authority across the region, coordination with Tribal, regional, and state partners is key to enhancing the health and wellbeing of watersheds that service the Town and its residents. Continued investment in the Russian River Watershed Association (and in other key partnerships) will foster habitat restoration, support the vitality of key (and endangered) species (e.g., Chinook Salmon), promote regional water quantity and quality goals, and enhance the resilience of watersheds from current and future climate hazards.
Potential Partners: Russian River Watershed Association, Sonoma County Watershed Collaborative, Public Works, Planning, Sonoma County Water Agency, Sonoma Water
Timeframe for Implementation: Near-Term

Reduce the risk posed by extreme heat and drought on shade and anchoring trees, streams and reservoirs, fish and wildlife, and other natural resources and habitats.

Resilience Value: Despite having evolved in a drought-prone environment, natural systems in the Windsor region are particularly vulnerable to current and projected drought events - which are expected to intensify and last longer. Natural systems are considered moderately vulnerable to extreme heat events, which are also expected to increase in duration and frequency in the coming decades. Working with local and regional partners to identify strategies to reduce the risks of drought and extreme heat events on the health and wellbeing of shade and anchoring trees, streams and reservoirs, fish and wildlife, and other natural resources and habitats is crucial to ensuring the wellbeing of watersheds in the region.
Potential Partners: Sonoma County Regional Parks, Sonoma County Ag & Open Space, Sonoma County Watershed Collaborative, Sonoma County Ecology Center, Russian River Watershed Association, FireSafe Sonoma, Sonoma Water, California Department of Fish and Wildlife
Timeframe for Implementation: Medium-Term

Expand public engagement to support resilient landscape management through volunteerism, ecological education, tourism, community events, and other activities.

Resilience Value: Resilient landscape management practices that promote healthy working lands, biodiversity and conservation outcomes, and healthy watersheds require buy-in, planning, and investment from local, regional, and state agencies, industries, and the general public. Implementing resilient landscape management practices often require a wide range of innovative approaches rooted in the best available science that align with local and regional land use planning goals. Some tools - like prescribed burns, which can be effective at reducing

the risk of catastrophic wildfires - require additional education and engagement to gain more broad public support. Tying into existing partnerships that are already working on education and engagement will lead to more effective and efficient results.
Potential Partners: Agricultural producers, Fire Safe Sonoma, Sonoma County Vintners, Sonoma Water, Sonoma County Regional Parks, Sonoma County Ag & Open Space District, Sonoma County Watershed Collaborative, Sonoma County Ecology Center, Russian River Watershed Association
Timeframe for Implementation: Near-Term

Enhance pre-disaster recovery capacity to assess and restore ecosystems post-wildfire.

Resilience Value: Pre-disaster recovery planning provides an important framework for understanding and planning for managing recovery efforts following a major disaster (like a wildfire). Identifying opportunities to support local and regional partners in their efforts to efficiently and effectively assess wildfire damage to ecosystems, watersheds, and native species that promote recovery and restoration now will help streamline the process in the case of a future wildfire.
Potential Partners: Russian River Watershed Association, California Department of Fish and Wildlife, Sonoma County Regional Parks, Sonoma County Watershed Collaborative, Sonoma County Ecology Center, Local Universities, Sonoma Water,
Timeframe for Implementation: Near-Term

Goal 5

RESILIENT ECONOMY

Strengthen and support the local economy by ensuring that businesses and workers are well-prepared for climate-related hazards and are able to respond to and rebound from disruptions.



Prepare businesses (and business-dependent services) for climate related disruptions.

STRATEGY SUMMARY

Business continuity planning is not new to the private sector and has been used to help businesses prepare for everything from weather disruptions to terrorism for decades. Local businesses have been, and will continue to be, challenged by extreme weather events and climate change. Business Continuity planning and/or management is a great way to embed climate preparedness into business operations and includes evaluating operations and thinking about how climate and weather can affect the people (staff and customers), business operations, and supply chains.

Town Strategy Lead(s):	Key Partner(s):
Economic Development	Chamber of Commerce Sonoma County Tourism Sonoma County Economic Development Board Professional Groups - such as Rotary Regional Climate Protection Authority

Metrics of Success

- By 2025, 80% of businesses in Windsor, regardless of size, have developed climate smart business continuity plans. These businesses feel confident and well prepared for emergencies.
- Information sharing and discussion of climate related risks and risk reduction opportunities both locally and throughout the supply chain are integrated into business roundtables, meetings, and conversations on a regular basis.
- By 2030, the Town has worked with the business community to develop necessary support including requirements for flood and fire resilience.

Considerations for Communities of Concern

Employees from Communities of Concerns can face challenges when it comes to preparing for extreme weather and climate hazards. Their employers can support them by 1) better understanding their needs and challenges, and 2) adjusting business continuity or operational plans to support these workers. Particular attention should be paid to working with and supporting:

- Hourly workers who don't get paid time off or don't get paid during business closures;
- Home health care, domestic, and in-home daycare, or other informal work arrangement;
- Agricultural and other outdoor workers;

- Senior living centers; and
- Spanish language speaking businesses and workers.

Challenges to Implementation

- Many small businesses do not have staff dedicated to emergency management or business continuity planning.
- It can be difficult for owner operators to make time to gather information, understand climate risks, and update operational and business plans.
- Many of Windsor's small businesses are restaurants and retail shops that do not own their facilities and thus may have limited control over larger property improvements that would reduce climate risks.
- Lack of funding can make implementing proactive changes a challenge.

Town Policy/Planning Connection:	Funding Mechanisms/Opportunities:
Hazard Mitigation Plans Business considerations in Emergency Operations Plan Comprehensive Economic Development Strategy Stormwater Resource Plan	BayREN CAL EOS Grants DWR State grants for drought resilience FEMA State and Federal Agricultural programs

STEPS TO IMPLEMENTATION

Key Actions	Timeframe
Build awareness for the importance of climate-smart planning with businesses. Lean into past experiences and future climate projections to expand the conversation so that business leaders understand the need to consider and prepare for the future.	Near-Term < 2 Years
Create business continuity toolkit resources. Ask business leaders what information and support they need to better understand and prepare for weather related risks and climate hazards. Develop toolkits and resources as necessary. Segment resources based on business size and types as necessary.	Near-Term < 2 Years
Support and Track Climate Smart Business Continuity Planning. Look for ways to support climate smart business continuity planning and monitor and track business preparedness.	Near-Term < 2 Years
Expand climate discussions with the business community. Continue discussions about how best to prepare individual businesses and the Windsor economy for climate related disruptions. Look for emerging opportunities for the Town to support or enhance those efforts.	Medium-Term < 5 Years

Expand collaboration for business resilience. Economic vitality depends on constant evolution of business products and services. Expand the connections between local businesses, county, and State support to ensure that these developments keep up with changing conditions.	Medium-Term < 5 Years

STRATEGY DETAILS & ADDITIONAL MATERIALS

Windsor is economically and culturally tied to Sonoma County and serves as an attractive location for visitors traveling along the Highway 101 corridor from the Bay Area. In close proximity to wine country[96] and the nearby Russian River recreation area, Windsor has a diverse economy, supporting jobs in its largest economic sectors of retail trade, food service, educational services, and manufacturing. The Town has a mix of residential, commercial, professional, and industrial land uses that support a range of employment opportunities for residents.

California is home to more than 4 million small businesses that employ nearly half of California's workforce.[97] Beyond the COVID19 Pandemic, local businesses have been and will continue to be challenged and affected by climate change and extreme weather events[98]. Regional wildfires have created smoke that has affected business operations and tourism and even led to a Town wide evacuation. Recent extremes in rainfall have led to historic drought conditions (2021) and flooding (also 2021) that directly and indirectly affect the ability of small and medium sized businesses to operate. Small businesses that operate out of a single location can be particularly vulnerable to these extreme weather events. Their facilities can be directly damaged by extreme weather or indirectly affected by disruptions or failures of telecommunications and power systems, supply chain interruptions, and rising insurance costs. A BCI Risk Report from 2020 estimated that "*60% of all major business risks are either directly caused or negatively affected by climate change.*[99]" The Institute for Business and Home Safety estimates that 25% of small to mid-sized businesses do not reopen following a major disaster and that the cost of downtime can be as much as $3,000 a day from extreme weather events[100]. The majority of small businesses do not have disaster recovery plans and rarely spend time preparing or maintaining those plans.

Areas of Opportunity for Action

The Town of Windsor's Community Vulnerability Assessment provides a great resource for looking beyond historical events to future projections of extreme weather and thinking through how those will or could affect business operations. Business Continuity planning and/or management is a subset of traditional risk management and encompasses evaluating business operations and thinking about how climate and weather can affect the people (staff and customers), business operations, and supply chains.

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[96] There are 50 wineries and vineyards within five miles of Windsor, and the surrounding area is considered a hub of three of the largest American Viticultural Areas (AVAs) in the country - Russian River, Dry Creek, and the Alexander Valley; (Town of Windsor, 2012)
[97] (Office of Governor Gavin Newsom, 2021)
[98] (Schot et al., n.d.)
[99] (Agility, 2021)
[100] (Reynolds, 2013)

OPPORTUNITIES FOR ACTION

Climate Smart Business Continuity Planning

Business continuity planning is not new to the private sector. These plans have been used to help businesses prepare for everything from weather disruptions to terrorism for decades. Continuity planning complements other risk management standards (such as ISO 31000 or 41001). For large businesses, business continuity planning is the primary way that they are addressing climate related disruptions.[101] Climate Smart Business Continuity Planning has been the topic of sessions at regional climate conferences[102] as early as 2016 and featured in numerous discussions[103] and blog posts.[104] Developing a continuity plan or risk management plan is one of the first steps to both identifying risks and developing approaches to reduce those risks, manage and respond during extreme weather events, and prepare for the future.

The five main steps to creating an effective business continuity management system are described below.[105]

1. ***Reviewing the context of the business*** **-** this includes identifying how climate change can influence business operations and who will be affected. Businesses can collaborate with the Town of Windsor, the Chamber of Commerce, and others to explore these issues. Start by looking at the specific local impacts of climate change (highlighted in the Town's Climate Vulnerability assessment). Then, consider supply chains, how the goods will get to a business and work with vendors to determine any critical climate risks. Also, think about staff and how they could be affected by extreme weather, unable to perform their jobs, or get to work.
2. ***Developing leadership*** - Start by making the case to top management. It can be tricky to quantify the potential impacts of future events, but it is easy to see how past events have affected business operations. Start by summarizing examples of past events and their costs to the business. Think about direct experiences with Public Safety Power Shutoff as analogies for other extreme weather disruptions. Summarize how changes to traditional Business Continuity planning are necessary to be better prepared for the future. Decide how best to review and amend policies and who needs to lead those efforts.
3. ***Understanding key issues -*** Get into the details with a granular assessment of potential impacts using Business Impact Analysis or Risk Assessment. With Business Impact Analysis - the focus is on how disruptions affect the business (regardless of cause). Think about how these disruptions could change (become more frequent or more severe) with changing climate conditions. A Risk Assessment framework works best with more quantitative data on projected changes. It can be important to consider all aspects of the

[101] (Pearce et al., 2013)
[102] Local Solutions Conference 2016, hosted by Antioch University Center for Climate Preparedness and Community Resilience. Conference Title: Business Continuity: In the Face of Extreme Weather - April 4th - 6th. https://www.communityresilience-center.org/conferences/conference-2016/business-continuity/
[103] (Johnson, 2018)
[104] (Blus, 2019)
[105] (bsi, 2014)

business including effects on markets, logistics, premises, people, processes, and finance. Consider impacts to IT infrastructure, business inventory, ways to harden or protect local facilities, proactive back-ups of critical data, and redundancy in operating systems and workforce.[106] Look beyond the walls of the business and consider supply chains - pay particular attention to critical vendors.[107] Ask those vendors about their climate preparedness plans and resilience strategies. Increasing communication with suppliers and aligning sustainability and resilience strategies across the supply chain can increase resilience and financial performance.[108]

4. ***Preparing for severe weather and climate change -*** Brainstorm and then evaluate potential adaptation options to reduce impacts and business disruptions. Specific actions will vary depending on the type of business and its desired areas of investment. Consider ways to 1) reduce the likelihood of disruption; 2) shorten the period of disruption; and 3) limit the impact of the disruption. In many cases, current business continuity planning may already include these considerations - it is just a matter of thinking through how climate change will expand the impacts of extreme weather events. Once you have explored the options, prioritize, and select preferred options - don't forget to ensure that a broad multi-faceted group of staff is involved in that selection process. This helps ensure that the prioritized options work for everyone, will be effective, and will be implemented.
5. ***Evaluating performance -*** The climate is changing and will continue to change. So, it will be important to monitor how well the actions are working and create space to continue to adapt over time. This includes developing a set of indicators (downtime per year, number of supplier disruptions, workforce disruptions...etc.) and setting a time (likely annually) for management to review these metrics and discuss additional Business Continuity investments.

Other Considerations

- **Insurance** - While reducing risk and planning for disruption is critical, it is likely impossible to eliminate the risk of extreme weather affecting the business. Long term survivability may depend on insurance. Review insurance coverage and make use of it to provide the protection the business needs in the event of catastrophic wildfires or floods.
- **Gradual Impacts -** Not all climate impacts will come from extreme weather events, more gradual increases in temperature or supply costs can affect operations. To maintain a competitive advantage in the industry, think about how these shifting baselines could affect the business and make strategic investments (e.g., energy efficiency upgrades or seasonal diversification) to counteract or prepare for these changes.
- **Protect employees -** Set out clear guidelines for health and safety during extreme weather. Have an evacuation plan in place and create flexible workplace policies so that workers that fall into Communities of Concern, have school aged children, or have older adults in their families that need additional support during extreme weather, are allowed to leave work and provide support during extreme weather. In this era of remote working

[106] (Flood HUB, 2018)
[107] (Agility, 2021- Business Resilience & Insights)
[108] (Schot et al., n.d.)

- ensure that employees have the resources and support they need to prepare for and manage risk around their homes.
- **Tabletop exercises -** plan and conduct tabletop exercises to test out business plans, build familiarity with roles and responsibilities, and discover potential gaps in responses. Use this information to improve the company's approach to business continuity planning.

Partner with other organizations and Local Authorities
Leveraging a Business Round Table or chamber of commerce can be effective in sharing knowledge and sharing the burden of preparation. Many of the hazards that local businesses are likely to face are the same - so businesses can share approaches to responding to those hazards.

Stay connected and be informed
Sign-up for Public Safety Power Shutoff notifications and other wildfire alerts from PG&E - www.pge.com/addressalerts. Encourage employees to sign up for these alerts and make them aware of the additional resources available to Communities of Concern (e.g., those with durable medical needs) who can access additional resources such as battery storage and Community Resource Centers.

Example Resources

Example resources from other communities that have incorporated business continuity planning into their resilience efforts are included below (Figures 23 and 24).

Cambridge Large Organization

Ready for Extreme Weather?

CLIMATE RESILIENCE TOOLKIT

To achieve resiliency, large organization like yours need to work with many internal and external stakeholders to implement actions. Many actions are also implemented within different applications as they relate to planning and design, operational changes, and/ or education and training. In the table below, different applications and partners are identified by resiliency goals.

	Resiliency Goal	Application			Partners/Stakeholders		
		Planning & Design	Operational Change	Education & Training	Employees	Vendors	City
1	Understand specific climate vulnerabilities with the best available information organization-wide, and spread knowledge within the operation.	✓	✓	✓	✓	✓	
2	Evaluate internal systems, and plans with a climate change lens to understand gaps and evolving needs.	✓	✓	✓	✓		
3	Understand organization's dependance on external services and vendors that are vulnerable to disruption; including energy, communication and transportation infrastructure.			✓	✓	✓	
4	Educate organization's host communities on impacts from extreme weather events.			✓	✓	✓	✓
5	Strengthen public-private collaborations to build community resilience that enhances the organization's resilience.		✓	✓	✓	✓	✓
6	Implement climate resilient design into all new construction to avoid later retrofits.	✓	✓		✓		✓
7	Build understanding of mutual vulnerabilities and opportunities with organizational peers to identify where collaboration and sharing make sense.		✓	✓		✓	✓
8	Make your community more prepared and resilient.	✓		✓	✓		✓

MORE RESOURCES

Guide to Public-Private Collaboration on City Climate Resilience Planning:
https://www.c2es.org/site/assets/uploads/2017/05/guide-public-private-collaboration-city-climate-resilience-planning.pdf

Climate Action Business Association:
https://cabaus.org/

Figure 24. Excerpt from Cambridge, MA, MVP Toolkit for Large Businesses.

BEVERAGE INDUSTRY ENVIRONMENTAL ROUNDTABLE

How Can Extreme Weather Impact the Beverage Industry? Extreme weather can affect businesses across the value chain, as well as impacting the local community and environment. The following are common business considerations:

Upstream / Sourcing 	☐ Which first and second tier suppliers are most susceptible to extreme weather or natural disasters? Are any of these suppliers sole source or business critical? ☐ Do key suppliers have business continuity plans that include extreme weather events? ☐ How will the supply versus demand for goods and services change during an extreme weather event and how will that impact sourcing? Could there by material price volatility? ☐ Are sourcing disruptions incorporated into insurance (e.g. a stock throughput program (STP) for goods in transit and/or stock and inventory)?
Beverage Manufacturing 	☐ Is your facility located in or near an area more likely to experience extreme weather? Is there a viable monitoring and alert system? ☐ Does the facility have adequate insurance? What is and is not covered? ☐ Can mechanical, electrical, HVAC, IT, and other critical equipment be better protected or moved to a more secure location? ☐ Does the facility's business continuity plan include extreme weather and natural disaster events? ☐ How sensitive are key utility sources (e.g. electricity, water quantity and quality, wastewater)? ☐ Is documentation necessary for federal, state, or local assistance during a disaster prepared and protected? ☐ How would employees be communicated with before, during, and after an extreme weather or natural disaster event?
Downstream / Market 	☐ Does the local community have adequate disaster and resiliency plans that consider extreme weather and natural disasters? ☐ What are community expectations for businesses during such events? ☐ How does the facility communicate to customers during such events and what are main needs that the facility could support?

Figure 25. Excerpt from the Beverage Industry Environmental Roundtable. Physical Risk Brief on Extreme Weather.

Additional Economy Strategies

Support businesses in their efforts to harden facilities to the impacts of wildfires, drought, and flooding.

Resilience Value: Businesses, especially small businesses, don't own the buildings they operate in and don't always have the resources to invest in retrofitting their facilities or own the buildings to reduce wildfire risk. They are also frequently located in the center of town away from the wildland urban interface. Developing outreach, education, and incentive programs can help encourage businesses and landowners to understand the value of retrofitting their facilities and ultimately protect the surrounding buildings and facilities.
Potential Partners: Fire Safe Sonoma, Chamber of Commerce, Economic Development programs
Timeframe for Implementation: Near-Term

Limit the impact of extreme heat on local businesses and customers.

Resilience Value: While not historically an issue, extreme heat is an emerging threat, especially for older residents, outdoor workers, and other Communities of Concern. Extreme heat events can limit the ability of local businesses to use outdoor spaces or decrease tourism revenue during those events. From the customer perspective local businesses can invest in shade structures or vegetation, misters, and other ways to make the environment cooler and more inviting. Businesses can also assess how extreme temperatures may affect other aspects of their operations and ability to create certain products. Having a strategic plan to address those risks will make implementation of any necessary investments as part of normal business operations will make those investments more cost effective.
Potential Partners: Chamber of Commerce, Economic Development programs, Trade and Tourism Groups
Timeframe for Implementation: Medium-Term

Provide worksite emergency preparedness and evacuation training for private and public sector employees to proactively prepare for climate hazards.

Resilience Value: Knowing what to do during an emergency is almost as important as doing it. The workplace provides an excellent opportunity to train residents and community members of emergency preparedness. This can both help the businesses clarify roles and responsibilities during an emergency and give the workers and employees the tools they need to proactive prepare their homes and their families for emergency situations.
Potential Partners: Chamber of Commerce, Business associations and Trade Groups
Timeframe for Implementation: Near-Term

Reduce flood risk for intersections and road segments that feed into commercial areas.

Resilience Value: Even if flooding does not affect the central business district section of town directly, it can cut-off access to and from that area, limiting the ability of customers and workers to access the facilities and the ability of workers to return home to care for their families during extreme weather events. Investing in protecting access to these important economic areas can support both the operations of the business and the workers who depend on that business.
Potential Partners: Chamber of Commerce, Business associations and Trade Groups
Timeframe for Implementation: Medium-Term

Work with surrounding communities and key partners to create new job opportunities that pay a living wage and provide benefits.

Resilience Value: Thinking holistically about resilience means considering not just the vitality of the economy for the Town and the Region, or the survivability of an individual business post disruption, but the workers in that business and their families. California has a long history of thinking holistically about employment and protecting employees including increases in minimum wages to $15 an hour in 2022. Benefits, paid time off, and living wages can have broad ripple effects that improve the resilience of the community by helping to ensure that families have the resources they need to reduce daily stress, consider preparing for extreme weather events, and bounce back effectively following events.
Potential Partners: Chamber of Commerce, Business associations and Trade Groups
Timeframe for Implementation: Medium-Term

Ensure business operation, strategy, and maintenance plans account for climate change projections.

Resilience Value: Much like the discussion of the value of incorporating climate change into Town plans, programs, and policies, businesses can benefit from integrating climate change into everything they do. Thinking strategically and critically about how extreme weather and climate related hazards can affect a business from workers' availability to supply chain disruptions can help the businesses operate more effectively and limit down time during disruptions. Using a scenario planning approach and investing in ways that prepare the business for the future can also give a business a competitive advantage as conditions continue to change.
Potential Partners: Chamber of Commerce, Business associations and Trade Groups
Timeframe for Implementation: Medium-Term

Support regional agriculture and viticulture businesses to become more resilient to climate hazards.

Resilience Value: Agricultural businesses can be highly reliant and dependent on weather conditions to be successful. These businesses are also some of the most creative and resourceful when it comes to preparing for uncertain conditions. Investments in things such as fans and misters to protect crops from early freezes have proven successful in protecting crops, but even smoke from distant wildfires has been known to affect the quality and flavor of grapes. Wildfire smoke from regional wildfires in 2020 are estimated to have made about 30%

of the crop (~50,000 tons) unusable and cost Sonoma County grape growers more than $150 million. As a key pillar of the economy, the more these businesses can take action to prepare for the more extreme weather, the more they will be better able to support the regional economy and the variety of workers and other businesses that depend on them.
Potential Partners: Vintner associations, chamber of commerce.
Timeframe for Implementation: Medium-Term

Center and promote diversity, equity, and inclusion practices in workplaces.

Resilience Value: Historic and current systems of oppression (including racial segregation and racism, poverty, income inequality, lack of living wage jobs, gaps in educational opportunities and attainment, concentrated neighborhood disinvestment, political disenfranchisement, and low social capital) result in social and biological factors that increase the vulnerability of some community members to climate change. Conducting an equity impact will provide Town staff and business leaders with the tools to ensure that community members are supported, feel safe going to work, and are treated equally.
Potential Partners: Chamber of Commerce, NAACP, Business Councils
Timeframe for Implementation: Medium-Term

Support businesses in the tourism economy to accommodate changes to the climate.

Resilience Value: Many of the Town's businesses rely on tourism tied to the wine industry. Traditionally, this tourism has been focused on harvest festivals in the fall, which is frequently a period of very high wildfire risk and can be affected by extreme heat events and smoke events. Acknowledging the need to diversify the time frames where people consider coming to Sonoma County, the tourism board has begun to promote the spring season for wine related events as that is when the vines bud. The flow of tourists through Windsor provides revenue to local businesses and there are many tourism related businesses beyond the wineries such as hotels, restaurants, and retail shops. Expanding the seasons for tourism can help ensure that all these businesses have more consistent revenue across the different seasons and that they won't be adversely affected by any single event.
Potential Partners: Sonoma County Tourism, Chamber of Commerce, Wineries, Hospitality
Timeframe for Implementation: Near-Term

5 CONCLUSION



Planning for the impacts of climate change and building resilience is a process. While this plan reflects the significant amount of work that has already been done by the Town and the community around reducing the impacts of climate change, it doesn't stop here. The Plan is intended to serve as a roadmap for decision-making and investment over the coming years, starting with the near-term actions. It can help guide the ways climate change is mainstreamed into other community efforts and will undoubtedly require updates, revisions, and enhancements over the coming years as the science evolves, more data about social vulnerabilities becomes available, and the region changes. As defined in this Plan, one of the most important indicators of success is that climate resilience planning shapes all Town planning processes and operations.

While this Plan cannot address every vulnerability, nor answer every question facing the Town, it does prioritize actionable steps that address the most pressing vulnerabilities presented by the climate crisis. Continued commitment to greenhouse gas reduction and taking bold and decisive actions now (and in the near future) will enhance the resilience of the Town and region. Effective responses to climate change will require strategic investments in the following areas.

- **Collaboration and Partnerships** - Climate hazards don't stop at the Town's boundaries and climate resilience cannot be achieved by the Town alone. Continuing and augmenting investment in existing and new needed partnerships will be critical over the long-term. While every strategy in the Plan is customized specifically to the Town, many of these key partners are identified throughout the Plan. For example, the Sonoma County Administrator's Office (Division of Climate Action and Resiliency) may play a key role in aligning key local, regional, and state climate resilience priorities. Additional potential partnerships include: 1) participating in regional working groups and discussions focused on multi-jurisdictional planning efforts like the Sonoma County Community Wildfire Protection Plan and Multi-Jurisdictional Hazard Mitigation Plan; 2) coordinating with Sonoma County Regional Parks, Sonoma County Ag and Open Space, and neighboring municipalities in land use planning exercises that support the protection and conservation of wildfire risk reduction buffer zones; and 3) coordinating with local, regional, and state agencies, organizations, and entities focused on emergency operations and preparedness planning for the Town.

- **Infrastructure Investments** - Ongoing capital improvement planning processes must integrate current and future climate change projections to ensure that transportation infrastructure investments are protected, and that current and future investments protect the health, safety, and vitality of Windsor residents. For example, specific infrastructure improvements have been identified in the Plan that should be considered in the very near term, like planning, funding, and implementing additional ways in and out of neighborhoods who have limited evacuation options. Additional infrastructure investments could include: an investment in multi-modal infrastructure that augments existing evacuation preparedness and provides a multitude of additional benefits for Windsor residents; establishing new network connections and intersection improvements in strategic areas, and working with community members to identify and then build out Resilience Hubs in strategic areas.

- **Policy and Planning** - To be successful, climate resilience planning takes continuous investment, monitoring, and adjustment. Climate resilience-focused policies (and their enforcement) are a critical tool in the Town's "toolbox." While the Town has made great strides in ensuring that its policies reflect the current climate, additional investments are needed. For example, residential properties continue to be at risk due to wildfire, and additional investment in defensible space and vegetation management related policies and their enforcement will not only protect individual homeowners and their investments, but will ensure the health, safety, and wellbeing of residents across the Town. Finding the balance between regulatory methods and incentives in a variety of strategic areas will be critical as the Town weighs what options it has to enhance resilience. In many cases, these efforts will require a multi-pronged approach. Additional policy and planning investments include: ensuring all current and future Town plan updates include consideration of climate change; convening working groups and workshops focused on climate resilience policies and planning that bridge local and regional government and department silos; and investing in drought contingency planning efforts.

- **Communities of Concern** - Climate change impacts community members differently based on a variety of demographic and social factors. In addition to identifying social vulnerability factors that make some community members more vulnerable to the impacts of climate change, this Plan defined specific considerations that need to be addressed or considered for each strategy regarding Communities of Concern. These climate justice, equity, diversity, and inclusion practices will require ongoing attention and investment. For example, operationalizing unique, equitable, and innovative approaches to ensuring that all community members have access to the resources, tools, and training they need to evacuate safely in case of a wildfire is critical. Other strategies indicate the responsibility of Town staff and partners to meet communities where they are, identify barriers to engagement, and translate materials into several languages to provide opportunities for all community members to engage. In addition, the Town should critically identify how and if future investments may impact communities or neighborhoods differently based on demographic and social factors. Utilizing justice, equity, diversity, and inclusion assessments, criterion, and tools, developed as best practices across the region, state, and nation are essential to ensuring that these approaches truly enhance the resilience of all community members.

- **Education** - A central strategy theme identified in the Plan is focused on community education. This ranges from collaborating with partners on wildfire risk reduction education efforts to communicating effectively about the need to invest now in meaningful ways for changes that are expected to come. While climate experts acknowledge the role that humans play in contributing to climate change by emitting greenhouse gasses and can accurately quantify the impacts of continued inaction, many communities still face mis- and disinformation about what comes next. Bridging this gap requires continued engagement and outreach from Town staff and partners. Navigating the challenges of balancing investments and considering tradeoffs, requires information, community champions, and hard conversations. Some strategies in the Plan utilize regulatory measures and enforcement to create action. In other cases, incentives and education initiatives will be required. Enhancing the resilience of the Town will require taking a multi-faceted approach.

Implementing, monitoring, and evaluating the success of these actions will require ongoing collaboration between and among Town and County departments, agencies, and organizations, as well as with other municipalities. It will also require that the Town monitor and act quickly as funding opportunities become available at the regional, state, and national levels.

While addressing the climate crisis can be a daunting task, there is no doubt that the Town of Windsor not only understands those challenges, but is committed to putting in the time, effort, and investments necessary to invest in the community. By completing this Plan, the Town and the community have taken a significant and important step in the journey to build resilience. As the community and Town leadership makes progress reviewing, refining, and implementing resilience actions, the community can ensure that no one is left behind and the Town continues to be a healthy, vibrant, and thriving community for decades to come.

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COMMUNITY VULNERABILITY ASSESSMENT

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The Climate Change Consensus

The Town of Windsor is on the front lines of dealing with the impacts of the climate crisis. Wildfires are becoming hotter, more frequent, more severe, and more deadly.[1] In addition, extreme rainfall and associated flooding, prolonged periods of drought and extreme heat, and impacts to people as well as the human and natural environments are likely to get worse. All of these extreme weather events affect local and regional transportation systems, evacuation and emergency response plans, and the health and vitality of our community.

General Climate Science and Projections

Human activity, such as burning fossil fuels, is emitting greenhouse gases (GHGs) - primarily carbon dioxide and methane - into the atmosphere and warming Earth's surface and the oceans. This warming is caused by the GHGs that build up in the atmosphere and absorb sunlight and solar radiation that bounces off the Earth's surface. Normally, this radiation would escape back into space, but these gases trap heat and warm the Earth's surface much like a blanket traps heat and warms someone when they are sleeping; this is what's known as the greenhouse effect.[2] The average warming of the Earth brings more energy into the total climate system causing changes in patterns and increased variation at a local and regional level. The impacts of this warming and of climate change are being felt and observed across the globe, but the specific impacts vary regionally due to a multitude of factors.

Climate is the long-term average of weather over a given area; whereas *weather* is what is happening in the atmosphere at a given place and time. For example: in Windsor, the temperature and amount of rain on a given day is the weather, while the average temperature and precipitation in December (typically over a 30-year span) is the climate. Climate can be calculated across different spatial scales: globally, regionally, and locally. Each scale is useful for understanding different components of the climate system.

The exact amount of greenhouse gasses the world will emit over the next century is unknown, so scientists have to create climate change projections using several different scenarios based on plausible societal responses to climate change and other factors. The multiple emissions scenarios describe future trajectories of GHG emissions that capture the relationship between human decisions, global population growth, economic development, technological advancement, and global temperature change throughout the 21st century.

There are standard scenarios used across the scientific climate modeling community. Most recent emissions scenarios are the Representative Concentration Pathways (RCPs) created in 2010. The different scenarios are related to emissions trajectories until 2100 and are named based on the increase in radiative forcing, or the climate "warming influence", in watts per square meter on the Earth's surface at the end of the century. The scenarios are bounded by RCP 2.6, a stringent mitigation scenario that achieves net negative emissions by the end of the century and RCP 8.5, a higher-end scenario with no effort to constrain current emissions trajectories (Figure 1). RCP 2.6

[1] Bedsworth et al. (2018)
[2] Rosen (2021)

is representative of a scenario that would keep the average global warming to below 3.6°F (2°C) above pre-industrial temperatures and is extremely unlikely given current emission levels and lack of global political will to take action on climate change. The RCP 8.5 scenario corresponds to a future where carbon dioxide and other GHGs continue to rise over the rest of the century.[3] Average temperature is likely to increase by at least 3.6°F (2°C) under RCP 8.5 and lead to substantial warming across the planet and especially in the Arctic and northern latitudes. This warming is likely to cause rapid and extensive melting of glaciers and land ice, with global implications and consequences. The current emissions trajectory more closely follows RCP 8.5, so climate exposures and projections throughout this work will be based on RCP 8.5, with other scenarios offered to illustrate the range of potential future conditions.

It is important to take action to reduce emissions and limit the long-term impacts of climate change. The more emissions are reduced (globally), the less severe climate change exposures will be over the long term. So, while reduction of greenhouse gas emissions is important and it is still possible that the world will take action to limit the worst impacts of climate change, that is not the direct focus of this project. Mitigation (actions that reduce greenhouse gas emissions) and adaptation (actions that reduce the impacts of climate change) should be undertaken simultaneously and do have areas of intersection.

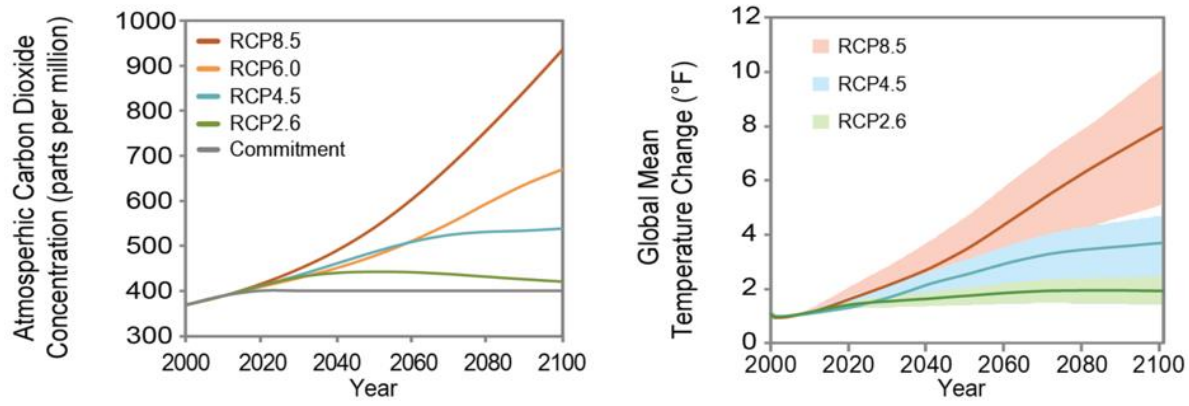


Figure 1. Future scenarios of global atmospheric concentrations of carbon dioxide and global temperature. Future scenarios of atmospheric carbon dioxide concentrations (left) and global temperature change (right) resulting from several different emissions pathways, called Representative Concentration Pathways (RCPs), which are considered in the fourth and most recent National Climate Assessment (Source: https://science2017.globalchange.gov/chapter/4/).

[3] Hayhoe et al. (2017)

SCALES OF ANALYSIS

Climate projections can be analyzed at multiple scale, and the appropriate scale depends on the climate exposure and the particular topographical and geographical features of the surrounding environment. When climate models are produced, climate scientists divide the area of study into a grid, and the model produces point estimates for each individual cell within that grid. These outputs can then be visualized on a map. In climate model projections, for any given snapshot in time, each grid cell is represented by a single value for the climate variable of interest (e.g., temperature, precipitation). Most global climate models are made of very large grid cells, from 100 to 600 square kilometer (about 38 to 230 square miles; for reference, Windsor's municipal area is ~7 square miles). This scale is useful when scientists study the global climate patterns or run complex global models, but it is not useful when trying to understand impacts on a more localized scale. In order to create finer-scale models for localized projections, scientists use various techniques to "downscale" global models. The data used in this climate analysis is taken from Cal-Adapt and downscaled to about a 6-kilometer resolution.[4]

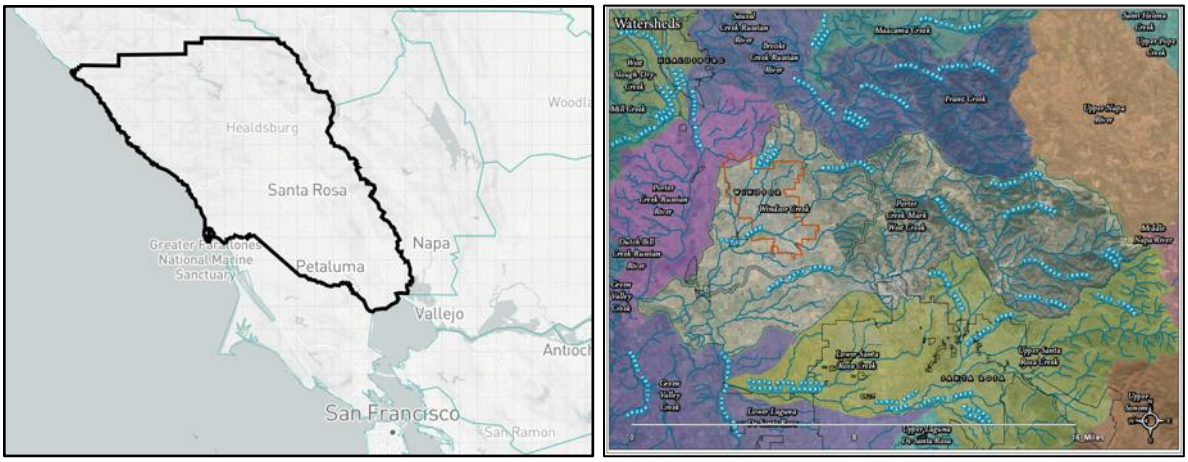


Figure 2. Map of different climate projection scales of analyses. The map on the left shows the Sonoma County boundary, which is used as the geographic scale for temperature and precipitation projections for Windsor (summaries provided through CalAdapt). The map on the right shows the outline of Mark West Creek Watershed (neutral color), one of the many watersheds around Windsor that have an impact on the Town (boundaries show in orange) and that can be used to discuss projected changes in other climate hazards such as flooding and wildfire. Map sources: CalAdapt (left), USGS National Hydrographic Dataset HUC12 designations hosted by the State of California (right).

While "downscaling" can help to analyze more localized climate projections, the spatial extent of the areas analyzed matter when considering particular climate exposures. The primary climate exposures, such as temperature and precipitation, can be averaged across the county-level to provide a more accurate representation of the projected changes for Windsor over the rest of the century. However, secondary exposure such as wildfire and flooding require a different - and larger - spatial extent due to topographical and landscape features (such as the watershed boundaries) that impact different environmental processes. While Sonoma County extends from

[4] Cal-Adapt (2018)

the ocean in the west and the valleys and mountains in the east, the county-level average for temperature and precipitation can still provide useful information on projected changes in magnitude of these climate drivers for the Town of Windsor.

EXTREME TEMPERATURES (HISTORICAL AND PROJECTIONS)

We all know that temperatures in Windsor vary daily and seasonally. Summers are warm (sometimes hot), winters are chilly (but rarely freeze). Historical average annual maximum temperatures for the Town of Windsor (modeled historical baseline 1961-1990) were 72.6 °F (range 72.2 °F - 72.9 °F), with most years seeing fewer than 10 extreme heat days (where temperatures rose above 100.5 °F) per year.[5]

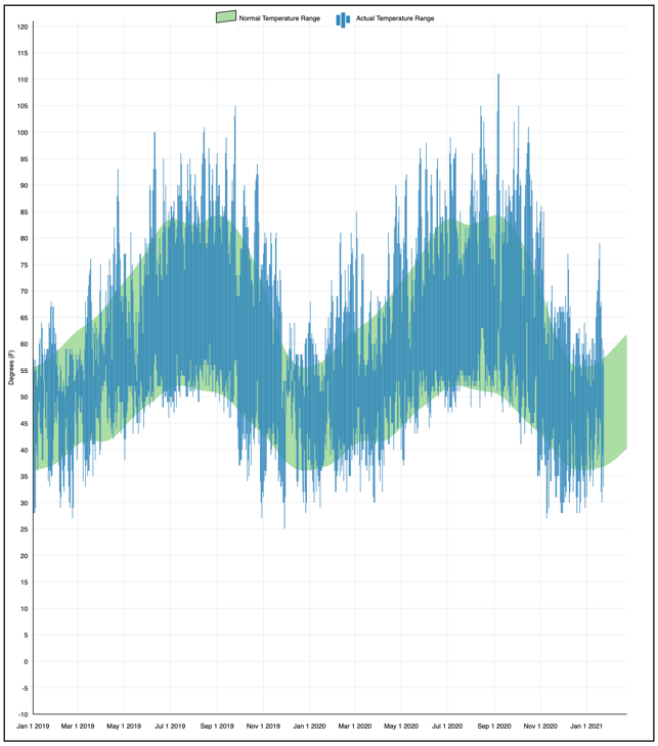


Figure 3. Graph of observed daily temperature for Santa Rosa over the last two year. Daily temperatures from the Santa Rosa Weather Station (# USW00023213) shown in the green shaded area. Actual daily temperature range for the last two years (Jan 2019-Jan 2021) shown in the blue bars. Temperature (in Fahrenheit) is listed on the vertical axis from -10 degrees to 120 degrees, and dates are listed on the horizontal axis from January 1, 2019 through January 1, 2021. Data provided by the U.S. Climate Explorer - https://crt-climate-explorer.nemac.org - Accessed January 24, 2021

The climate is changing; temperatures are increasing, and precipitation patterns are changing. Average annual maximum temperatures in the Bay Area region have increased 1.7 °F from 1950 through 2005 and are projected to continue to increase.[6] Using the RCP 4.5 and RCP 8.5 climate scenarios, average annual maximum temperatures in Windsor are projected to increase 3.3 °F *(RCP 4.5 average*) to 4.1 °F *(RCP 8.5 average)* by the mid-century *(2035-2065)* and 4.1 °F *(RCP 4.5 average)* to 7.2 °F *(RCP 8.5 average)* by the end of the century (2070-2099). In Sonoma

[5] Cal-Adapt (2018)
[6] Ackerly et al. (2018)

County as a whole, similar changes are projected, with average annual maximum temperatures expected to increase between 3.2 °F *(RCP 4.5)* and 3.9 °F *(RCP 8.5)* by mid-century and 4.2 °F to 7 °F (depending on the greenhouse gas scenario) by 2100.

Average annual maximum temperatures in the Bay Area region have increased 1.7 °F from 1950 through 2005 and are projected to continue to increase.

As part of this broader trend of increasing annual average maximum temperatures, the number of extremely hot days in a year is also projected to increase, with the potential to increase to up to three weeks per year under a high-emissions scenario by the end of the century. For this analysis, a daily temperature over 93.9 °F is considered an extreme heat day for Sonoma County.[7]

Table 1. Changes in Temperature. Average historical (modeled) and projected changes in average annual maximum temperature and average number of extreme heat days a year (above 93.9 Degrees Fahrenheit) for Sonoma County. Projected increases are for the higher future scenario (RCP 8.5) for both the mid-century (2034-2064) and the late-century (2070-2099) (Source: Cal-Adapt.org).

Changes in Temperature in Sonoma County					
	Historical[8] (1961-1990)	Mid-century (2035-2064)[9]		Late-century (2070-2099)[10]	
		RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Average Annual Maximum Temperature	69.2°F	+ 3.2°F	+ 3.9°F	+ 4.2°F	+ 7.0°F
Warm Nights (nights where temperatures do not fall below 55.4 °F)	4 nights/year	24 nights/year	32 nights/year	34 nights/year	74 nights/year
Extreme Heat Days per Year (above 93.9 °F)	4 days/year	10 days/year	12 days/year	13 days/year	23 days/year

Similarly dramatic increases are also projected under both scenarios for the number of warm nights, in which temperatures overnight do not fall below 55.4 °F. Under RCP 4.5, the county as a whole may see 20 additional warm nights by mid-century, and by late century, an additional 30 warm nights. Under RCP 8.5, mid-century warm night occurrence may increase by 28 nights per year, and by 70 nights per year at the end of the century. Likewise, the Greater Windsor area - whose vineyards rely upon night-time cooling - will likely see a similar trend. What all of this amounts to is a town, valley, and county whose climate is notably warmer.

[7] For purposes of this analysis, an extreme heat day or warm night is defined as a day in a year when the daily maximum/minimum temperature exceeds the 98th historical percentile of daily maximum/minimum temperatures based on observed historical data from 1961–1990 between April and October. (Source: Cal-Adapt)

[8] The historical baseline (1961-1990) average is chosen to represent a period in which the majority of California's critical infrastructure was developed. This 30-year period represents the period in which anthropogenic climate change signals were beginning to be felt and can be used as a standard baseline to discuss future projections. Thirty years is the traditional length of record used in climatological studies and is considered the minimum number of years needed to characterize a regional climate and for applying statistical tests. (Source: Cal-Adapt)

[9] This mid-century projection (2035-2064) is calculated using a 30-year projected average centered around the middle of the 21st century (2050). This period is selected to be coincident with the timelines developed for the Fourth National Climate Assessment. (Source: Cal-Adapt)

[10] This late-century projection (2070-2099) is calculated using the average of the last 30 years of the 21st century and is centered around 2085. This period is chosen to be coincident with the timelines developed for the Fourth National Climate Assessment. (Source: Cal-Adapt)

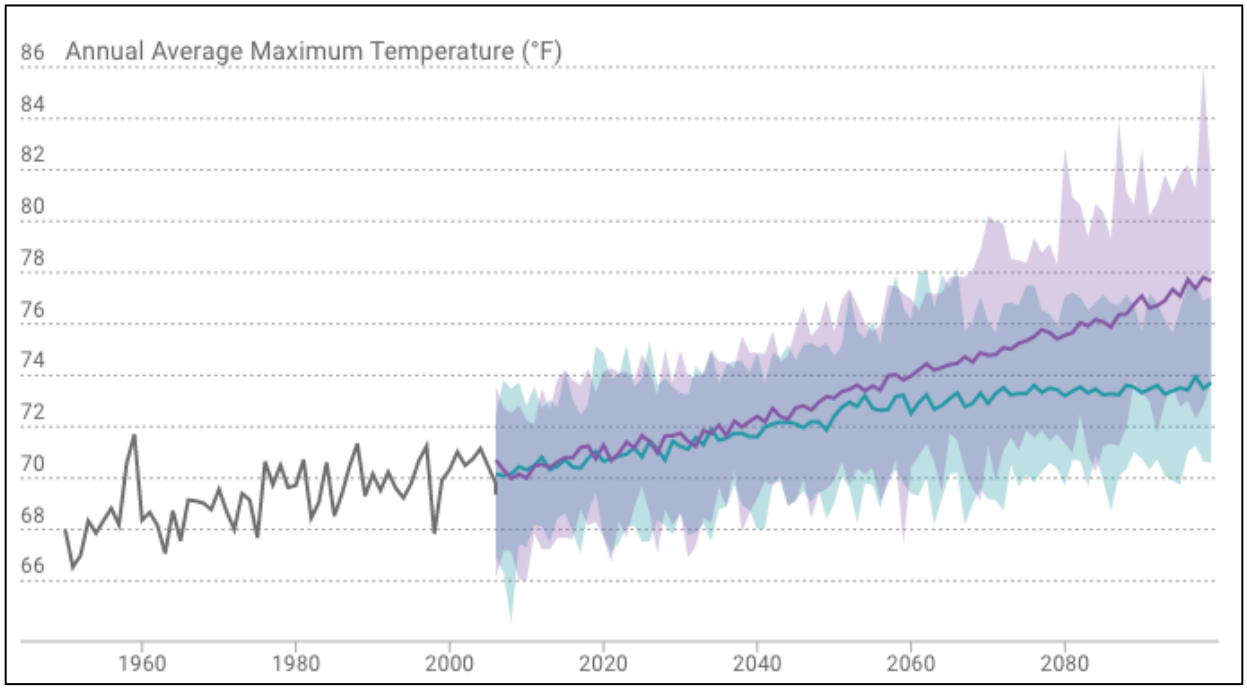


Figure 4. Graph of annual average maximum temperature for Sonoma County. Observed temperatures are shown in the dark grey line and show an increasing trend from 1950-2005. Future projections for two different emissions scenarios are shown in the colored lines and shading. A medium emissions scenario (RCP 4.5) is shown in teal, while a high emissions scenario (RCP 8.5) is shown in purple. Both scenarios show significant warming over the course of the century and there is very little difference between the scenarios through the 2050s, after which they start to diverge.

EXTREME PRECIPITATION (HISTORICAL AND PROJECTIONS)

Windsor is no stranger to highly variable precipitation patterns with extremely wet years and extremely dry years. In fact, the last two years are perhaps the perfect example of this swing from wet to dry. 2019 was extremely wet with large amounts of rainfall in the spring and early winter with a total accumulation of nearly 52 inches of precipitation. 2020 was very dry with only slightly more than 10 inches of precipitation over the course of the year. Both years show little or no precipitation between May and November.

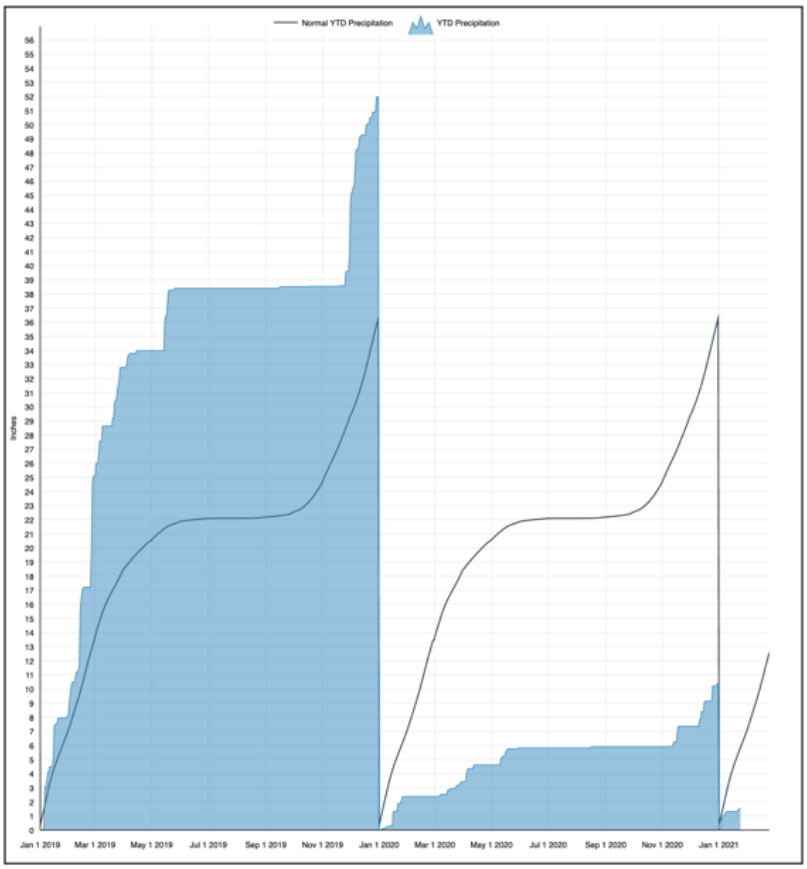


Figure 5. Graph of daily and accumulated precipitation for Santa Rosa weather station. Daily and accumulated precipitation for 2019 and 2020. The long-term average water year accumulation curve is shown in the dark blue curve. Observed precipitation from the Santa Rosa Weather Station (# USW00023213) shown in the blue shaded area. 2019 was extremely wet with large amounts of rainfall in the spring and early winter with a total accumulation of nearly 52 inches of precipitation. 2020 was very dry with only slightly more than 10 inches of precipitation over the course of the year. Both years show little or no precipitation between May and November. Data provided by the U.S. Climate Explorer - https://crt-climate-explorer.nemac.org - Accessed January 25, 2021

Research suggests that these cycles of wet and dry years will continue for much of the State of California.[11] While overall average annual precipitation may remain fairly constant, there will likely not only be a continuation of the wet/dry cycle, but there will be more intense storms and more precipitation will come in a shorter rainy period. Precipitation in the Bay Area will continue to exhibit high year-to-year variability - "booms and busts" - with very wet and very dry years.[12] This "boom and bust" cycle is readily apparent in the precipitation records from the Santa Rosa station over the last decade. The middle part of the 2010s (2013-2015) saw three generally low water years in a row, followed by four years with average or above average precipitation.

[11] Cal-Adapt (2018)
[12] Bedsworth et al. (2018)

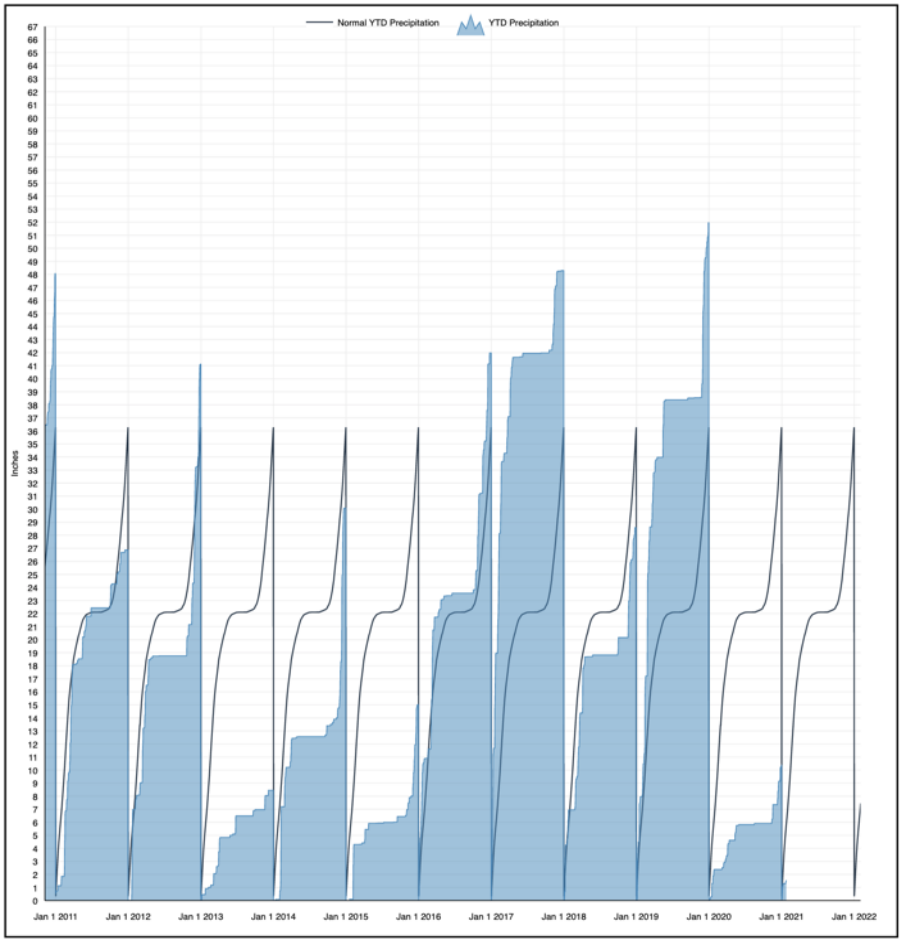


Figure 6. Graph of accumulated precipitation for Santa Rosa weather station (past 10 years). Accumulated precipitation for January 2011 through January 2021. The long-term average water year accumulation curve is shown in the dark blue curve each year. Observed precipitation from the Santa Rosa Weather Station (# USW00023213) is shown in the blue shaded area. 2013-2015 was extremely dry with only 2014 approaching average precipitation. 2016, 2017, and 2019 had significantly higher than average precipitation with 2018 only slightly below average. Data provided by the U.S. Climate Explorer - https://crt-climate-explorer.nemac.org - Accessed January 25, 2021

It is possible to see these highs and lows of precipitation in the overall average annual precipitation values for the last 50 years. The 30-year average (1961-1990) is 37.7 inches with lows of about 10 inches a year and highs of more than 80 inches a year. Rainfall is the most variable factor in climate models and projections for Sonoma County and the broader North Bay region. This wide variation in modeled rainfall projections is the greatest source of uncertainty in projected future conditions.[13] Climate projections show very little change in average precipitation over the course of the century, though there is likely to continue to be a high amount of variability and a continuation of wet years and dry years.

[13] Sonoma Water County Agency (2015)

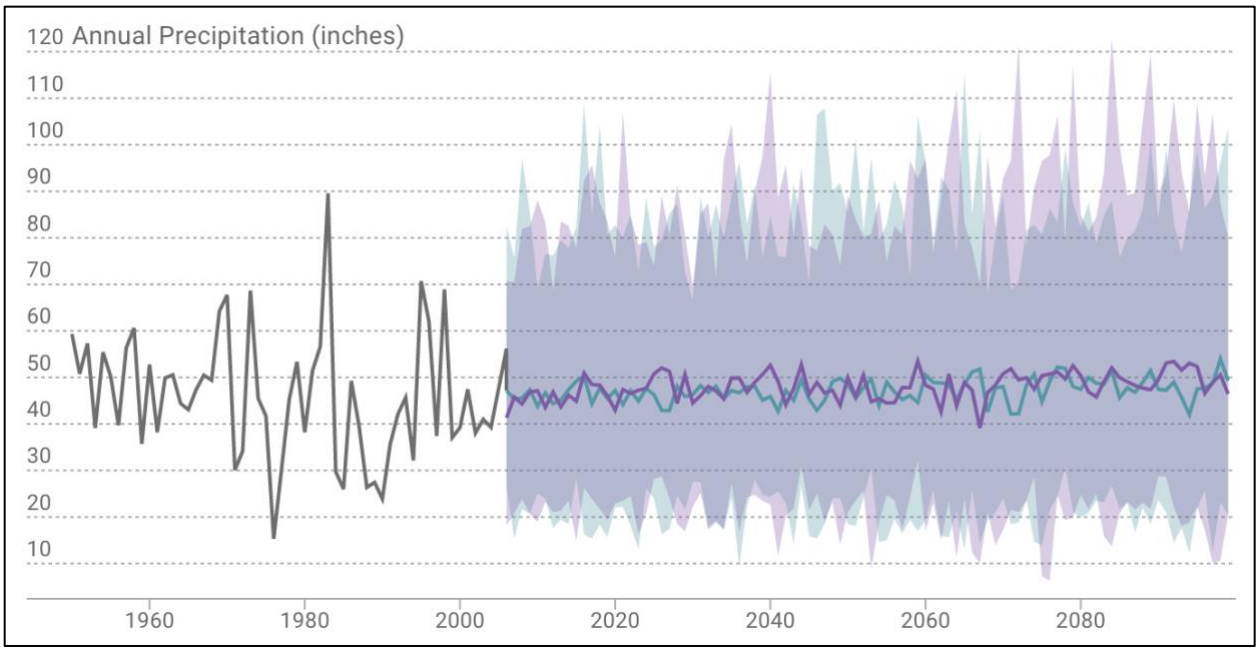


Figure 7. Graph of annual average precipitation observations and projections for Sonoma County. Average annual precipitation for Sonoma County shown in inches. The 30-year average (1961-1990) is 37.7 inches with lows of about 10 inches a year and highs of more than 80 inches a year. Observed annual precipitation is shown in the dark grey line. Future projected annual precipitation for two different emissions scenarios is shown in the colored lines and shading. A medium emissions scenario (RCP 4.5) is shown in teal, while a high emissions scenario (RCP 8.5) is shown in purple. Both scenarios show very little change in average precipitation over the course of the century, though there is likely to continue to be a high amount of variability and a continuation of wet years and dry years.

Table 2. Changes in Precipitation. Changes in average annual precipitation for Sonoma County based on modeled historical observations and future projections for 2050 (2035-2064) and the 2080s (2070-2099) under the RCP 4.5 and RCP 8.5 scenarios.

Changes in Precipitation in Sonoma County					
	Historical (1961-1990)	Mid-century (2035-2064)		Late-century (2070-2099)	
		RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Average Annual	46.2 inches	+ 0.7 inches (+ 1.5 %)	+ 1.6 in (+ 3.5 %)	+ 1.9 inches (+ 4.1 %)	+ 3.7 inches (+ 8.0 %)
Dry Spells	99 Days	+ 5 days	+ 8 days	+ 6 days	+ 10 days
Max 1-Day	3.02 inches	3.24 inches (+ 7.3%)	3.31 inches (+ 9.6%)	3.34 inches (+ 10.6%)	3.60 inches (+ 19.2%)

Another way to look at this boom-and-bust cycle of rainfall is to look at extreme precipitation events and dry spells. It is difficult to project changes to extreme precipitation events. Scientists do know that a warmer climate holds more moisture, and it is likely that extreme precipitation events will increase as the climate warms. For Windsor, the extreme (1% annual chance) 1-day rainfall event brings 2.66 inches of rain[14]. It is unclear from the climate projections whether the

[14] Cal-Adapt (2018)

intensity of these events will increase, but projections do show that they will likely become more frequent. The specific impacts of a given extreme precipitation event will depend largely on where exactly precipitation falls and when, it does highlight the fact that increased atmospheric water holding capacity will in turn lead to the potential for more dramatic precipitation events, which in turn may yield more dramatic and destructive outcomes for people living on the ground.

Climate projections show very little change in average precipitation over the course of the century, though there is likely to continue to be a high amount of variability and a continuation of wet years and dry years.

At the same time as dynamics surrounding extreme precipitation events transform, seasonal precipitation patterns in the region are also likely to change. In both Sonoma County and Windsor, summers are typically very dry, with more than 111 days a year in a row with less than measurable precipitation (< 1 mm of precipitation a day). The length of those dry spells is projected to increase as the climate warms. Expanding by about a week by the middle of the century and on average an additional 9 days by the end of the century[15]. At the same time, these dry spells will be characterized by increasingly hot days and nights, further heightening the intensity of the region's dry summer seasons. As a result, while overall annual precipitation will likely remain similar or even increase, combination of longer dry spells, higher temperatures, and other factors will accelerate evaporation as well as transpiration from plants, resulting in less surface water and drier soils which can affect both agriculture and the functioning of natural ecosystems in the region.

[15] Cal-Adapt (2018)

Vulnerability Assessment

Background and Overview

As the climate continues to change, there are four main climate hazards that will likely affect Windsor: wildfire, flooding, drought, and extreme heat. All of these hazards are discussed and addressed in the Sonoma County Hazard Mitigation Plan[16] and annex for the Town of Windsor[17]. While many of the same findings and discussion occur in this chapter of the Resilience Plan, this plan provides additional perspective on the Town's vulnerability to these hazards particularly in light of changing climate conditions. Each of these hazards has the potential to impact people, buildings, infrastructure, natural systems, and the economy in different (as well as compounding) ways. Some hazards can create immediate threats to human health and safety, whereas other hazards can be chronic and more slowly degrade quality of life, the built environment, natural systems, and aspects of Windsor's economy. All of these hazards have direct and indirect effects on the physical, emotional, and mental health of those affected. Understanding how these climate hazards have already impacted Windsor as well as how they are exacerbated due to climate change is an essential step in working to become a more resilient community in the face of a changing climate.

This Vulnerability Assessment outlines the different hazards facing the community and analyzes how people, buildings, infrastructure, natural systems, and the economy are affected by these hazards. By better understanding who and what will be affected in these hazards, the assessment can help the Town prioritize efforts that will most effectively and efficiently address Windsor's climate vulnerabilities.

[16] Sonoma County (PENDING). *Sonoma County Operational Area Hazard Mitigation Plan*
[17] Sonoma County (PENDING). *Sonoma County Operational Area Hazard Mitigation Plan*

Windsor's Climate Hazards & Concerns

Changes in temperature and precipitation are the main climate drivers to multiple climate hazards. The graphic below describes the main relationships between extreme temperatures and precipitation, the four climate hazards, additional considerations, and the subsequent impacts to Windsor's people, assets, and resources.

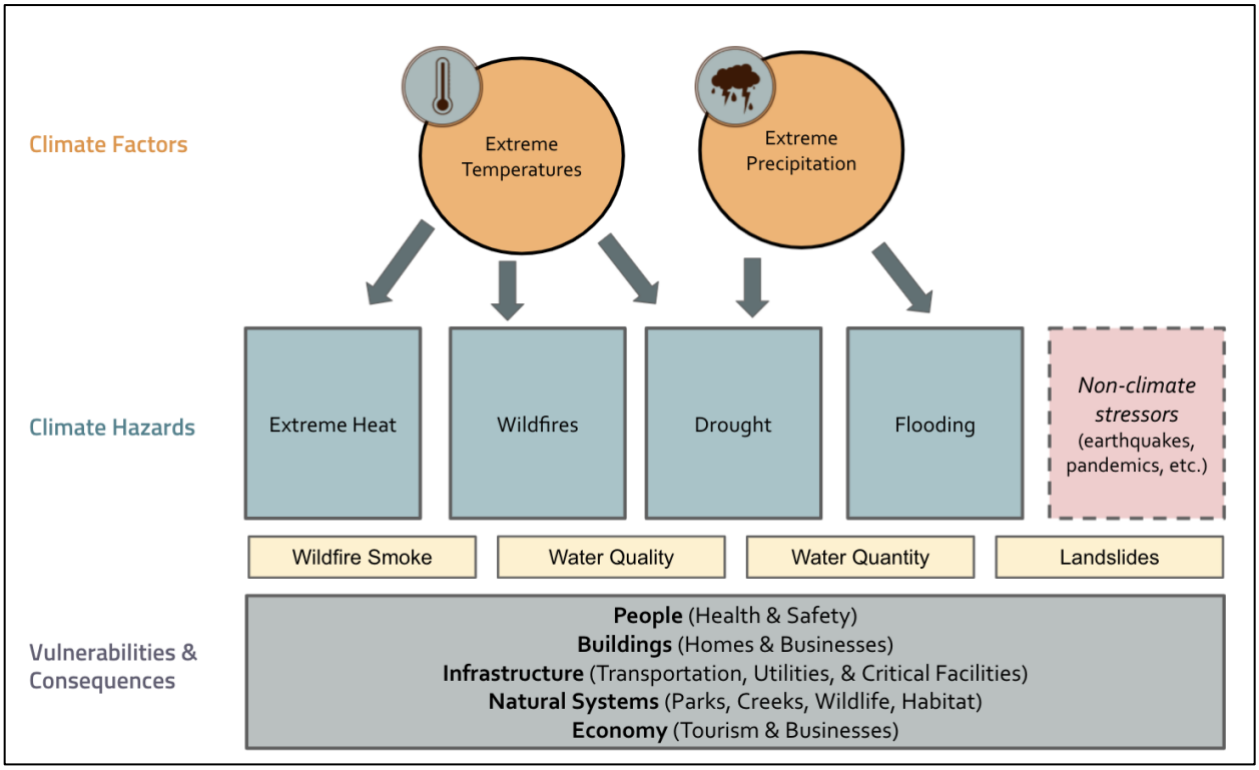


Figure 8. Relationship of climate factors, hazards, and vulnerabilities. A graphic representation of the relationships between climate factors (extreme temperatures and extreme precipitation), climate hazards (extreme heat, wildfires, drought, and flooding), and the vulnerabilities and consequences to assets for Windsor.

The methodologies used to analyze and discuss each hazard varies, due to the quality and scalability of the data available. In general, a climate hazard will be introduced and discussed in the context of historical, current, and projected exposure for the Town and surrounding region using the best available science and information. It is important to understand that climate hazards are interconnected and influence each other in complex ways, many of which are known but also in ways that are still somewhat uncertain. The following sections of this plan pull together and summarize the plethora of information from local and regional sources, ongoing projects and planning efforts, as well as additional analyses unique to this project.

WILDFIRE

Wildfire is a familiar current and present danger across the region and state. Climate change is exacerbating the frequency, intensity, and severity of wildfires in California,[18] yet fire suppression policies at different levels of government,[19] and the continued expansion of development into the Wildland Urban Interface (WUI)[20] are also increasing the risk of wildfires in the region. Local wildfires can threaten the lives and safety of residents, as well as buildings and other resources. Smoke from regional wildfires can affect daily life (especially for those with existing respiratory conditions) and stress residents, negatively affect natural resources, and impact the economy. The characteristics are changing, and areas outside the traditional WUI are vulnerable to ignition by ember cast and firestorms from wildfires burning miles away.

The wildfire assessment focuses on changing environmental conditions, shifting characteristics of wildfires and new ways of discussing wildfire risk for Windsor. This analysis focuses on human health and safety and discusses wildfire-specific evacuation vulnerabilities within the transportation network. This analysis does not go into detail on the vulnerabilities at a structure-level but does highlight particular sensitivities that make certain buildings and homes more vulnerable to ignition.

FLOODING

While flooding is the second most financially devastating hazard facing Californians,[21] it may not be a hazard that many residents think about or deal with frequently. However, as precipitation in the region becomes more and more "flashy" and variable, people and infrastructure within Windsor and the surrounding area are increasingly vulnerable to damage from fluvial (Russian River) and creek flooding. Traditional 100-year and 500-year flood events may become more frequent and cover areas that previously did not flood. Atmospheric river events can dump incredible amounts of precipitation in areas that can cause river and creek swelling or flooding that can lead to overtopping of critical roadways, reduced efficiency of utility infrastructure, and lead to standing water in low-lying neighborhoods. While flooding is generally temporary, impacts to the quality of Windsor's consumptive water resources can be much longer lasting and felt by many more people.

The flooding assessment highlights areas within the Town and the surrounding areas currently vulnerable during a 100-year and 500-year flooding event. Current flood maps, created by the Federal Emergency Management Agency (FEMA), use only historical data and do not incorporate projected change in precipitation amount, duration, or frequency; due to limited data, the scope of this assessment, and high levels of uncertainty in precipitation projections, the analysis of future impacts of climate change on flood vulnerability takes more of a qualitative approach to highlight areas and assets currently at risk and factors that may exacerbate flood risk under changing climatic conditions.

[18] Bedsworth et al. (2018)
[19] Plumer, B., & Schwartz, J. (2020)
[20] Pierre-Louis, K., & White, J. (2018)
[21] Taylor (2017)

EXTREME HEAT

Excessively warm temperatures and heat rank as one of the deadliest natural hazards, yet heat-related illnesses and deaths can be largely prevented.[22] Windsor "feels" the California heat differently, in that it is typically cooler than many other locations throughout the Bay Area and southern California; however, how humans and the natural world react to increased temperatures is all relative. Residents and native species have adapted to historical temperature ranges, yet the projected increase in annual and seasonal average can cause significant health stress on organisms at the top of their specific temperature thresholds. The number of excessively warm days in Windsor are expected to increase as are the frequency and duration of extreme heat events (back-to-back days of extreme heat). Although life-threatening impacts are preventable, it will take preparation and planning for Windsor to prevent significant impacts to people, natural systems, and critical infrastructure.

DROUGHT

Another all-too-familiar hazard for Windsor is drought. Longer and more pervasive droughts are projected for California with significant implications for natural resources.[23] Due to the characteristics of regional water dynamics, droughts occurring in areas outside of Windsor and Sonoma County can impact residents of Windsor - especially during extended and extreme periods of drought. The projected increasing temperatures and drying trend will likely lead to increased regional wildfire risk and exacerbate the frequency, duration, and severity of wildfires.

Assessing Vulnerability

Vulnerability to changing climate conditions and the associated extreme weather events of climate hazards is generally dependent on three key factors: climate exposure, sensitivity, and adaptive capacity.[24] Figure 11 depicts the relationships between climate exposure, sensitivity, adaptive capacity. When climate exposure and sensitivity interact, the potential impact of an asset, resource, or system will experience due to climate change is defined. When that combined potential impact interacts with an assets adaptive capacity, the relative vulnerability of the people, assets, resources, or systems of the Town are defined.

> ***Climate Exposure*** **-** Long-term changes to temperature and precipitation patterns along with the associated changes to extreme weather and climate related hazards (e.g., wildfires, extreme heat, drought, flooding).
>
> ***Sensitivity*** **-** The degree to which a key asset, resource, or system is affected by a climate exposure or hazard.
>
> ***Adaptive Capacity*** **-** The ability to adjust to potential impacts, take advantage of opportunities, and respond to extreme weather events and changing climate conditions.

Climate Change exposures and hazards discussed describe, and in some cases quantify, the climate and weather conditions that the Town currently faces and will need to be prepared to face

[22] California Climate Action Team (2013)
[23] Public Policy Institute of California (2021)
[24] California Adaptation Planning Guide (p. 282). (2020).

in the future. Since human systems are generally designed to meet the needs of the current environment, these future exposures and hazards may extend beyond the limits that our systems are prepared for or able to address. Intuitively, systems, assets, resources, or community members that are more sensitive to these exposures and less able to adapt will be more vulnerable to these changing conditions. Similarly, systems, assets, resources, or community members that are less sensitive or can adapt easily will be less vulnerable to these changes. Ultimately, relative climate related vulnerabilities can help determine and inform the allocation of funding and planning support to reduce those vulnerabilities. Since the Town has only a finite number of resources, budget, and staff time, the higher vulnerability items are ones that could be addressed first while lower vulnerability items could be addressed in the future. Thus, making strategic use of these investments to reduce vulnerability and enhance resilience.

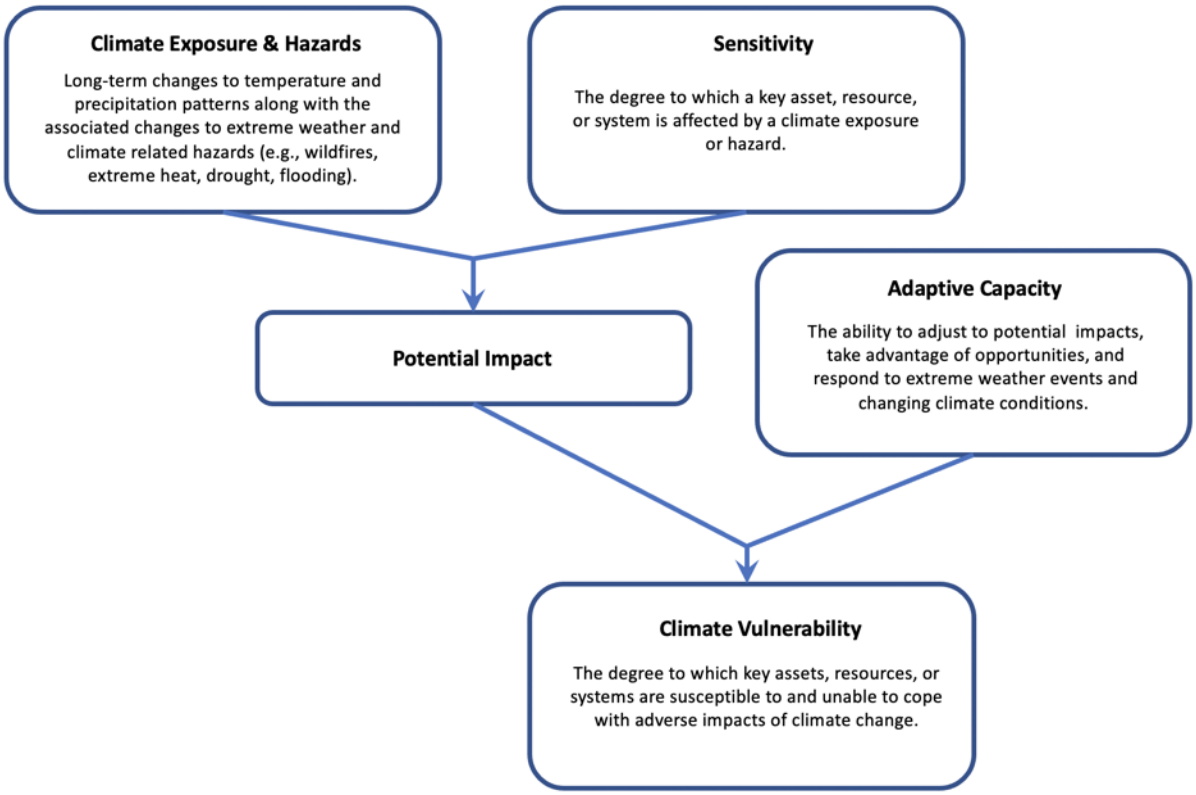


Figure 9. Definitions of climate exposures, sensitivity, adaptive capacity and climate vulnerability. Definitions and relationships of Climate Exposure, Sensitivity, and Adaptive Capacity, all of which contribute to climate vulnerability. Adapted from the California Adaptation Planning Guide, 2020.

Throughout the assessment, the project team considered the climate exposures and then assigned each main area of potential consequence a sensitivity and adaptive capacity ranking. These rankings ranged from low to very high on a five-point scale (0-4). Sensitivity rankings ranged from S0 (the component will not be affected by projected weather and climate conditions) to S4 (the component will be greatly affected by projected weather and climate conditions). Adaptive capacity can range from AC0 (the component is not able to adjust to projected weather and climate conditions) to AC4 (the component can adjust to projected weather and climate conditions in a beneficial way). These rankings were then combined to determine the overall

vulnerability of the area of consequence. Areas that are highly sensitive to extreme weather and climate events and had limited ability to adapt were highly vulnerable, while those that are less sensitive or had greater ability to adapt were less vulnerable.[25] The adaptive capacity ranking process and results are discussed in detail for each of the climate in the following sections.

Asset Categories

The Town looked at five main asset areas: people, buildings, infrastructure, natural systems, and the economy. A *consequence analysis* helps to illustrate to what extent people, buildings, infrastructure, natural systems, and the economy are projected to be affected by a hazard - or multiple hazards. Focusing on these areas makes it easier to better understand the range of depth of potential impacts that climate change will have on the community and identify the priority action areas where the Town and the community can focus to reduce climate related risk and enhance resilience. Within each category, the assessment identifies key areas of concern or differential vulnerability.

While analysis focuses mainly on the assets within the jurisdiction of the Town of Windsor, the people, places, and things that give the town character and provide resources for the community extend beyond the jurisdictional border of the Town. Because of this, some of the assets discussed include those that fall beyond the Windsor town boundaries and are considered to be within the "Greater Windsor" area. While this is not strictly defined, this is assumed to include hillside communities to the north and east in the Bald Hills and blow Chalk Mountain, the Windsor Airport and the surrounding industrial parks, agricultural and residential areas to the west between Windsor and the Russian River, and the various residential areas and critical connections just outside of the town's limits.

PEOPLE (HEALTH, SAFETY, AND WELLBEING)

Windsor prides itself on being a family-oriented community with a diverse population, small-town character, and welcoming atmosphere. The Town values cultural diversity and promotes opportunities for all residents to "share their unique heritage and engage in the life of the community".[26] Windsor is currently home to 28,248 residents (Windsor Annex to Sonoma County Hazard Mitigation Plan), representing approximately 5.73% of Sonoma County residents. The Windsor population is roughly 34% Hispanic, 57% European Ancestry, and 9% Black, Asian, Mixed-Race, or Native American. When compared to Sonoma County as a whole, the average Windsor household is more likely to own their own home, to have a higher household income, and to live in a slightly larger home.[27] English and Spanish are the primary languages spoken in Windsor.

Community health and wellbeing are a major focus of the Windsor 2040 General Plan, which facilitates healthy development by including and encouraging active design strategies that encourage stair climbing, walking, bicycling, transit use, active recreation, and healthy living for Windsor residents.[28]

[25] Data from the CA Department of Finance, Estimated population from January 1, 2020. Retrieved from https://scta.ca.gov/wp-content/uploads/2021/01/8.4-Measure-M-LSR-LBT-Annual-Allocation-Estimates.pdf
[26] Town of Windsor (2018b)
[27] Town of Windsor (2018a)
[28] Town of Windsor (2018b)

All of the climate hazards have the potential to affect all Windsor residents. However, decades of research on disasters and climate change have demonstrated that social factors such as individual characteristics (age, gender, existing medical challenges, etc.), social status, capacities, networks, and resource availability can lead to distinctly different outcomes.[29] These "Communities of Concern" often experience the first and worst impacts of the extreme weather events and other changing climate conditions. In order to better understand which portion of the Windsor community might be disproportionately affected by current and future climate hazards, this analysis includes a review of an array of socio-demographic and health indicators that have been demonstrated to have implications for impacts of these event, either by heightening sensitivity to hazards or by limiting the ability of these communities to proactively prepare or adapt after the hazards occur. **In this context, *social vulnerability* is the disproportionate sensitivity of some segment of the community or groups to the climate exposures or hazards.**

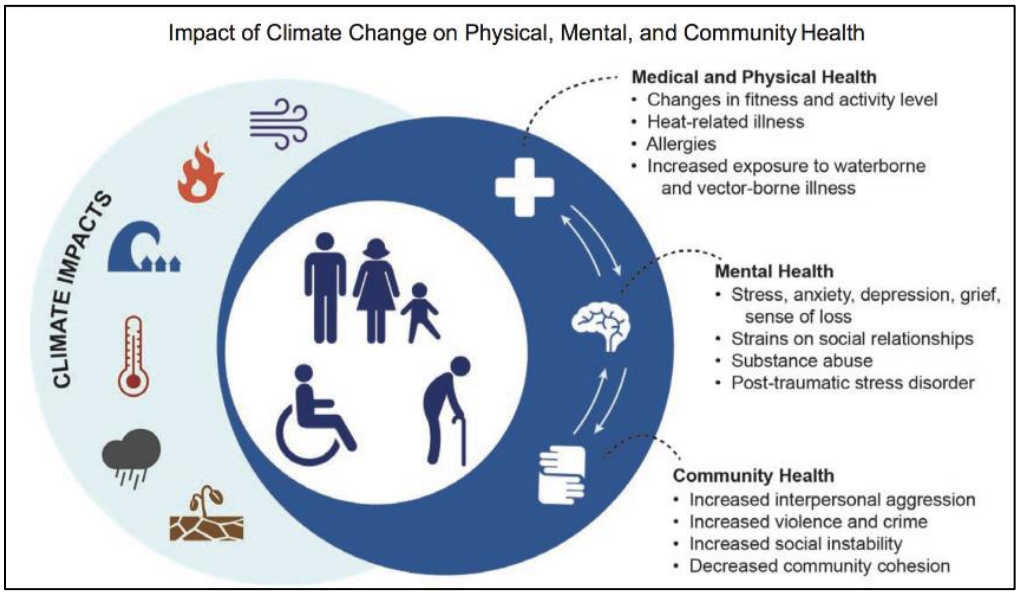


Figure 10. Impact of climate change on physical, mental, and community health. The myriad of health impacts from climate change. Source: https://www.psychiatry.org/patients-families/climate-change-and-mental-health-connections.

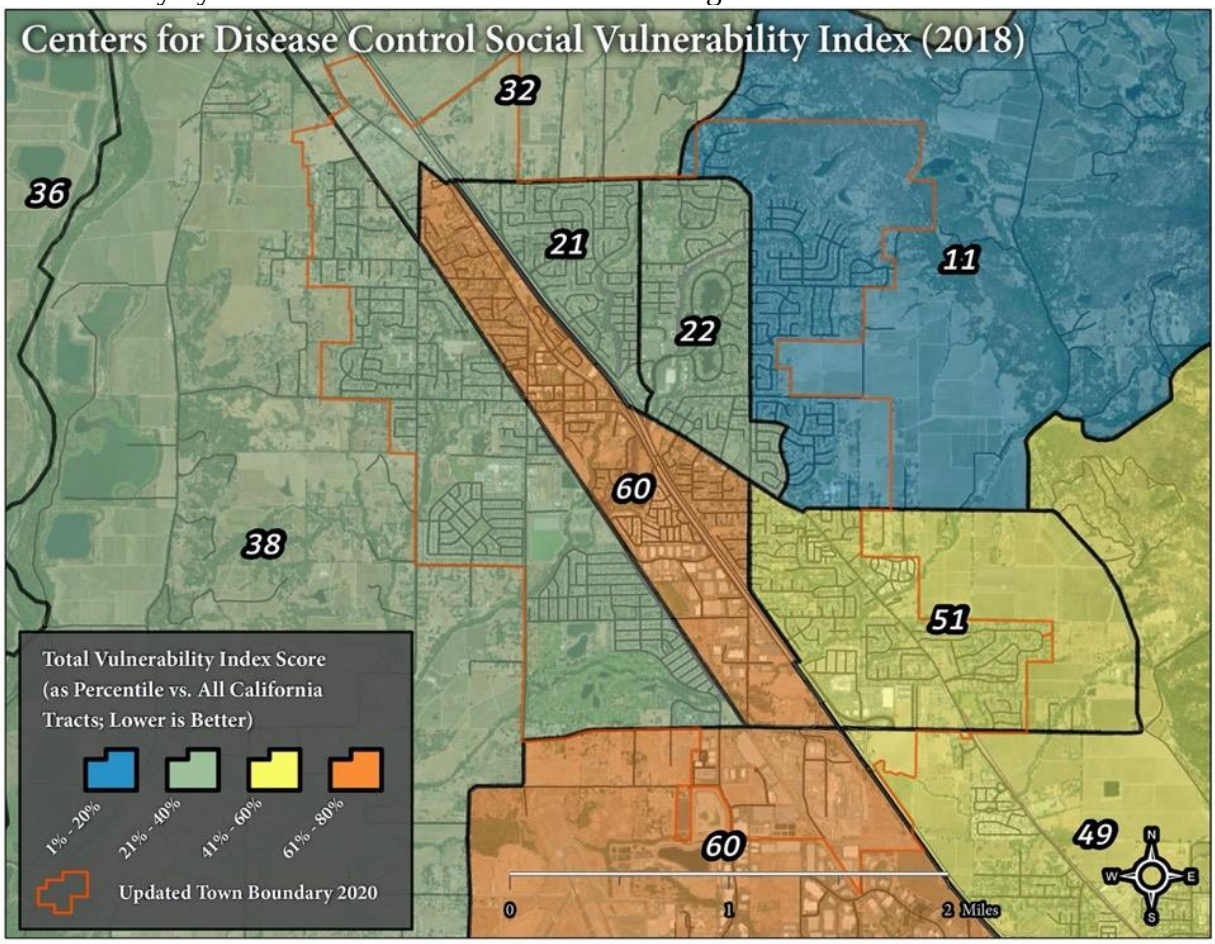
This analysis included examining factors that:

- Increase the likelihood of severe negative outcomes during and after hazard events, such as poverty, economic burdens associated with housing costs;
- Are known to result in disproportionate post-exposure impacts due to societal discrimination, disenfranchisement, and such as race, ethnicity, and linguistic isolation;
- Heighten the immediate negative impacts of certain hazards like smoke, e.g., asthma and cardiovascular disease;

[29] Cutter et al. (2009); Thomas et al. (2013); Fatemi et al. (2017); USGCRP (2016)

- Hinder or preclude the ability to evacuate quickly in the event of an emergency, such as physical disability, age, English as a second language, and a lack of automobile access; and
- Limit the ability of individuals to incorporate new information about risk into their daily lives and make appropriate adjustments at the household level.

The Centers for Disease Control and Prevention's Social Vulnerability Index[30] program, the State of California's CalEnviroscreen program,[31] the California Healthy Places Index, and Headwaters Economics Neighborhoods at Risk System[32] each utilize data gathered by the U.S. Census Bureau, Environmental Protection Agency, and other authoritative sources. These data are compiled and aggregated to identify those areas or segments of the community that are more likely to face social, political, economic, or cultural challenges to extreme weather events and changing climate conditions. While it is not possible to pinpoint the vulnerability of specific individuals or households, the composite indices highlight census tracts that are most likely to be home to individuals and households with heightened sensitivity to hazard and disaster events and that may be limited in their capacity to prepare for, respond to, recover from, and adapt to hazard exposures. These community members are the ones that are most likely going to be affected more intensely by hazards now and within a transforming climate and environment.



[30] ATSDR (2021)
[31] California Office of Environmental Health Hazard Assessment (2021)
[32] Headwaters Economics (2021)

Figure 11. Map of Social Vulnerability Index (SVI) for Windsor. Relative social vulnerability index scores for census tracts in Windsor using data compiled by the Centers for Disease Control and Prevention (CDC). This compilation of 15 factors that are known to affect the ability of households and individuals to prepare for and respond to extreme weather events. Percentile rankings are relative to other census tracts in California where higher numbers (and warmer colors) are more vulnerable, and lower numbers (cooler colors) are less vulnerable to these events.

The project team collected ranking scores and raw information compiled by the state and federal agencies and created maps of specific vulnerability indicator variables for Windsor census tracts to help understand which neighborhoods/subdivisions are most likely to be home to individuals and households with heightened sensitivity to hazard and disaster events. The relative social vulnerability index does not identify who lives in which areas but highlights generally conditions that make these areas more exposed, more sensitive, or less able to adapt to the climate hazards. Some of the key socio-economic and demographic factors that go into these indices are described below. More detailed information can be found in Appendix A.

OLDER ADULTS

People over the age of 65 are also more likely to have underlying health conditions or experience health and age-related issues that may heighten their sensitivity to specific climate-driven hazards such as smoke, post-flood mold, extreme heat, and interruptions to water and electric/gas supply. In Windsor, many neighborhoods exist with average ages much higher than the surrounding areas in the County, including both neighborhoods tailored to independent senior living as well as areas where assisted living facilities are located. Numerous home-based care facilities are also present within otherwise purely residential neighborhoods. In general, the east side of town shows higher proportions of persons over 65, as do the communities just east of Windsor in the surrounding forested hillsides.

CHILDREN

Young children and infants have higher metabolic rates, spend more time outdoors, and get dehydrated more easily which can make them more sensitive to hazards related to smoke inhalation and extreme heat. During the day, schools and other facilities that house large numbers of children (such as day care facilities) present unique challenges for emergency response planning and evacuation. People under the age of 16 are unable to legally drive in California and will generally require assistance from public services or family members during evacuation events. Children live in every part of Windsor, making up between 20% and 24% of its residents depending upon the specific area. The town's elementary-, middle-, and high school facilities are located outside of wildfire and flood risk areas for the most part but are near to both in all but a few cases.

LINGUISTIC ISOLATION (ENGLISH AS SECOND LANGUAGE/LIMITED ENGLISH PROFICIENCY)

Effective communication is critical to any preparation, response, recovery, or adaptation effort, and language differences can create a barrier to effective communication. Since most government communication during emergencies is conducted in English, understanding where community members have limited English proficiency or primarily speak Spanish (or other languages) can inform planning and interactions with these community members. In the central Windsor census tract along the 101 corridor, an estimated 1 in 10 people speak English less than well and may require additional assistance from interpreters or native language translations of

documents and public communications. Spanish is the second most spoken language in Windsor and the surrounding area, but others are likely as well.

PEOPLE OF COLOR

Historical legacies of racial discrimination, marginalization, and under-allocation of resources to communities of color have resulted in a constellation of factors that enhance these communities' experience of negative outcomes during both disaster processes and within the planning, preparation, and rebuilding efforts seen in many U.S. communities. Windsor is a multi-racial and multi-cultural community and is home mainly people of Caucasian ("white") and/or Hispanic/Latino descent with small populations of people with black, Native American, Asian American, and mixed-race heritages. Windsor, similar to Santa Rosa to the South, is made up of a notably more diverse cluster of communities than the largely rural and largely white Sonoma County area.

POVERTY AND ECONOMIC STRESS

Community members with lower incomes, living in poverty, or under economic stress are generally less able to invest in disaster preparedness and have fewer resources at their disposal to respond to climate hazards if/when they occur. Also, they are more likely to live in substandard housing that is less able to withstand extreme weather events or creates chronic stressors on the families in those situations. Residents living in Windsor 101 Corridor, Windsor Southwest, and Southeast Exurbs experience the highest rates of poverty and thus may be less likely to own an automobile and require additional mobility support during a climate emergency.

ACCESS TO AUTOMOBILE OR PERSONAL VEHICLE

People with limited or no access to a vehicle, either by choice or necessity, are more dependent on transit, if available, or friends, family, and private services to travel. While vehicle ownership in Windsor is generally high, lack of vehicle access can constrain mobility and limit access to key destinations.[33] While lower dependence on automobiles typically helps to reduce congestion, it is important to know where these residents live as they may need assistance evacuating during a disaster.

HEALTH CONDITIONS AND DISABILITY

Individuals suffering from cardiovascular and/or respiratory disease or stress, such as asthma and allergies, are more prone to experiencing complications from multiple environmental hazards, many of which are exacerbated by climate change. This population may need additional support during climate emergencies (especially evacuations or PSPS events) or extreme weather events. People with disabilities may be dependent on certain medical devices or need mobility assistance or help with transportation. This assessment considers the overall health and wellbeing of residents in the context of climate hazards and changing conditions, including general safety as well as characteristics of certain populations of residents that may make them more sensitive or less able to prepare for or adapt to climate hazards.

[33] Blumenberg, E., & Schouten, A. (2020)

BUILDINGS (RESIDENTIAL, COMMERCIAL, PUBLIC AND CRITICAL FACILITIES)

For this assessment, buildings are considered the built structures within the Town of Windsor and include homes, businesses, public facilities (such as schools), and critical facilities (such as hospitals and fire departments). The built environment for the Town is centered around the Highway 101 corridor and Old Redwood Highway.

RESIDENTIAL AND COMMERCIAL STRUCTURES

The primary land use in Windsor is single-family residential. Many older structures are residential buildings that range in architecture from raised, wood slat homes with front porches to concrete and plaster homes with aluminum windows and asphalt driveways.[34] The more modern residential subdivisions are visually distinct from the older residences yet vary in design, color scheme, size of structures, and type of building materials; however, they are all single family detached homes that are one or two stories. Schools and a park are typically associated with single family residential neighborhoods. Areas of higher density multi-family development are located in the Station Area/Downtown Specific Plan area. Larger single-family developments are planned for the northern area of Town, north of Arata Lane, that was annexed to the Town in 2019.[35] Known in the region as a great place to raise a family, and despite increasing housing prices due to a general shortage of housing within Sonoma County, Windsor remains an affordable community compared to others in the region. Commercial buildings are generally focused in the Town Green area and in smaller commercial centers throughout town. The larger regional-serving commercial areas are located in the southeast part of town, and current and planned industrial developments are located in the southwestern part of Windsor.

CRITICAL & PUBLIC FACILITIES (FIRE AND POLICE DEPARTMENTS, HOSPITALS, SCHOOLS, ETC.)

Critical and public facilities - defined broadly - include both those facilities that support important town functions and health systems operations as well as key social functions and services. These are buildings, structures, or recreational facilities, such as schools and hospitals and those that function as community gathering sites. According to the 2018 LHMP, Windsor has 10 educational facilities (including administration buildings) schools, 3 urgent care or general medical care facilities, 11 registered senior care and/or assisted living facilities, 1 government center, and 4 community gathering sites.

[34] Town of Windsor (2018b)
[35] Sonoma County (PENDING). *Sonoma County Operational Area Hazard Mitigation Plan*

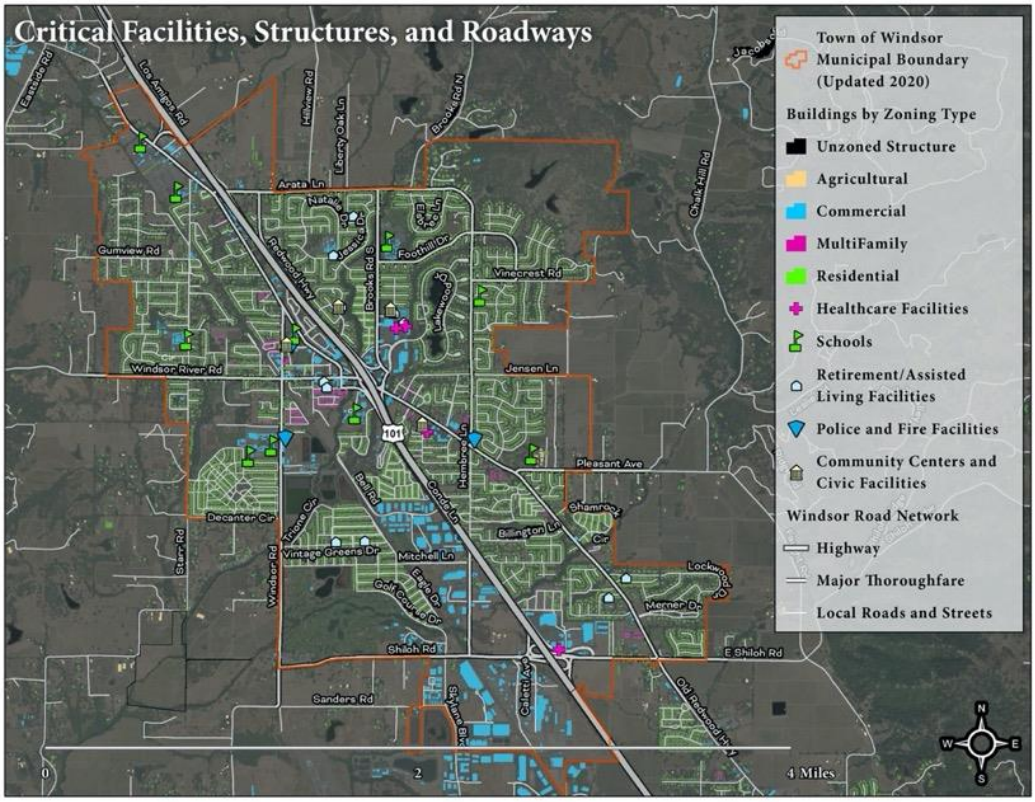


Figure 12. Town of Windsor map of Critical Facilities, Structures, and Roadways. Overview of building location and building type in Windsor. Colors highlight residential, multi-family, commercial, and agricultural buildings by land use zoning type. Symbols identify various critical facilities, such as healthcare facilities, retirement/assisted living facilities, schools, police and fire facilities, and other public facilities and centers. Zoning designations are based on Sonoma County Parcel information as of late 2021, with mobile home parks (zoned commercially) converted where possible to residential visualization for the purposes of clarity for risk evaluation.

Where possible, this assessment will provide mostly a quantitative analysis of the number and types of buildings in climate exposure zones. It will also qualitatively discuss the changing nature of some climate and weather-related risks and the implications of those changes on the built environment.

INFRASTRUCTURE (CRITICAL SYSTEMS AND TRANSPORTATION NETWORK)

Windsor's infrastructure consists of multi-modal transportation assets and networks that provide a vital public service to residents and impact a wide range of issues including the economy, environment, health, safety, and overall wellbeing for Town residents. These systems are complex, expensive, and involve a wide range of stakeholders (some infrastructure may or may not be owned and/or operated by the Town). For this assessment, infrastructure is defined as multi-modal transportation assets including roads, bridges, and transit, as well as electric utilities, natural gas, telecommunications, water, and wastewater infrastructure. Climate hazards and extreme events can damage and/or destroy Windsor's infrastructure and disrupt vital services for the town, potentially leading to additional risk to health and safety of Windsor residents.

WATER INFRASTRUCTURE

The Town sources the majority of its potable water locally and from surface water sources.[36] Most of its water comes from the Russian River and the remainder is purchased from Sonoma Water. Direct sources include the Russian River Well Field (aka "riverbank wells"), local (off-river) groundwater wells, Russian River surface withdrawals (via the Santa Rosa Aqueduct), and recycled water.[37] The Windsor Water District (WWD) service area includes the entire Town of Windsor as well as portions of the surrounding areas. The water distribution system includes 136.6 miles of polyvinyl chloride (PVC) pipes, four storage tanks in the primary pressure zone (and 12 storage tanks in smaller, higher elevation zones), five river wells and five off river wells.[38] The majority of the system has been installed within the last 25 years, is buried at a range of depths from 32 inches to over eight feet deep, and is generally in good condition. The Town also has a recycled water system supplying water for irrigation. Recent studies have looked at the available water supply and projected future demand with population growth and determined that with some continued investment in the system it will be able to meet future demand. Calculations were based on daily and peak water demand including flows necessary for fighting fires.

Water can be produced and purchased during PSPS events. The Russian River Well Field is equipped with an auxiliary power supply (500 KW generator), which allows the Town to operate three of the five wells during such an event. In addition, there are also stationary and portable generators to push water within the outside agreement areas of the Shiloh Estates and Mayacama water systems.

The community responded well to drought contingency measures in the past and residents currently use on average 109 gallons of water per day per person. Forecast demand is based on an estimated 120 gallons per day per person. The Water Master Plan did an initial look at potential increase in water use due to climate change and determined that indoor water use was unlikely to change. Water needed for irrigation may increase with warmer temperatures, but even with a 20% increase in irrigation demand, the system would have excess annual water supply. Planning for droughts is a continued need for the effective management of the system. In addition, members of the Technical Advisory Group for this project mentioned that the Well Field has come close to being impacted by high water levels due to flooding events.

ELECTRIC UTILITIES INFRASTRUCTURE

Electrical providers in the Town of Windsor include Pacific Gas and Electric (PG&E) and Sonoma Clean Power (SCP).[39] SCP - a public nonprofit electricity provider operated by Sonoma County - is the default electricity provider of Windsor residents, although residents do have the choice of receiving service from PG&E. PG&E is a for-profit investor-owned utility company which services a large portion of the State. Both electric utility companies purchase electricity from power plants located across the State of California and in the broader Western United States (there are no power plants located locally in Windsor). In 2018, around 34% of the State's electricity was generated by renewable energy sources. In 2021, around 31% of the electricity in the State is currently being generated by solar power alone.[40] Additional energy sources include

[36] Town of Windsor (2018a)
[37] Town of Windsor (2011)
[38] Town of Windsor (2019b)
[39] Town of Windsor (2018a)
[40] California Energy Commission (2021)

coal, nuclear, geothermal, liquefied natural gas, and other renewable energy sources (including wind, geothermal, solar, etc.).

The Town has been actively involved in installing solar photovoltaic power systems over the past decade including installations community centers and schools. Last year (2020) the Town installed and began operating a new 1.7 Megawatt floating solar power system at the Town's wastewater recycled water Pond 7. The array will provide power to the Windsor Wastewater Reclamation Facility, Public Works Corporation Yard, and the Geysers pump station, delivering about 90% of the water reclamation facilities' power needs, saving approximately $5 million dollars in energy costs over the next 25 years and reducing the Town's Greenhouse gas emissions by 350 metric tons a year.[41]

Two major electricity transmission lines - both owned by PG&E, and which connect distribution facilities in Santa Rosa and Healdsburg - service the Town of Windsor. In addition, Windsor's electricity is serviced by substations in Santa Rosa and Healdsburg as well as a substation on the north end of Town on Old Redwood Highway. All of the electric transmission lines that service the Town of Windsor are located above ground, while many neighborhoods have undergrounded lines. In addition, according to the Windsor General Plan and the Town's municipal code, all new electric utility distribution lines are required to be undergrounded.[42]

NATURAL GAS INFRASTRUCTURE

All of the Town of Windsor's local natural gas infrastructure is serviced by two high-capacity natural gas pipelines owned and operated by PG&E, Windsor's sole natural gas provider.[43] Both natural gas pipelines run through the middle of the Town, one running underneath the railroad tracks and another along Old Redwood Highway. At present, natural gas provides a significant portion of the power demands for the Town, but this reliance could present significant challenges if the pipelines are damaged.

TELECOMMUNICATIONS INFRASTRUCTURE

Telecommunications infrastructure includes all of the wires, cables, towers, satellites, and mobile network systems critical for supporting communication across the Town. There are a variety of services that provide internet, cellular, and landline services to homes in Windsor including AT&T, Comcast, Verizon, Frontier Communications, HughesNet, Dish Satellite, Sonic, and ViaSat.[44] Reliable, resilient, and redundant telecommunications infrastructure is critical to the health and safety of Windsor residents, particularly in the case of an evacuation.

TRANSPORTATION NETWORK

The transportation network for the Town is vital to the movement of people, goods, and services throughout the community and to/from the broader region. Broadly speaking, the transportation network includes roads, paths, trails, rail lines, and the airport. Within the Town boundaries this multi-modal network includes roadways, transit services, SMART rail services and a bicycle and pedestrian network that allows residents and visitors to walk, bike, take the bus or train, and

[41] Town of Windsor (2019a)
[42] Town of Windsor (2018b)
[43] Town of Windsor (2018a)
[44] Town of Windsor (2021c)

drive around Windsor. Transportation vulnerabilities will affect the community when failures of transportation assets impede movement of people and goods and services.

ROADWAY NETWORK

The roadway network is the foundation on which all multimodal travel options operate. The Town of Windsor is located along Highway 101, a six-lane, limited access highway that bisects the Town of Windsor and connects it to Santa Rosa (and ultimately San Francisco) to the South and Healdsburg to the North. Although alternate, country road routes are available, Highway 101 and the two complete interchanges at the center and southside of town provide access to critical jobs, cultural activities, medical services, and in-coming tourism, workers, and raw materials. Old Redwood Highway, a two-lane roadway, runs parallel to and connects many local roads to Highway 101, as well as providing a critical alternative route to the north and south when Highway 101 is closed, temporarily congested, or lower-speed routes are desired. Old Redwood Highway can also serve as a secondary evacuation route if necessary.

Laid out in mainly fused grid and curvilinear patterns ("cul de sac" style) cut roughly in two by Highway 101, the local main roadway network extends throughout the town and up into the hills both to the east and west, and provides access to residential areas, shops, community facilities, and services. Every day, roughly 35,000 vehicles travel through the two critical interchanges with 101 on the south-side (101 and Shiloh Rd.) and center of town (101 and Old Redwood Highway). This traffic is due to both the high densities of regional travelers, substantial commuter traffic, and the growing flows of on-demand delivery retail operations and the constant truck and commercial vehicle traffic required from regional distribution centers to the south. Like almost all of the cities in Sonoma County, Windsor is heavily dependent upon raw goods and services accessible only by these limited roadway connections, highlighting the need to resolve critical bottlenecks and challenges along the greater Highway 101 corridor.

Built largely from the 1970's onward, most local roadways are functional, but many are in need of repair and upgrades due to their age. With limited points of rapid egress available, critical pressure is constantly placed on just two key exchanges and the three cross-town roadways (Arata Ln., Old Redwood Highway, and Shiloh Rd.) that connect the east and west sides of town. Although bypass routes along Skylane Blvd. and Windsor Rd. provide connections to the south, these two-lane paved roadways are highly sensitive to congestion slowdown. Routes to the east over the mountains also exist (as well as a handful of 4x4-only accessible routes), but these too are both highly sensitive to obstruction and congestion due to their rugged and windy conditions.

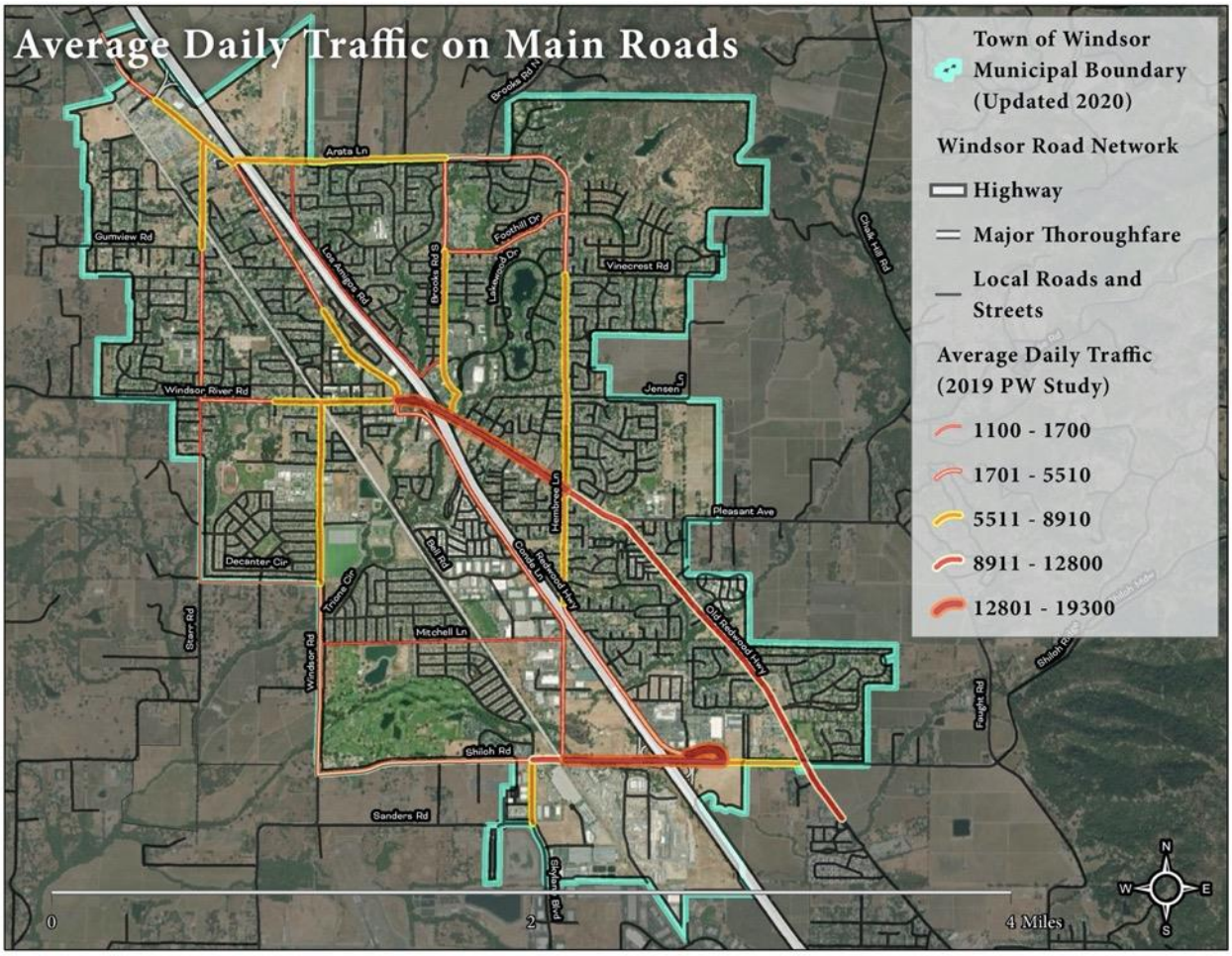


Figure 13. Town of Windsor map of road network and average daily traffic counts on main roadways. The Town of Windsor's Road Network shown with Average Daily traffic volumes. Traffic counts for local roads and streets not shown.

Windsor's current Local Hazard Mitigation Plan (LHMP) (2018) designates Highway 101 as the primary evacuation route and Old Redwood Highway as the primary surface street to support evacuations. The LHMP also identifies other potential evacuation routes that could support small-scale evacuations, including Windsor River Road, Starr Road, Hembree Lane, Conde Lane, and Shiloh Road. Neighborhood-level evacuation routes have recently been developed by the Town of Windsor to aid in the process of evacuation that delineate specific routes for residents and workers, as well.

LOCAL ACCESS AND NEIGHBORHOOD ROADS

Off the main network and highway are the streets, ways, courts, and lanes that terminate in the town's low-density residential neighborhoods and driveways, where the vast majority of Windsor's 28,000+ residents live and increasingly work, receive deliveries, and engage in home-based businesses. These roads vary highly in condition and layout type, although many are arrayed to serve cul-de-sac neighborhoods, with curvilinear street designs that limit connections to larger roads. This type of curvilinear street design poses several potential challenges for people who use the roadways, as they limit ingress/egress points into/from a neighborhood,

increase the difficulty of navigating and wayfinding, and lead to few intersections and parallel roadways. Large, fused grid neighborhoods (such as the Jessica Way area and the north side of Mitchell Ln) provide significantly more flexibility for drivers and a more redundant transportation network. As a result of the conditions in many neighborhoods, people and vehicles must travel through a small number of the same major intersections, creating the risk of chokepoint effects occurring at every step of a person's journey towards the bigger arterials and the regional road network, be it for evacuation or other purposes. Furthermore, the street network in Windsor includes several narrow two-lane bridges that may act as chokepoints in the network during an evacuation. The Sonoma County Multi-Jurisdictional Hazard Mitigation Plan identifies two-lane bridges on the following roadways:

- Caletti Avenue (provides access to the Town's industrial area)
- Hembree Lane (provides access to Hwy 101)
- Conde Lane (provides access to Hwy 101 via Shiloh Road)
- Old Redwood Highway between Billington Lane and Deanna Place (provides access to Hwy 101)

BIKEWAY AND PEDESTRIAN NETWORK

Windsor's bicycle network consists of 2.5 miles of Class I pathways, 17 miles of Class II bike lanes, and 1.1 miles of Class III bikeways. According to the Bicycle and Pedestrian Master Plan, pedestrian activity in Windsor largely occurs in three major districts: Central Windsor, areas around schools, and areas around other public facilities. The Central Windsor pedestrian district is the largest district and covers a large section of central Windsor on both sides of the highway. The district includes the Town Green, the future intermodal SMART train station, high school, town hall, and other developments west of Highway 101, as well as the housing and commercial establishments on the east side of the highway.

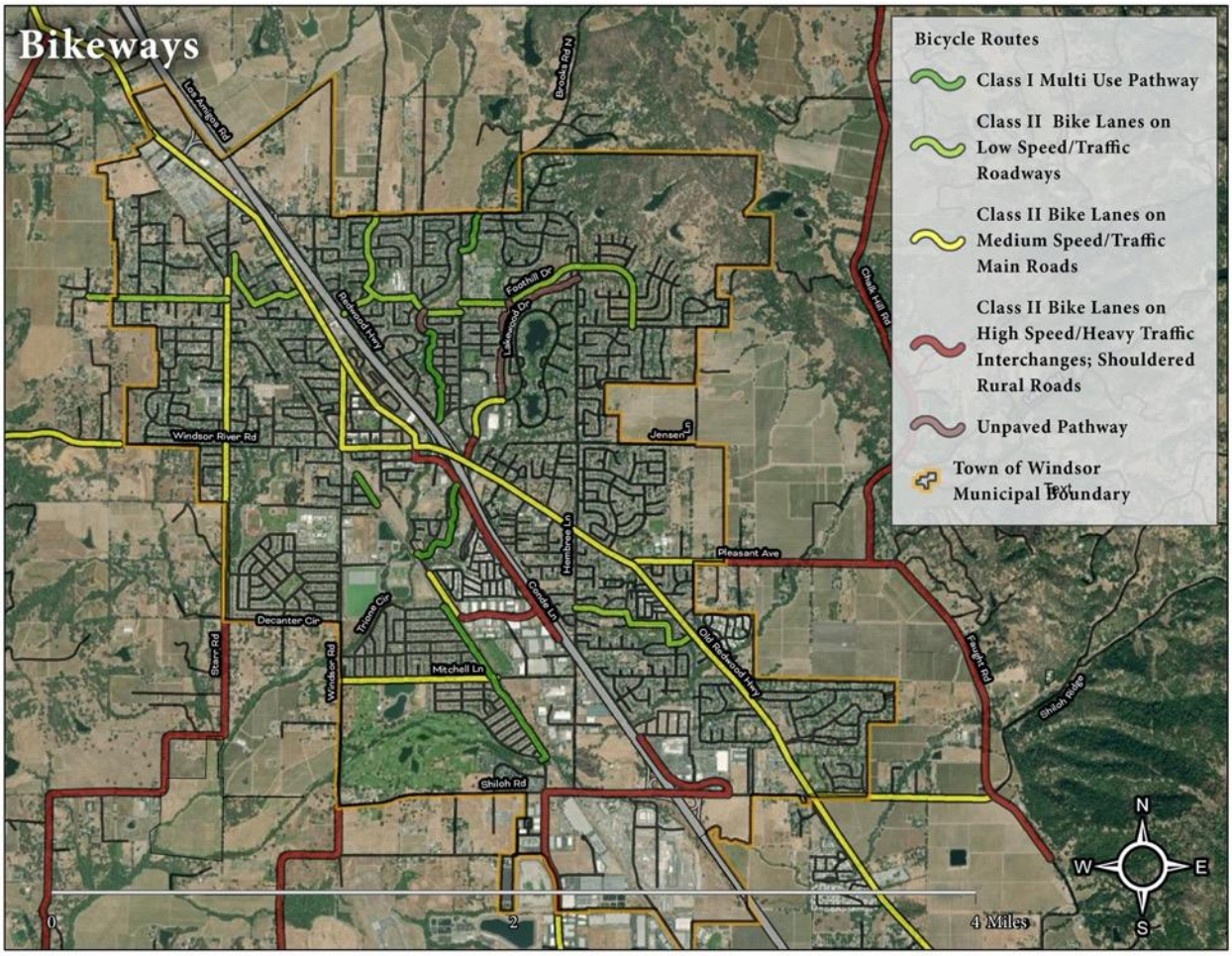


Figure 14. Town of Windsor map of bicycle routes. This map shows the different bicycle routes by type and class within the Windsor Municipal Boundary and connecting routes to the surrounding areas. Class I pathways are separate from automobile traffic and provide the safest options for pedestrians and bikes. Class II bike lanes are alongside automobile traffic and require increased caution depending upon local traffic conditions, especially around interchanges. Rural bikeways may not be distinct bike lanes and may have topography that inhibits visibility or ready maneuverability for less than intermediately skilled riders.

One of the greatest challenges for people who walk and bike is limited connectivity between the east and west sides of town due to Highway 101. The Highway (which runs Northwest/Southeast through the center of the community, generally splits the Town in half and there are only a limited number of connections between the two sides of town. There are two underpasses and one overpass that extend across Highway 101 providing east-west connections for people, bikes, and cars. The Old Redwood Highway underpass (Figure 17) has dedicated pedestrian paths and bike lanes. However, these crossings also host the on/off ramps for the highway. While there is pedestrian signage and a painted bike lane, free right and left turns create unsafe crossing conditions for people who walk or bike.



Figure 15. Highway 101 underpass at Old Redwood Highway. Note combination of dedicated bike lane, but also freeway on and off ramps that can create unsafe conditions for pedestrians and cyclists, making it less likely for them to use these crossings and limit East/West access across town. Source: Google Street View

The Arata Lane underpass (Figure 18) does not have dedicated pedestrian paths and bike lanes, which creates unsafe conditions for people who walk and bike and these conditions may influence the choices of individuals about their mode of transportation.



Figure 16. Arata Lane and Highway 101 intersection. Note the lack of pedestrian and bicycle infrastructure. Source: Google Street View.

The community has already identified these limitations to the transportation network. The Windsor Bicycle and Pedestrian Master Plan (2014) recommends the expansion of both the pedestrian and bicycle network, including projects to bridge the gap between the east and west sides of town and to improve connectivity to schools, commercial centers, and parks to transit. While the focus of this assessment is on the impact to local assets, the way infrastructure functions regionally can have direct impacts to Windsor and its residents and should also be considered in future planning. When possible, quantitative data will be provided to elucidate the potential impact of different climate hazards to buildings within Windsor.

TRANSIT SERVICE

Sonoma County Transit (SCT) is the local transit operator. SCT provides a fare-free local transit service via Route 66 (Windsor Shuttle) which runs daily Monday through Saturday and creates a loop around town from the Windsor Depot around the Town center connecting a number of schools to residential areas. Intercity service on Route 60 and Route 62, which connect Windsor with downtown Santa Rosa (to the south) and Healdsburg/Cloverdale (to the north). Frequencies of these routes are low, with buses running every 45 to 60 minutes. Route 62 is the only route that runs on all days of the week; the other routes operate on weekdays only or have limited Saturday service. In addition to fixed-route service, SCT also runs an ADA paratransit program for qualifying residents; paratransit serves areas within ¾-mile of fixed-route SCT services during the same hours and days.

RAIL NETWORK

The railroad network - developed in 1872 through what is now the Town boundaries - was central to development in the region.[45] The San Francisco-Northern Railroad connected Windsor with San Francisco and facilitated the trade and distribution of agricultural products (including hops, grain, prunes, lumber and grapes) to the coast. The railroad system was owned and operated by Northern Railroad until the 1950's. In 2008, renovations and updates to the station building and rail facilitated the expansion of the Sonoma-Marin Area Rail Transit (SMART) service to the Town, which now provides regional connectivity and tourism along the SMART travel corridor. The rail is centrally located in the Town and parallels Highway 101. In 2020, the planned $65 million expansion project was initiated to extend the SMART rail Airport Boulevard to downtown Windsor. The project is currently on hold pending resolution of legal proceedings associated with one of the project funding sources, Measure 3.[46] The current bus depot along Windsor River Road next to the railroad tracks will be updated to accommodate the new service. In addition, all of the planned SMART rail corridor includes bike and pedestrian paths. Future SMART extension plans include extensions to Healdsburg and Cloverdale.[47]

AVIATION INFRASTRUCTURE

The Charles M. Schultz Sonoma County Airport - first developed as an airfield used to support an Army Base in WWII - services regional, interstate, and intrastate flights to scheduled commercial and private entities (private, business, corporate, and recreational planes). The County assumed operation of the airfield from the military in 1946 and has continued to expand since that time. Commercial airlines that operate out of the airport include United, Alaska Airlines, Avelo Airlines, and American Airlines and total passenger counts range from 15,000-40,000 annually in the last few years.[48] Guided by the Airport Master Plan, the airport is considering additional national and international service expansion in the coming years.[49] In addition to providing essential regional connectivity for people, goods, and businesses, the industrial and commercial area near the airport provides business opportunities and employment for Windsor residents.[50]

[45] Town of Windsor (2018b)
[46] Sonoma-Marin Area Rail Transit (2020)
[47] Sonoma-Marin Area Rail Transit (2021)
[48] Sonoma County (2021d)
[49] Sonoma County (2011)
[50] Town of Windsor (2018b)

NATURAL SYSTEMS (PARKS, CREEKS & WATERWAYS, FISH & WILDLIFE HABITAT)

The Town's identity is inextricably linked to its location and surrounding agricultural lands, oak woodlands, canyon's, rolling hills, evergreen forests, and beautiful recreation areas. Windsor's development standards encourage site design to preserve and enhance the natural and scenic beauty and resources of the area, its open spaces, and the agricultural lands just outside of the Town boundary which exist seamlessly with the more urban areas. The interconnected creeks and waterways within Windsor provide natural beauty that helps instill the collective community stewardship of natural resources that helps to benefit the needs and values of current residents as well as those of future generations. In addition, the open spaces of the Town not only provide valuable ecosystem services (e.g., floodplain management, scenic value, recreation) for Windsor residents, but also serve as critical habitat and movement corridors for fish, wildlife, birds, insects, and more.[51] In addition to the community, joint use, and neighborhood parks, Windsor is in relatively close proximity to three regional parks owned and maintained by the County including Foothill Park (located within Town limits), Riverfront Park, and Shiloh Ranch Park, which range from 211 to 845 acres in size.[52]

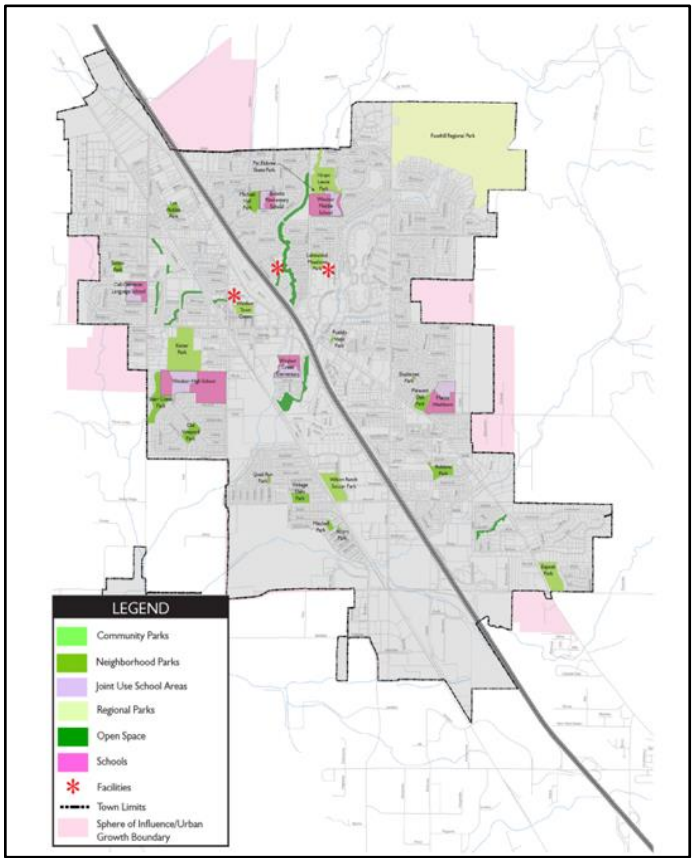


Figure 17. Map of Windsor parks, recreation spaces, open spaces, and facilities. (Source: Windsor Parks and Recreation Master Plan, 2017)

[51] Town of Windsor (2018b)
[52] Town of Windsor (2017)

This assessment will provide mostly a qualitative analysis of the impacts of different climate hazards to the natural systems as well as discuss the complexities of compounding impacts to the environment and ecosystems under changing climate conditions.

ECONOMY

Windsor is economically and culturally tied to the larger region of Sonoma County and serves as an attractive location for visitors traveling along the Highway 101 corridor from the Bay Area and beyond. In close proximity to wine country and the nearby Russian River recreation area, Windsor has a diverse economy, supporting jobs in the largest economic sectors of retail trade, food service, educational services, and manufacturing. There are 50 wineries and vineyards within five miles of Windsor, and the surrounding area is considered a hub of three of the largest American Viticultural Areas (AVAs) in the country - Russian River, Dry Creek, and the Alexander Valley.[53] The Town has a mix of residential, commercial, professional, and industrial land uses that support the range of employment opportunities for residents. The primary commercial service areas of the town include the Downtown, Lakewood, the Shiloh Road corridor, and particular areas along Old Redwood Highway; the Town Green is celebrated as one of the Town's key economic assets.[54] Climate hazards impacting or interrupting the transportation network and natural ecosystems within and around Windsor have the potential to directly and indirectly affect Windsor's economy.

This assessment will generally discuss the qualitative impacts of climate hazards to Windsor's economy. When possible, quantitative information will be used to provide context to the potential magnitude of impact to the economy.

[53] Town of Windsor (2012)
[54] Town of Windsor (2018b)

"Exposure and Consequence" Analysis

This section summarizes the relative vulnerability rankings for each climate hazard and specific asset categories for the Town. Each section includes a more detailed analysis of the climate hazards and a discussion of the intersectionality of climate resilience and non-climate stressors. As described in the climate change projections section, rising temperatures and changing precipitation patterns influence and create climate hazards. Of primary concern for the town are wildfire, flooding, drought, and extreme heat. Some non-climate stressors (such as population growth, or dam failures) have indirect connections with climate change (for example extreme precipitation may raise reservoir levels and put additional stress on dams) are discussed as appropriate in the subsequent sections. Earthquakes are not directly related to climate change, but many of the actions developed in the Windsor Resilience plan will help enhance resilience to these non-climate hazards.

While this assessment is formatted to discuss the four hazards, their exposure, and consequences to assets separately, it is important to remember that climate hazards are often and very likely interconnected. They may happen simultaneously, in quick succession and/or may exacerbate the vulnerability of and impact to different assets. For example, extended periods of drought exacerbate the potential for a wildfire, and if a wildfire does occur, the dry soils and vegetation can increase the severity of a wildfire. Additionally, drought periods followed by a high precipitation event can lead to more severe flooding, as the soils are not able to absorb surface water, further exacerbating the impacts of flooding on the landscape and to infrastructure. This interconnected nature of climate hazards makes the conversation of vulnerabilities more complicated; however, the potential solutions to these challenges and vulnerabilities (as discussed later in the Adaptation section of this plan) can address multiple hazards while also providing benefits to residents in their everyday lives.

VULNERABILITY SUMMARY

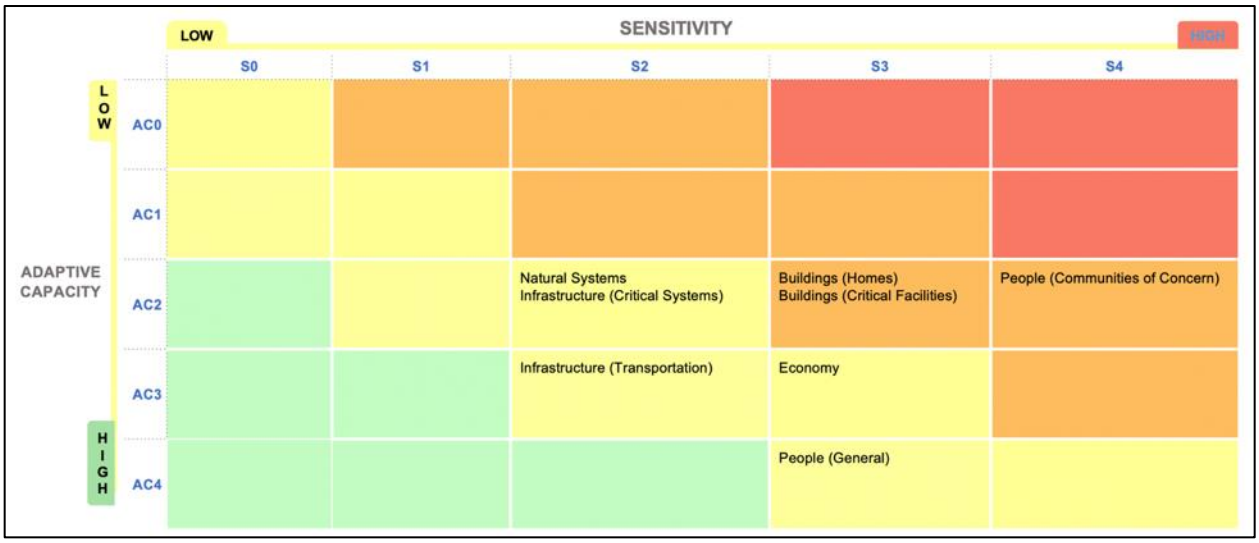


Figure 18. Relative vulnerability assessment of wildfire for Windsor's primary assets categories. Vulnerability is shown by the different colors of the matrix (Red = Extreme Vulnerability; Orange = High Vulnerability, Yellow = Medium Vulnerability; and Green = Low Vulnerability). Given the climate hazards, relative vulnerability is based on the assessment of sensitivity (x-axis ranging from S0 = not at all sensitive to the projected changes to S4 = extremely sensitive to the projected changes) and adaptive capacity (ability to respond to those changes ranging from AC0 = no ability to respond to AC4 = ability to respond to projected changes in a beneficial way).

PEOPLE: **Windsor residents are highly vulnerable to wildfire** due to both the potential exposure of the Town and the potential impact to the health and safety of residents. Several subsets of the Windsor population are particularly sensitive to the impacts of wildfire. These Communities of Concern are more sensitive (S4) as they may have underlying health conditions and/or limited ability to evacuate (e.g., individuals with disabilities, older adults, individuals in assisted living facilities, among others). The general population is somewhat less sensitive (S3). In addition, limited evacuation options out of Windsor due to local and regional chokepoints and limited ingress and egress out of some neighborhoods increases the sensitivity of Windsor residents to wildfire. Some residents are more sensitive to the impacts of wildfire smoke caused by wildfires due to factors including pre-existing health conditions (such as asthma), limited access to air purification systems, employment that exposes residents to smoke, and other conditions. In general, adaptive capacity is medium for Communities of Concern (AC2) and high for the general population (AC4). This is due to local and regional emergency preparedness planning, enhanced wildfire behavior modeling, wildfire detection technologies, incorporating local and regional lessons learned from past wildfires, and wildfire preparedness education, increasing the adaptive capacity of Windsor residents to the impacts of wildfire.

BUILDINGS: Homes and critical facilities are highly vulnerable to wildfire. Exposure to wildfires continues to increase. Very few of the Town's buildings and homes are located in the WUI - a traditional indicator of sensitivity to wildfire. However, wildfire exposure is increasing

due to climate change (among other factors) and expanding wildfire risk. The potential impact on homes and buildings in Windsor continues to increase. Under an extreme wildfire scenario, all Windsor homes and businesses are highly sensitive (S3) to the impacts of wildfire - particularly those in closer proximity to the wildlands, as evidenced by past regional wildfires (e.g., Coffee Park and Kincade). Adaptive capacity is generally medium (AC2) for homes and businesses in Windsor and depends on a variety of factors (e.g., vegetation management and fuel reduction efforts, landscape scale fuel breaks, wildfire detection capabilities, etc.) in addition to policy and program changes that support structural resilience to wildfire.

INFRASTRUCTURE: Windsor's infrastructure systems are moderately vulnerable to wildfire. Exposure to wildfires continues to increase and existing electric utilities, telecommunications, and water infrastructure, and transportation are somewhat sensitive to wildfire (S2). Adaptive capacity for Windsor's telecommunications, water, electrical and transportation infrastructure is moderate (AC2) as system components and capacity can be increased over time. For example, the communications system exhibits redundancies that allow for it to be functional even after a wildfire were to occur[55] and the Town of Windsor Municipal Code requires all new developments with existing overhead services along its frontage, including electrical lines, to be placed underground.[56] It is, however, not easy to relocate infrastructure once it is in place and upgrades will generally happen gradually over time. The transportation system does have built in redundancy though there are chokepoints and other bottlenecks that can exacerbate the impacts of certain hazards. In addition, secondary impacts of wildfire, including increased sediment, erosion, and landslides due to hydrophobic soils, can have significant impacts on transportation systems.

NATURAL SYSTEMS: Natural systems are moderately vulnerable to wildfire. Natural systems have evolved to rely on wildfire to survive and thrive in the region, therefore, they are not very sensitive (S2). Yet, the extent and intensity of wildfires continues to increase, therefore the sensitivity of natural systems and the ecosystem services that they provide to wildfires is also increasing. This is particularly true in extreme wildfire scenarios, particularly in sensitive ecosystems that support threatened and endangered species (e.g., California Coast Coho Salmon). Ecosystems with the highest sensitivity to wildfire are local stream and riparian habitats, and mature and old growth forests.[57] The secondary impacts of wildfire, including increased sediment, erosion, and landslides due to hydrophobic soils, can have significant impacts on aquatic environments. In addition, natural systems are more susceptible to increases in invasive species post-wildfire, which not only impacts ecosystem health and function, but increases the likelihood of additional wildfires. These species and ecosystems have a medium level of adaptive capacity (AC2). They have evolved over centuries and millennia and may not be able to keep up with the pace of change.

ECONOMY: The economy is moderately vulnerable to wildfires. Many businesses in town are dependent on tourism, agriculture, and viticulture. These industries are sensitive (S3) to wildfires, associated evacuations, and all business can be affected on a short-term basis by secondary impacts such as smoke or loss of power due to public safety power shutoff events. As

[55] FireSAFE Sonoma (2016)
[56] Town of Windsor (2018b)
[57] FireSAFE Sonoma (2016)

the wildfire season expands beyond historical norms due to climate change, and the perceived risk of wildfire increases, this will continue to increase concern of visitors and affect the local economy. Adaptive capacity varies based on the individual business but many businesses in the town have a medium or high degree of adaptive capacity (AC3).

WILDFIRE EXPOSURE FOR THE TOWN & REGION

Past regional wildfire risk assessments have classified wildfire risk for the Town of Windsor as being relatively limited. Yet, a variety of factors - including climate change - are requiring a new approach to understanding wildfire risk for the Town. Across the region and state, wildfires are becoming hotter, more intense, lasting longer, can now happen at any time of the year, and are proving more deadly. Today, nearly all of the Sonoma County is at risk to wildfire. According to the Sonoma County Multi-Jurisdictional Hazard Mitigation Plan (2021), "risks include, but are not limited to, extensive building in the Wildland Urban Interface/Intermix (WUI) areas, lack of vegetation management near homes and in wildland areas, structures not built or retrofitted with ignition-resistant building materials that can increase resistance to wildfire's heat and embers, and a significant likelihood of high wind events during dry fall months" (p. 1-2).[58] As residents have quickly learned from recent experience, wildfire risk reduction and protection efforts are not just a matter of maintaining a sense of security, limiting property destruction, injuries, and death. For towns like Windsor, that maintain a reputation as a thriving tourism destination, as a viable place to build a business, and a stable community to raise a family or enjoy one's retirement, changing wildfire risk presents a real threat to the community's identity and vision for the future.

Reestablishing an accurate understanding of wildfire risk in Windsor requires a new approach to characterizing the hazard itself. The effects of firestorms, ember cast, and of wildfire smoke produced by wildfires (sometimes) hundreds of miles away, mandate a new hazard categorization that redefines the differences in exposure and risk. Hazard mitigation activities that target forward-looking (leading) risk factors are generally more effective at targeting future community resilience, but in lieu of accurate forecasting the tendency is to rely on the historical experience and other lagging data. While utilizing existing wildfire assessments remain an important indicator for planning purposes, several additional factors (including climate change) that exacerbate the size, intensity, duration, and frequency of wildfires must be considered in order to create accurate planning assumptions, accurately quantify appropriate mitigation and response resources, hone operational procedures for wildfire response, and build appropriate community coping capacities. The following section of this report will discuss the traditional ways of modeling and understanding wildfire risk, the factors that exacerbate that risk, and the new assumptions that need to be incorporated into wildfire resilience planning efforts moving forward.

TRADITIONAL (AND OUTDATED) WAYS OF UNDERSTANDING WILDFIRE RISK

Wildfire is a known hazard in Windsor, but wildfire risk has historically been under-classified in regional planning efforts. In 2018, as assessed in the Windsor LHMP, wildfire was classified as a

[58] Sonoma County (PENDING). *Sonoma County Operational Area Hazard Mitigation Plan*

'Medium' level threat to the community. This placed it comparatively lower in terms of severity than drought or earthquake - both of which had received a 'High' threat designation.[59]

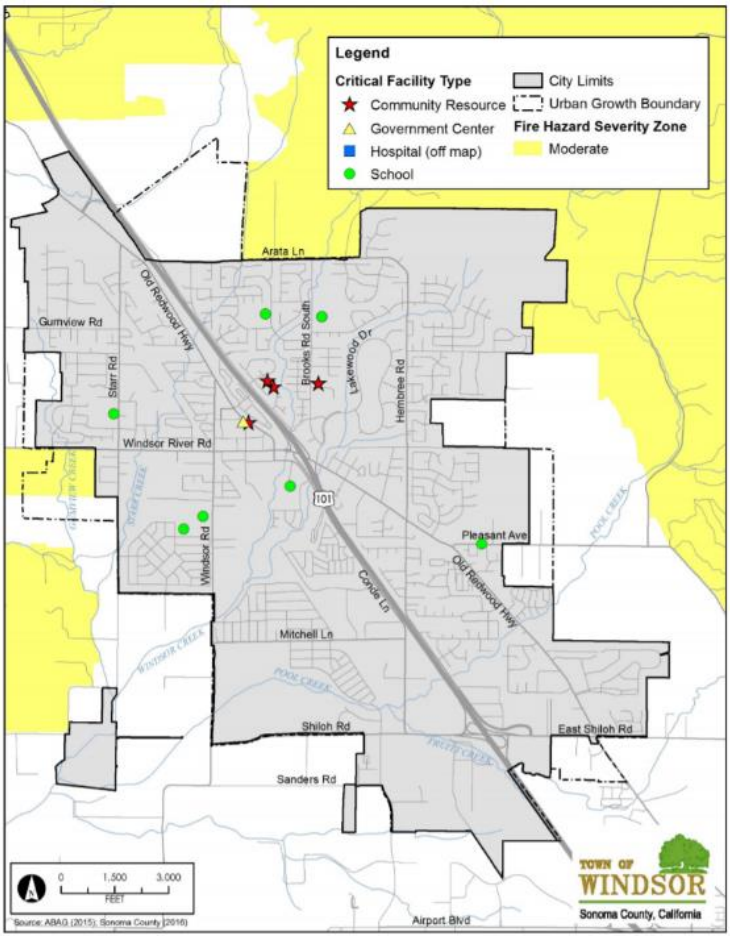


Figure 19. Wildfire Risk Map that appears in the 2018 Windsor Local Hazard Mitigation Plan. This map highlights the limitations of existing methodologies for quantifying actual wildfire risk for Windsor.

Like the LHMP, past wildfire risk assessments - which classified wildfire risk within the incorporated jurisdiction of Windsor as being medium or low - have traditionally provided the basis of planning in the emergency management, hazard mitigation, and community development sectors. Prior to 2017, wildfire risk assessments were drawn almost exclusively from two key data points: 1) a historical record of wildfires that only included three major fires over the course of 80 years in the proximity of the Town; and 2) a map of Fire Hazard Risk Zones maintained by the CAL FIRE Fire Resource and Assessment Program (FRAP). Because none of the three fires had any direct impact on the Town of Windsor itself, and the FRAP maps used in the assessment indicated no presence of wildfire risk zones within Town limits, wildfire risk for the Town of Windsor was classified between low to medium wildfire risk and a steadfast assumption of safety was established.

[59] Hazards which received a lower risk designation in the 2018 Windsor LHMP [Town of Windsor (2018a)] include flood and extreme heat, both of which are classified as 'Medium' threats, and dam failure, landslide, and liquefaction, each of which received a 'Low' threat designation.

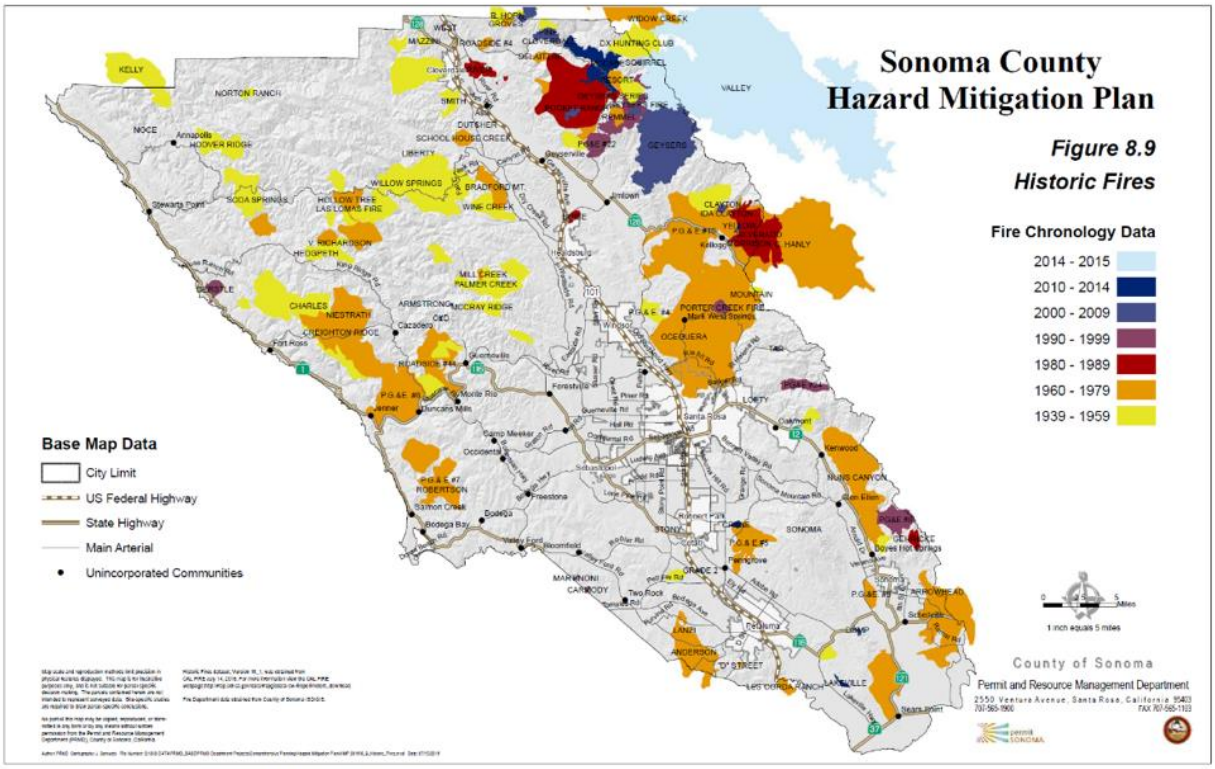


Figure 20. Sonoma County Fire History, 1939-2015 (Source: Sonoma County Permits, 2016 http://bit.ly/3oBTWOx)

Like many other California communities, Windsor has relied on CAL FIRE FRAP Wildfire Hazard Severity Zone maps to scope the exposure to, or potential severity of, wildfire risk. These maps are generally the most informative data available given the general absence of more locally relevant products and guide the development of local policies and codes (e.g., fire-resistant building codes). However, the maps carry two key limitations that limit the Town's capacity to accurately assess wildfire risk within its jurisdictional borders. The CAL FIRE FRAP maps do have value for local communities in terms of their capacity to indicate areas where exposure to trans-boundary transmission is likely or possible (e.g., areas where wildfires originating on State or Federal land may cross into the LRA). These maps, however, do not provide a level of detail for wildfire exposure and risk within the communities themselves to understand any level or risk below 'Very High', nor were they marketed as such (despite their widespread and prevalent use).

Windsor's multi-year effort to develop the Town's LHMP was completed in February of 2018. As the most complete and accurate information on wildfire risk at that time, the CAL FIRE FRAP wildfire hazard risk zone maps formed the basis of this plan's wildfire risk profile. Drawing on the data reported on this map, coupled with the Town's hazard history, exposure and risk in Windsor was depicted as follows:

> "There are no wildfire hazard severity zones within the limits of the Town itself. The area south of Windsor River Road near Gumview Creek, which is outside of the Town limits but within the urban growth boundary, is considered a moderate fire hazard severity zone. There are also areas of moderate fire hazard severity along the Town's northeastern border." (Windsor All-Hazards Mitigation Plan, 2018; Page 41).

The map which appears on the left in the figure below is excerpted from this plan and is reflective of the description provided (*see Figure 22*). While sourced as being created in 2016, the depiction of fire hazard severity zones as indicated in yellow is nearly identical to what is reported on the 2008 CAL FIRE FRAP map for the County. The only notable difference is a small area in the northwest where an annexed area of land has been added to the incorporated areas. The risk zones as designated, however, remain unchanged.

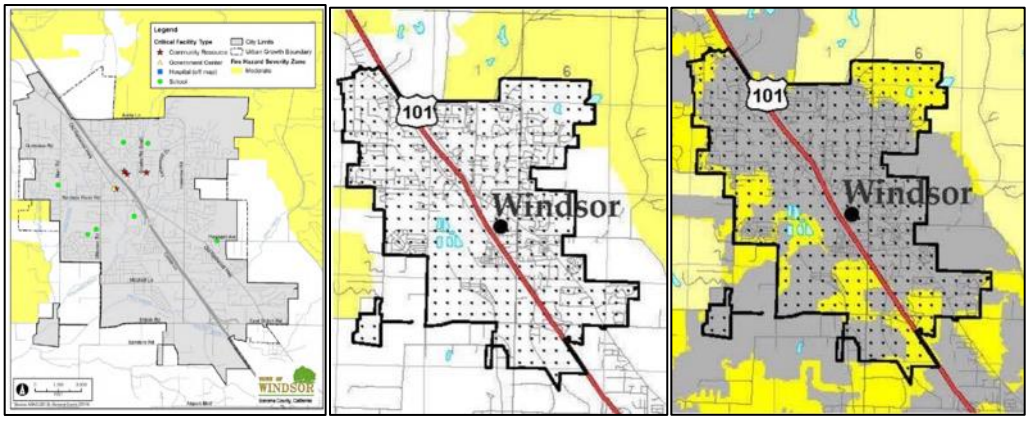


Figure 21. Historical Windsor wildfire risk maps. (LEFT) Wildfire Risk Map that appears in the 2018 Windsor Local Hazard Mitigation Plan. (CENTER) Detail of wildfire risk in the Town of Windsor as reported on the CAL FIRE FRAP 2008 release of Wildfire Hazard Severity Zones. (RIGHT) Excerpt of the Draft CAL FIRE Draft FHSZ Map showing multiple areas of 'Moderate' wildfire severity in Windsor Town. Source: CAL FIRE.

Although CAL FIRE only endorses the approved final maps for which 'Moderate' and 'High' risk zone designations have been removed from the LRA, it provides access to the original 'draft' maps that contain all zones of severity. Provisional maps detailing risk in Windsor, released in 2007, provide significant insight into the extent to which wildfire hazard risk actually extends into the Windsor LRA. Despite the lack of CAL FIRE endorsement, this map nonetheless establishes a more informative reference point for a better understanding of the extent of wildfire risk within Town limits. And while the 2007 release date might be considerably old, it should be noted that the data included in the final map used in the current LHMP was drawn from essentially the same set of data (namely, the 2008 approved CAL FIRE FRAP map). The CAL FIRE risk assessment for the town indicates the town center is of limited risk while the surrounding hillsides face only a low level of risk. Accuracy can be increased by incorporating the information contained in the 2007 CAL FIRE FRAP map that details LRA Hazard Severity Risk Zones, although much of the town is still demarcated as having limited risk. Recognizing that limited risk is not zero risk, and that house-to-house spread is possible once a fire enters the town from this elevated risk, all areas and thus all structures must be rated for wildfire risk to achieve an actionable assessment.

Wildfire risk that is portrayed in older maps and planning efforts understate the appropriate wildfire risk for the Town.

It is important to highlight that the wildfire risk portrayed in older maps and planning efforts understate wildfire risk for the Town. Further, because they are based on traditional modeling techniques, these older maps are not necessarily representative of the changing wildfire risk due to the impacts of climate change, both in their intended use setting (public land forest management), nor for towns like Windsor at the wildland edge. It is important to note that an expected level of uncertainty exists in current modeling techniques. As a result, decision-makers often downplay, ignore, or misunderstand actual wildfire risk for a given area when relying solely on current or historical modeling techniques. [60] A variety of factors – including climate change - challenge the ability of existing modeling techniques to account for hyper-localized variations in wind, temperature, and precipitation changes and their impact on urban and suburban environments. Even with new, more detailed maps, it is critical that we understand that "low" risk is no reason for low levels of preparedness or caution, as recent years have borne out all too well. In the next section, we will explore this changing risk and the factors that require new ways of understanding and planning for increasing wildfire risk in Windsor.

THE NEW NORMAL FOR WILDFIRES

Among Town and Sonoma County officials, there is growing consensus that Windsor's wildfire risk is 'High' and continuing to increase. The 2021 update to the Sonoma County Operational Area Hazard Mitigation Plan (SCHMP) determined that wildfire risk should be recharacterized in Windsor as having a 'High' level of threat.[61] The 2021 update to the Sonoma County Multi-Jurisdictional Hazard Mitigation Plan classified wildfire risk across the county as 'High.'[62] In addition, the Sonoma County Community Wildfire Protection Plan update, completed in 2021, also classified the Town of Windsor as having a 'High' level of risk to wildfire.[63]

Among Town and County officials, there is growing consensus that Windsor's wildfire risk is 'High' and continuing to increase.

Wildfire risk factors for the Town of Windsor include, but are not limited to: 1) Climatic changes that are resulting in larger, more frequent, more intense, and more common wildfire events; 2) current and historical fire-suppression policies; 3) increasing population growth in the Wildland Urban Interface (WUI) and intermix; 4) vegetation and fuels (and lack of vegetation management around homes and in wildland areas); 5) structures not built or retrofitted with ignition-resistant building materials that can increase resistance to wildfire's heat and embers; and, 6) localized changes in wind patterns which fuel the formation of 'firestorms' and drive ember cast. These factors are altering the Town's hazard profile by creating entirely new hazards and increasing the severity and likelihood factors for others. A new understanding of wildfire risk, and subsequent appropriate planning response, must therefore be established to correct any outdated or inaccurate perceptions and assumptions. The following presents a forward-looking assessment reliant on leading data. It distinguishes between standard wildfire threats and more damaging firestorms, recognizing observed data and developing research on evolving wildfire

[60] https://digital.lib.washington.edu/researchworks/handle/1773/46885
[61] Sonoma County (PENDING). *Sonoma County Operational Area Hazard Mitigation Plan* Recharacterization of wildfire risk in Windsor from Medium to High was the result of three factors: 1) Evacuation of the town in 2019 during the Kincade fire when it was determined the entire town was potentially exposed; 2) Evacuation of the northwestern part of town in August of 2020 during the Walbridge Fire; 3) a new understanding about wildfire behavior developed while developing this resilience plan.
[62] Sonoma County (PENDING). *Sonoma County Operational Area Hazard Mitigation Plan*
[63] Sonoma County (PENDING). *Sonoma County Community Wildfire Protection Plan*

behavior. It also acknowledges the profound effects that debris flows and prolonged wildfire smoke inhalation are having on the life, health, and property of Windsor residents.

CLIMATE CHANGE

Climate change is exacerbating the frequency, intensity, duration, timing, and severity of wildfires across the State of California.[64] In addition, wildfires are becoming hotter, more intense, and more deadly.[65] Important climatic factors like rising temperatures, changing humidity levels, longer and more severe droughts, and a reduction in annual snowpack compound the way climate change exacerbates wildfire risk. In the past few decades, there has been a significant increase in the number of wildfire ignitions, acres burned, and harmful impacts to humans and ecosystems in California.[66] According to CalMatters, of the 20 largest wildfires in California history, five burned in 2020.[67] In 2020, over 8,500 wildfires statewide burned more than 4 million acres and California experienced its first "Gigafire," a term used to denote a wildfire (the August Complex Fire) that burned over one million acres. According to the California Climate Assessment, projections show that the average area burned statewide could increase 77% by 2100 if greenhouse emissions continue to rise.[68] In addition, recent studies suggest that climate change has rendered the concept of a "fire season" in California obsolete — major wildfires can happen at any time throughout the year and areas previously considered to be low-risk can experience catastrophic wildfires. A 2019 study showed that, due to changes in the North Pacific jet stream, the correlation between winter rainfall and the severity of the fire season can no longer be made.[69] Studies suggest this disconnect between winter moisture and wildfire conditions coincided with federal historical wildfire suppression policies in the early 1900's and were all but non-existent after 1977.

CURRENT AND HISTORICAL FIRE-SUPPRESSION POLICIES

For more than a century, federal and state policies have shaped wildfire-suppression tactics as a means to reduce the negative impacts of wildfire on the built environment. Although these policies (and fire management practices) are slowly evolving, current and historical fire-suppression policies at the federal[70] and state levels[71] exacerbate the size, intensity, and duration of wildfires across the region and state. For millennia, fire has been a natural mechanism for cultivating healthy woodlands and forests across the West. Prior to European settlement, Indigenous peoples' used fire as a tool to manage forests and grasslands, protect their homes, and to support the regeneration of culturally significant foods and medicines.[72] Yet, as more Europeans moved West and began to build infrastructure that they wanted to protect, fire suppression policies solidified as a means of protecting those assets and timber for use in logging. Traditional Indigenous fire management practices were quashed as Native Americans were stripped of the right to manage the landscape that they had lived on for centuries and Europeans sought to protect valuable timber harvests.[73] Federal and state fire-suppression

[64] Bedsworth et al. (2019)
[65] Rincon (2019)
[66] California Department of Forestry and Fire Protection (2018)
[67] Hwang (2020)
[68] Bedsworth et al. (2019)
[69] Wahl et al. (2019)
[70] Plumer, B., & Schwartz J. (2020)
[71] Shogren (2021)
[72] Cowan (2020)
[73] Cowan (2019)

policies have shaped the way fire management is understood and practiced across much of the West, even as more fuels began to accumulate. When a wildfire escapes suppression, the increased fuel loads have resulted in bigger, more intense, and more destructive wildfires. Many of those policies and approaches remain today, despite increasing calls from scientists, Indigenous communities, and land managers to return to utilizing fire as a management tool (e.g., prescribed burns) on the landscape. In the Southeastern part of the US, where the conditions and landscape allow, prescribed burns are used regularly to reduce the risk of catastrophic wildfires.[74] Coupled with increasing population growth and the development of valuable properties in the WUI, dismantling fire-suppression policies or encouraging fire-adapted management practices presents a significant challenge for local and county governments.

INCREASING POPULATION GROWTH IN THE WUI AND INTERMIX

Population growth in the Wildland Urban Interface (WUI)[75] and intermix has been increasing for decades across the state despite the continuously increasing risk of wildfire.[76] Between 1990 and 2010, the US experienced an estimated increase of 12.7 million homes and 25 million people moving to the WUI.[77] In California, an estimated one million homes were built in the WUI between those two decades. Within the town boundaries of Windsor itself, 19% (2,541 of 8,313) of single-family and 27% (47 of 150) of multi-family residential structures are in a FRAPS-designated WUI zone. However, when including structures on a parcel that intersects WUI zones (classified here as the WUI Edge), 31% of multi-family and 31% of single-family structures are directly exposed. Despite these numbers being relatively low when compared with other communities in Sonoma County and the County as a whole, (leading to "low" and "moderate" fire risk scores in assessments at the county-scale), this should by no means be taken as a signal that the town of Windsor faces minimal exposure to wildfire risk. For example, the north and eastern borders of the Town directly border vast regions of woodland and forested lands characterized by sparse agricultural and residential development. In addition, the western edge of the Town also borders a large swath of forested lands and a continuous surface of agricultural and residential vegetation. More importantly, because Windsor's green spaces, urban trees, and small-scale agriculture are all potentially flammable in the eyes of a floating ember, we cannot exclude them from our cataloguing of the potential sources of fire ignition and spread as has been done in many wildfire risk assessment approaches to date. As a result, it is critical that our planning, awareness, and mentality about fire looks beyond the type of discrete classifications used by wildland forest management agencies and takes an honest assessment of the true risks posed by Windsor's specific geographic and ecological features.

[74] Fuller, T., & Pierre-Louis, K. (2019)
[75] Pierre-Louis, K. & White, J. (2018)
[76] Barringer (2013)
[77] Pierre-Louis, K. & White, J. (2018)

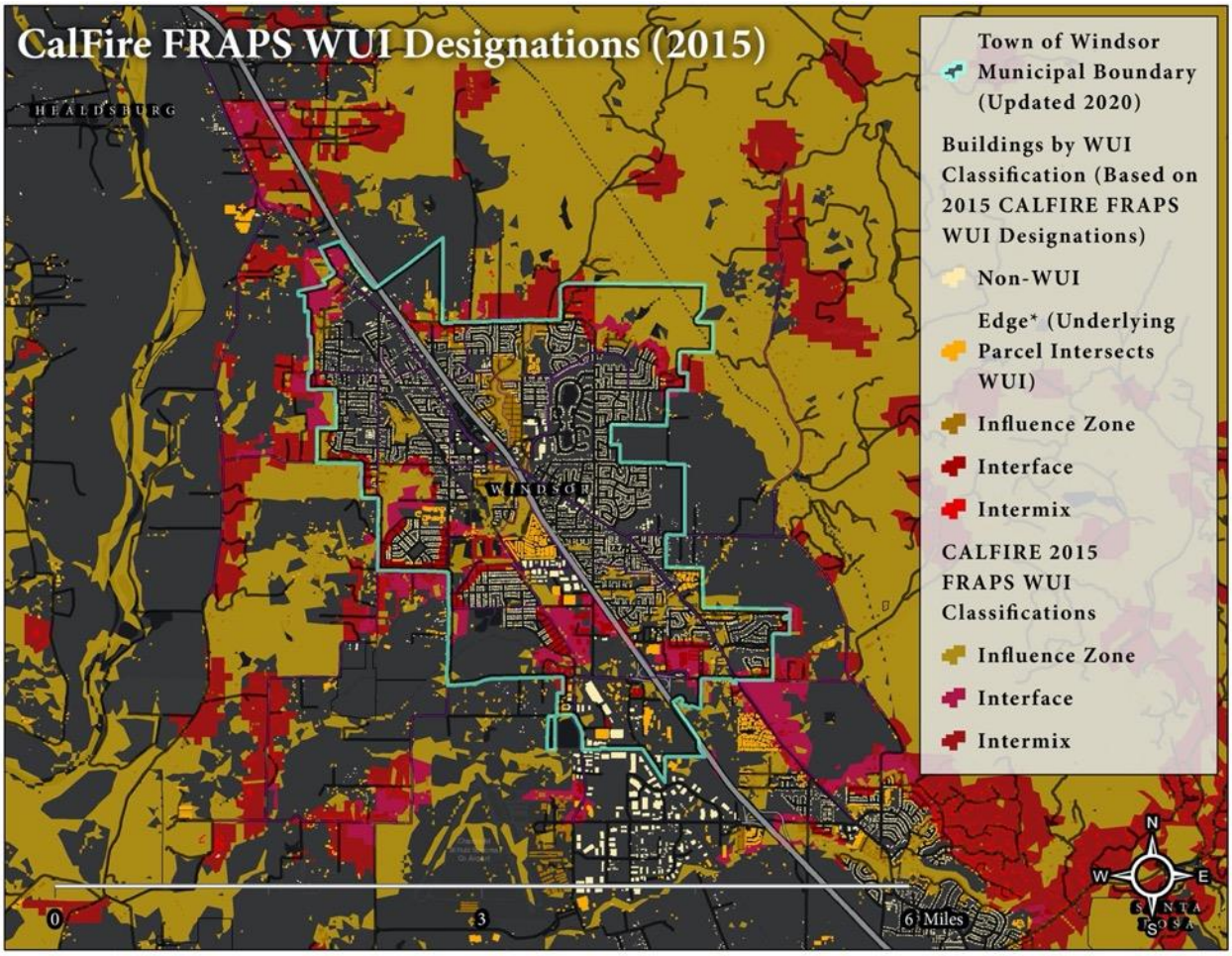


Figure 22. Windsor Wildland Urban Interface Classifications. Source: CAL FIRE, 2021. Although much of the town's structures and parcels are not within traditionally recognized Wildland Urban Interface (WUI) areas, the town's small overall size puts all structures within catching distance of potentially intense wildfire activity, with multiple extensions of dense vegetation into and through the town's residential areas and commercial core. Difficult to control and rapidly growing fires in nearby WUI areas could readily induce heightened fire risk in non-WUI areas as a result. As seen in other maps, these types of classification schemes cannot be the final determinant for fire preparation, response, and adaptation planning.

VEGETATION AND FUELS

Other wildfire risk factors include vegetation cover, vegetation type, the probability that a fire will exist in a certain area to begin with, and if there, the degree to which a fire in that area will grow or spread. Several recently released datasets – developed for the 2021 update to the Sonoma County Community Wildfire Protection Plan - allow us to examine some of these factors with a more finely tuned eye to the local context in Windsor.[78] While the Town has historically been classified to have 'low' wildfire risk due to limited encroachment in the WUI and intermix compared to other parts of the county and the state as a whole, significant fuel sources exist within town boundaries in the form of vegetation and urban trees around homes, along roadways, and within parks. As shown in Figure 23, below, this vegetation creates a more

[78] Sonoma County (PENDING). *Sonoma County Operational Area Hazard Mitigation Plan*

or less continuous surface of ladder fuels from surrounding wildland hillsides and through the entirety of the town. When structures are added to this mix, the available fuel landscape of the town becomes almost total. Vegetation and trees provide a variety of ecological, social, and physical benefits to the Town (including shade for extreme heat days), highlighting the complexity of planning decisions and tradeoffs that need to be made to address multiple climate hazards (like wildfire and extreme heat).

Following the Tubbs Fire in 2017, the Town initiated the process of updating its landscaping requirements as a part of a broader Zoning Ordinance Update. This update will require hardscape within 5-feet of buildings in order to reduce fuels around structures that spread wildfires and damage property.

In addition, local and regional powerlines (highlighted in bright yellow here for the area's two 60kV and one 230kV transmission lines) – which are a common wildfire ignition source - further underscore the risk of wildfire to the Town.

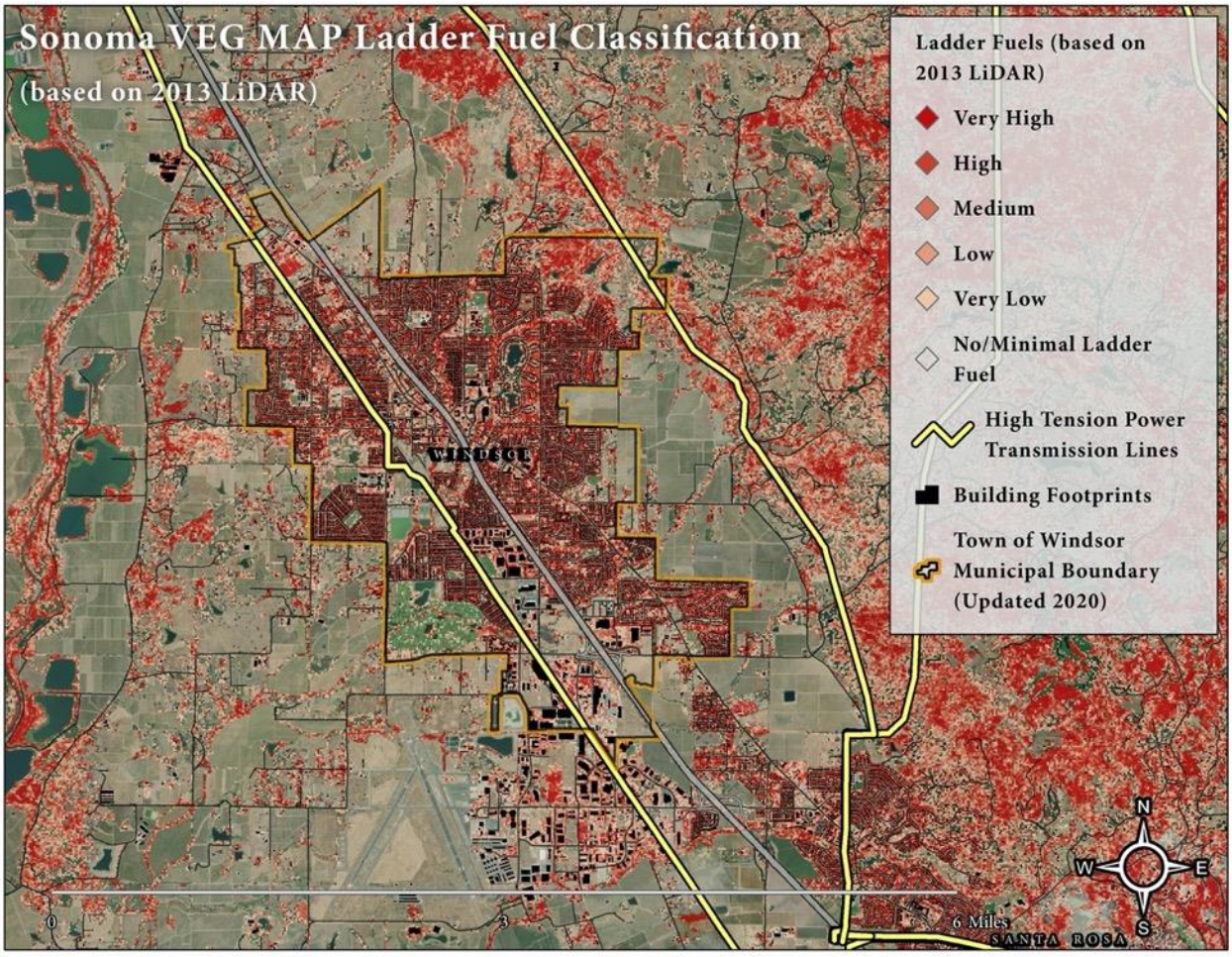


Figure 23. Ladder fuel presence (i.e., vegetation within ~40 ft. of the ground, by height) based on 2013 LiDAR data and major electrical transmission line pathways. Note: not all transmission lines are shown, only those carrying 60 kV or more (max 230 kV on the line running over the Bald Hills). Sourced from SonomaVegMap.org and CA Energy Open Data.

In the statewide Wildfire Hazard Potential Index (*see Figure 24*) provided by this same effort, the town and the areas surrounding it are, perhaps unsurprisingly, classified as low- to moderate risk in terms of the overall Wildfire Hazard Potential, with much of the town area classified as "non-applicable" due to the absence of wildland vegetation. However, as we have seen above, this distinction between "wild" vegetation and vegetation on the ground in the form of urban trees and green spaces can be somewhat misleading. This does not mean that this work is invalid – or that the component datasets that went into it are inaccurate – just that, relative to the potentially catastrophic risks faced by other parts of the state, Windsor is indeed on the low end of likely negative outcomes and the overall challenge of fighting fires nearby.

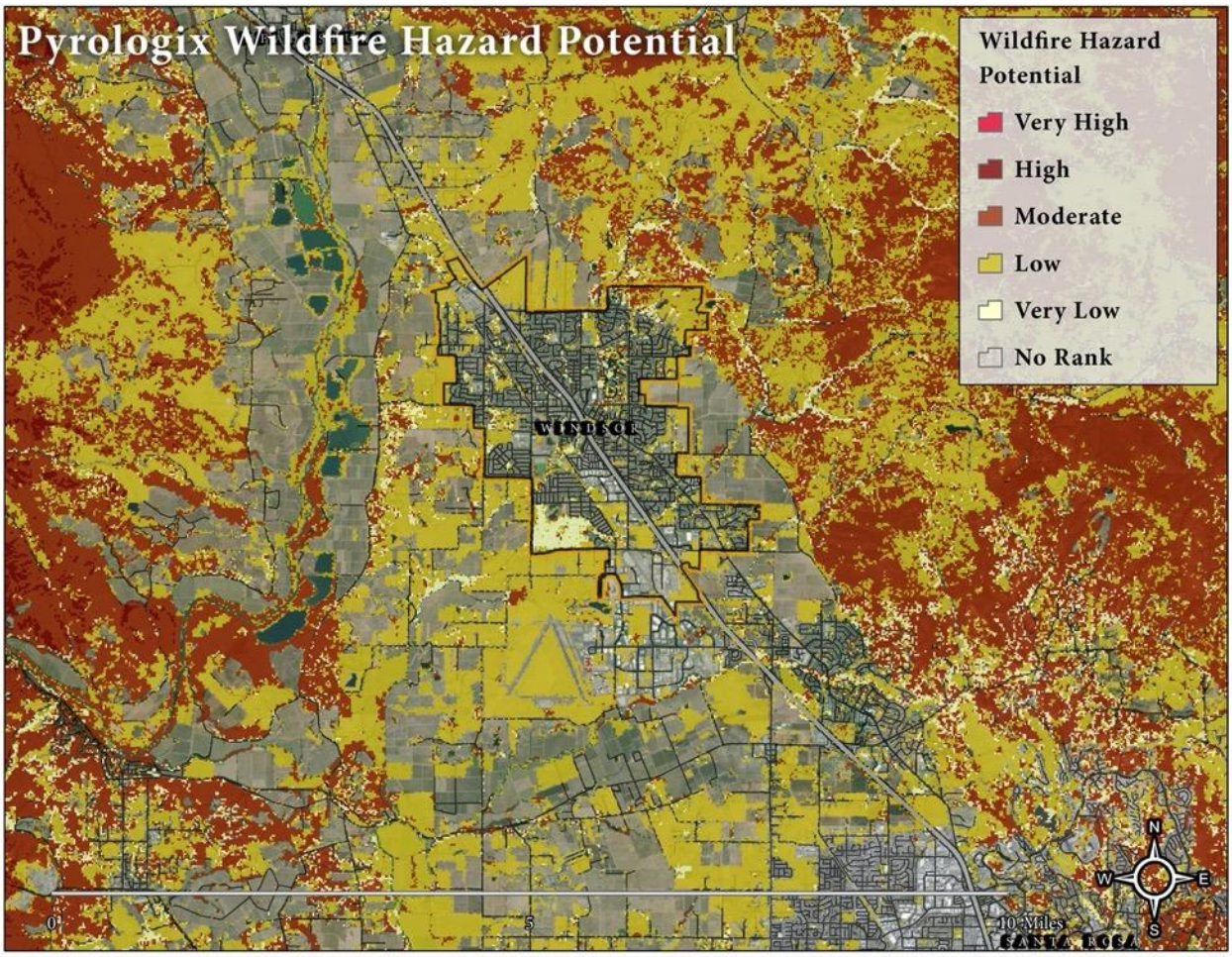


Figure 24. Windsor wildfire Hazard Potential by Pyrologix (2021). Based on modeling incorporating fuels, topography, fire weather, and an array of other factors, the Pyrologix model does not include structures or urban areas as a fuel type in its risk assessment, as it is focused on providing information for decision-makers in the public land management context and at the scale of the state of California as a whole. To wit: Coffee Park, which burned completely, is in a low-to-no risk zone in this classification scheme. (Source: Tukman, et al. 2021)

However, as is shown in Figure 25, when one's view is adjusted to a smaller scale of reference – in this case, Sonoma County – the relative risks faced by the town become somewhat clearer. In addition, because this map incorporates dimensions of the built environment like human-built structures and power transmission lines into its risk model, the severity of the situation around

Windsor becomes more evident, with many areas within the town – some of which were entirely excluded from other risk assessments – falling in the high and moderate classifications for Wildfire Hazard Potential.

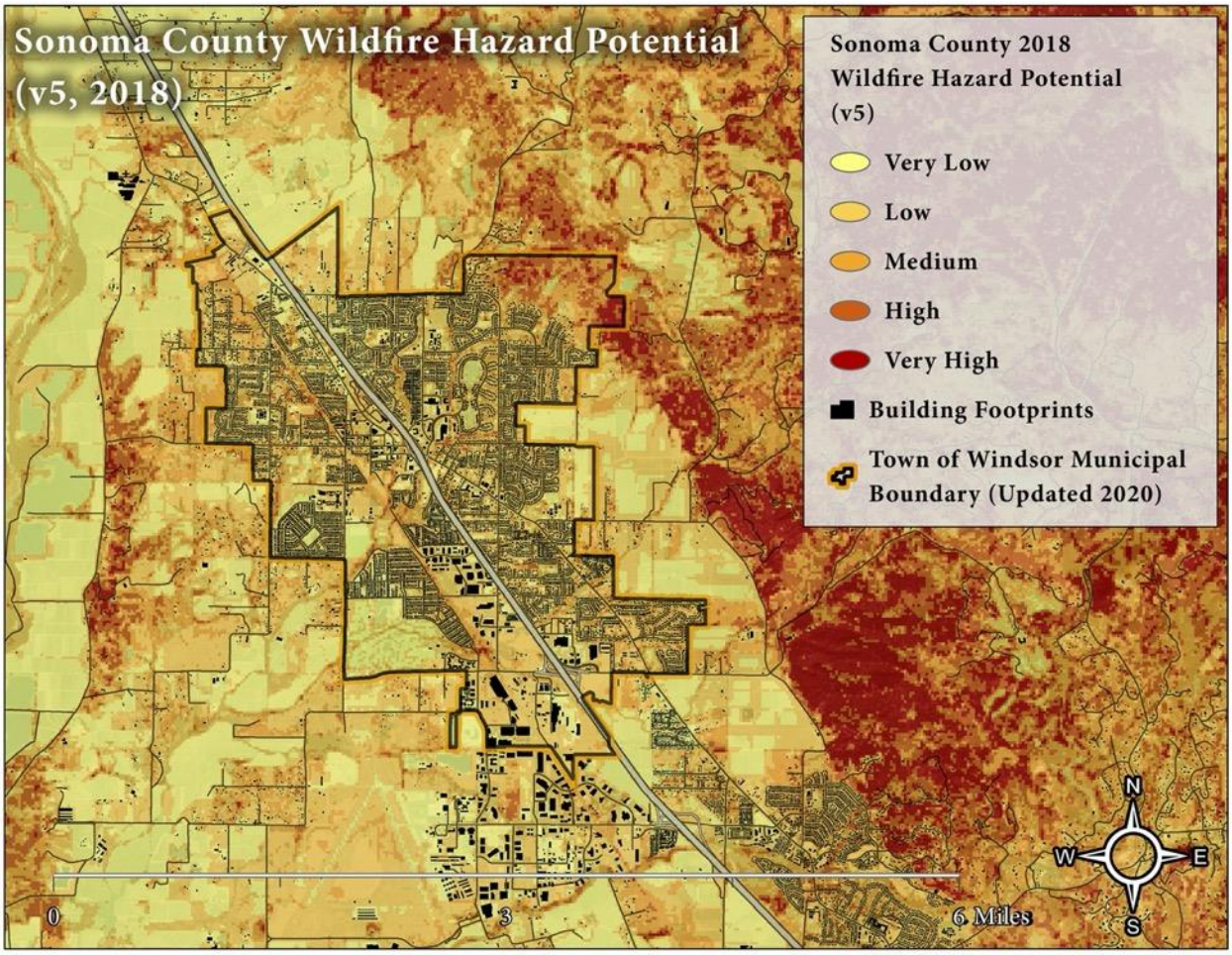


Figure 25. Sonoma County Wildfire Hazard Potential (v5, 2018). Operating independently from USDA and State efforts but sharing many project components, the recently updated Sonoma County Wildfire Hazard Index provides another valuable but limited view of the risk factors faced by the Town. Built from analyses of flame length potential, extreme fire weather potential, human development proximity, transmission line proximity, and suppression difficulty, this scheme also classifies much of Winsor and nearby areas as low- to medium severity, relative to all of Sonoma County. However, with much of the town within just a mile or so of potentially dangerous fire hazard areas, these classifications must always be presented in context.

STRUCTURES NOT BUILT OR RETROFITTED WITH IGNITION-RESISTANT BUILDING MATERIALS

Land use and building codes are important tools for municipalities to use in reducing exposure to wildfire. The Town of Windsor's General plan[79] and building codes establish development, home hardening, and vegetation management regulations in the Town.[80] Most of the homes in the Town of Windsor were constructed prior to 2008, the year that California's Building Code

[79] Town of Windsor (2018b)
[80] Town of Windsor (2021a)

Chapter 7A - "WUI Building Code" was implemented. Despite only a limited number of homes located in the WUI, the Town of Windsor does have homes within its jurisdiction located in the edge, influence zone, and intermix (*see Figure 23*). Continued development in these areas have implications not only for the residents living in those areas, but also for the residents located in Town boundaries due to the ability and rate of wildfire spread under the appropriate conditions. New construction is required to abide by local, county, and state WUI codes. In addition, there are trigger mechanisms in place for older homes to become wildfire code compliant. Also known as home retrofits, these changes to existing homes that increase their resilience to wildfire heat and embers can be expensive and time consuming.[81] New builds and homes that have already undergone this process represent a small proportion of buildings located within Town boundaries. Land use and building codes are important indicators of adaptive capacity for aspects of the Town's vulnerability to wildfire and will be further considered in later sections of this document.

The primary determinants of risk beyond proximity to wildfire risk zones is the presence of fuels, housing construction type, topography, and distance from adjacent structures. The following map, produced as part of recent risk modeling work for the State of California by Pyrologix, provides a more granular assessment of standard wildfire risk in Windsor that considers some of these dimensions. It is based upon the relative risk to structures based on local fuel characteristics and simulated flame length ranges derived from local topography and winds, and shows that the majority of the town's structures – and all of the areas immediately surrounding the town – are at moderate to high risk of destruction should a wildfire occur near it. However, while this dataset depicts relative likelihood of serious impacts to structures, it does not adequately incorporate the actual existence of structures and/or their ability to act as fuel into consideration. It also does not fully capture urban vegetation with coverage of less than 10 square meters, thereby excluding many urban trees in central Windsor from its fuel load calculations. These are important considerations to factor in when examining existing modeling approaches to defining wildfire risk.

[81] Lorence (2021)

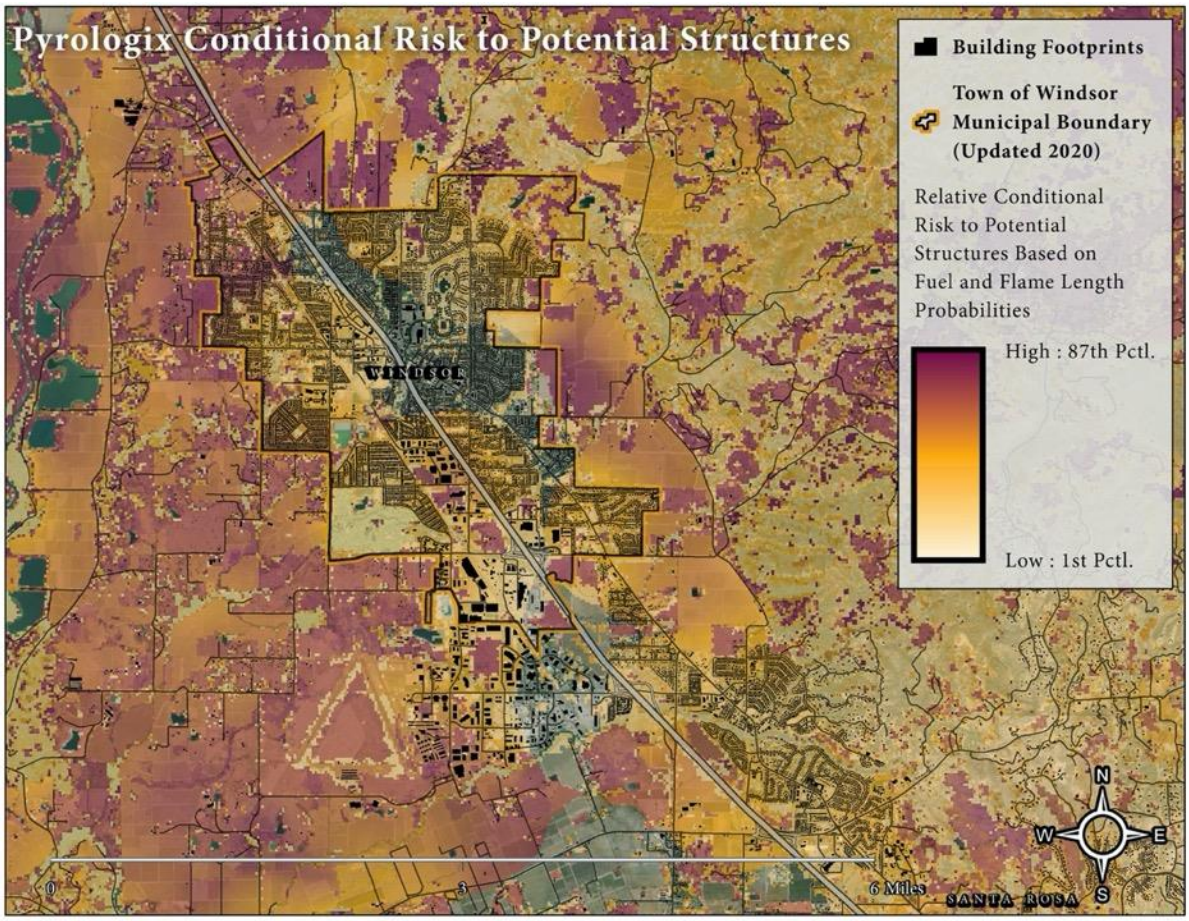


Figure 26. Building footprints and Pyrologix Conditional Risk to Potential Structure percentile rankings (relative to all CA lands). The higher the risk ranking, the more likely structures are to be destroyed during simulated wildfires occurring in the area. Note: this layer depicts relative likelihood of serious impacts to structures but does not incorporate the actual existence of structures and/or their ability to act as fuel into consideration. It also does not fully capture urban vegetation with coverage of less than 10 square meters, thereby excluding many urban trees in central Windsor from its fuel load calculations.

FIRESTORMS AND EMBERCAST

Localized shifts in wind patterns and intensity shape wildfire behavior in important ways. For example, extreme wildfires have the ability to create their own weather patterns (firestorms) and/or distribute embers miles away (ember cast). A firestorm is created when a wildfire burns with enough intensity to draw outside streams of air into the blaze, thereby increasing heat and influencing weather. They often result in wildfire behavior that is more damaging, less predictable, and harder to suppress. Firestorms form because hot air rises, and the resulting vacuum pulls in surrounding air. As the hot air reaches the upper atmosphere, it condenses and forms pyrocumulous clouds which have the capacity to generate lightning and strong winds. Lightning strikes can ignite additional fires outside the areas impacted by the original firestorm, and the strong winds contribute to the spread of any and all fires. The strong winds also have the capacity to create ember attacks, which are streams of burning material (e.g., twigs, bark, leaves, pieces of wood) that help to ignite new fires. These ember attacks act like blow torches, striking from the side or above and traveling miles from their point of origin.

This issue is also seen in recent efforts to project relative wildfire hazard severity for the state of California by both the state (via Pyrologix) and Sonoma County. For example, model simulations of ember production – now recognized as a significant risk factor in future stand-replacing, high intensity fires – show a relatively low level of risk within the area immediately surrounding Windsor, as is shown in Figure 28 and Figure 29. However, because "low" risk of ember production relative to the extreme levels of ember production that might be found in dense, mountain forests is still quite a significant threat, it is critical that planners and community members take steps to understand the risks of fires travelling long distances in a non-linear fashion. Areas surrounding the town may potentially produce significant embers during a major fire event, creating the possibility of fires starting well behind the normal defense lines put in place during firefighting efforts. If local resources for fire spotting and control are taxed by these regional fires, the potential for fires to spread unchecked in or near the town may be relatively low, but cannot be ignored.

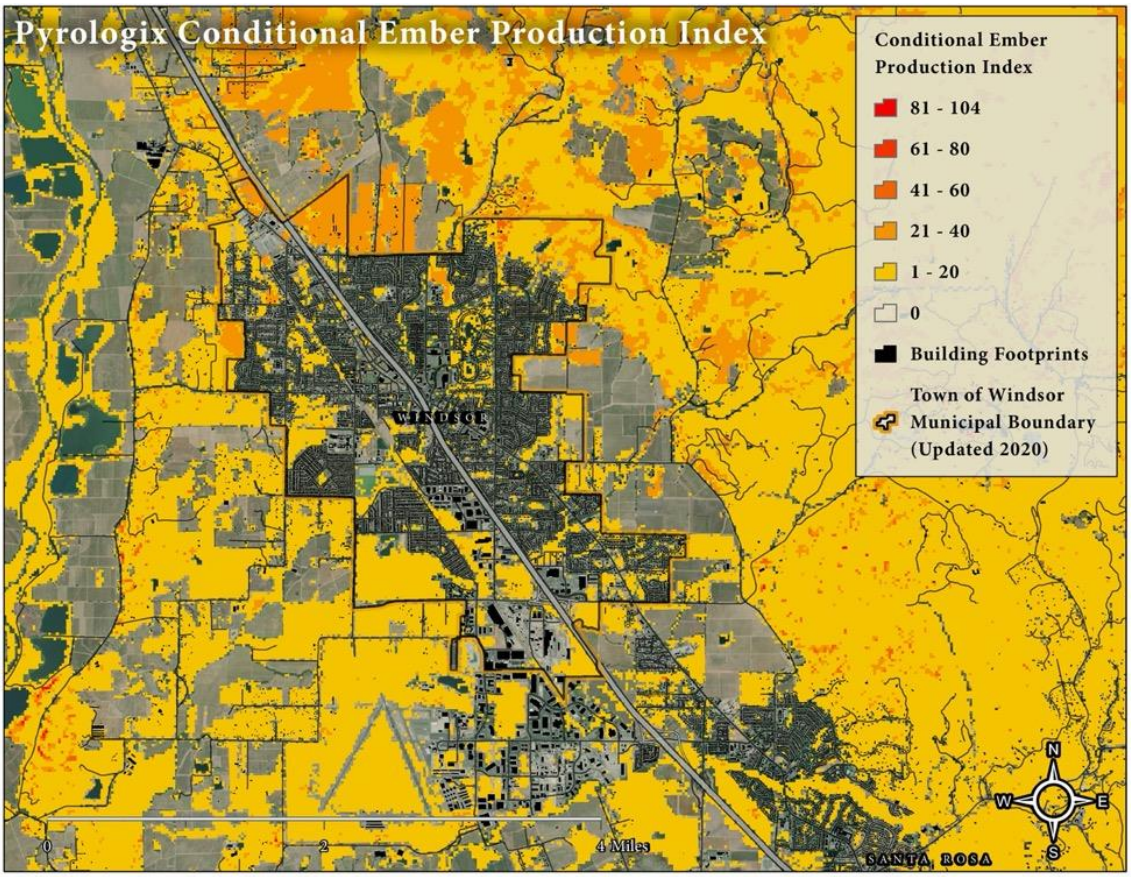


Figure 27. Pyrologix Conditional Ember Production Index for the Town of Windsor and the Surrounding Areas. Based on existing fuels, average wind conditions, topography, and fuel type, this map represents model outputs of an effort to predict the relative volume of embers produced by potential fires in the area. Relative to all of California, the area immediately around Windsor faces low and moderate ember production risks on a percentile ranking basis. However, embers produced in distant areas can be carried significant distances, and given the extreme risks faced elsewhere, "low" ember production risk within the state is no justification for low levels of caution. Forests upwind of the town to the west have significant ember production potential. (Source: Tukman, et al. 2021)

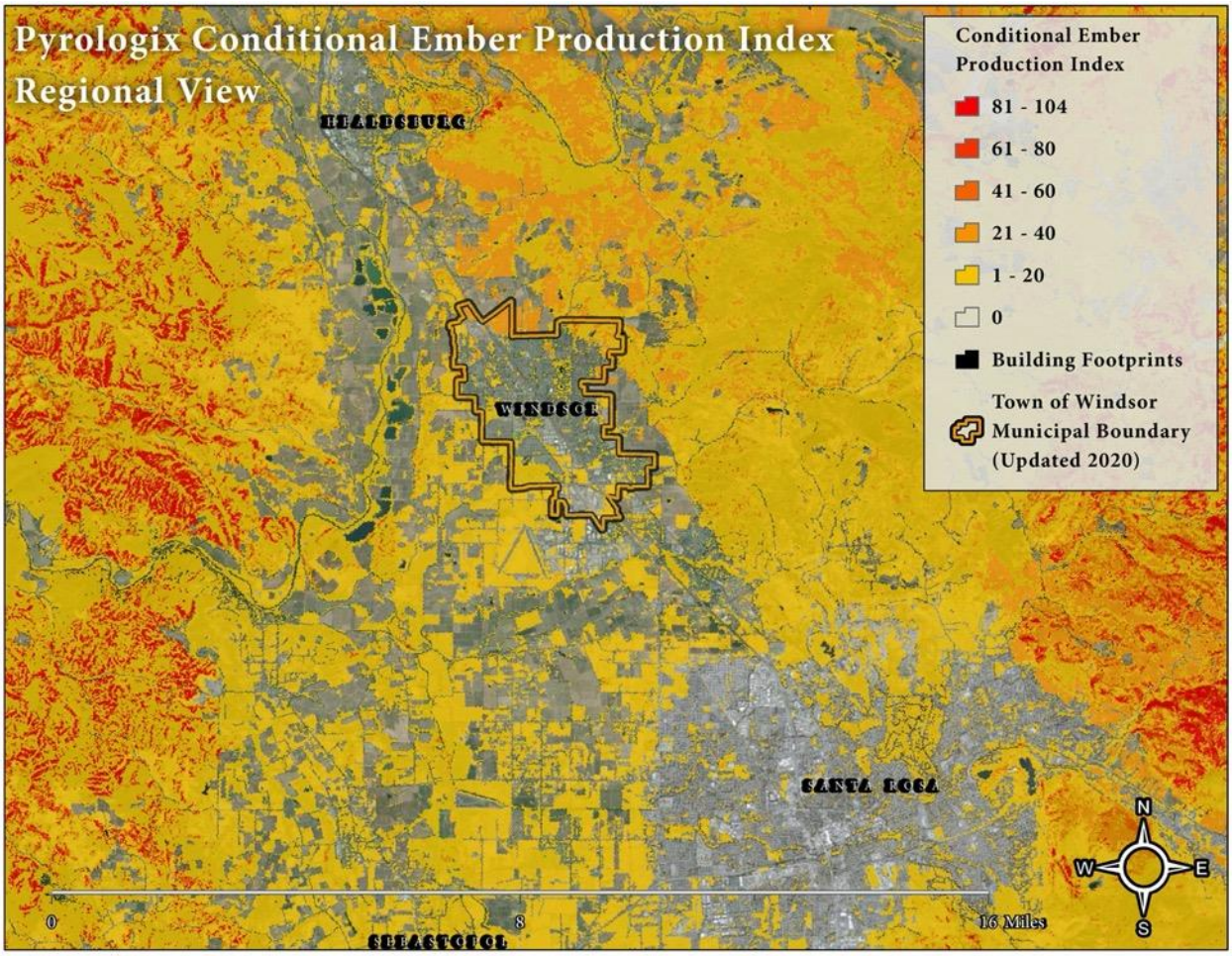


Figure 28. Pyrologix Conditional Ember Production Index for the broader region. Based on existing fuels, average wind conditions, topography, and fuel type, this map represents model outputs of an effort to predict the relative volume of embers produced by potential fires in the area. Relative to all of California, the area immediately around Windsor faces low and moderate ember production risks on a percentile ranking basis. However, embers produced in distant areas can be carried significant distances, and given the extreme risks faced elsewhere, "low" ember production risk within the state is no justification for low levels of caution. Forests upwind of the town to the west have significant ember production potential. (Source: Tukman, et al. 2021)

Typically, firestorm and ember cast behavior are not predictable using traditional models for quantifying wildfire risk. Where wildfire behavior is generally predictable and the expansion of wildfire events outside the wildland intermix and interface regions is hindered by changes in geography and vegetation, firestorms defy expectation. Firestorms exhibit much higher burn temperatures, with the ability to melt steel and PVC in the process. In addition, they consume so much oxygen that they can create their own weather systems. They also travel great distances with incredible speed; it is increasingly common for firestorms to advance at speeds exceeding 20-25 miles in a single day, consuming hundreds of square miles in a short period of time. Compared to traditional wildfires, firestorms are unpredictable, erratic, and much more difficult to suppress because of the convective forces that enable them to move against strong prevailing winds.[82] The windstorms that feed them (and those they create) can carry burning embers miles

[82] Siegler (2018)

from the fire itself, at times with such intensity as to be nicknamed 'ember attacks.' These ember-driven phenomena can ignite structures far from the fire in places assessed as falling safely beyond any WUI risk zone.[83] Firestorms, also called 'megafires,' can even produce pyro-cumulonimbus clouds that spawn "fire tornadoes." A viable secondary hazard, fire tornadoes are disasters in and of themselves, traveling beyond the wildfire front and destroying everything in their path inclusive of fire-resistant structures, vehicles, homes, and infrastructure considered well outside traditional wildfire risk zones.[84] Unlike firewhirls, which look like tornadoes but are just spinning funnels of flames (typically about 8 feet in diameter), fire tornadoes are true tornadoes and deliver an equivalent impact. The F-3 fire tornado created in the Carr Fire in 2018 was the largest and most powerful tornado in California history, and it was spurned not by a natural weather pattern but by the weather created by the wildfire itself.[85] More recently, the 2020 Loyalton Fire produced five fire tornadoes.[86]

In terms of exposure, the capacity for an ember attack or a fire tornado to transfer the heat and ignition of a wildfire miles from its source means there is no location in Windsor that is safe from this type of hazard. Increases in the likelihood of firestorm events increases wildfire exposure far beyond the boundaries of the intermix and the wildland urban interface (WUI) zones, including into the flat and more lightly vegetated Russian River Valley where Windsor is situated. For example, the 2017 Tubbs Fire approached Windsor from the southeast, assuming characteristics of a firestorm in the process. County first responders who were present at the fire describe conditions not only consistent with a firestorm, but also with fire tornadoes. In this event, a column of embers and wind-driven fire and smoke rushed beyond the WUI-designated zones into Santa Rosa's residential Coffey Park neighborhood. Responding officers described conditions as being 'unstoppable,' reporting the presence of smoke so low and dense as to obscure operations and prevent their ability to offer additional wildfire protection in the area. By the time the event was brought under control, over 1,000 structures had burned, most of which had been previously characterized as falling outside even the most moderate wildfire risk zones, including in those maps that detail LRA wildfire risk. The following maps illustrate how CAL FIRE FRAP WHRZ maps cannot accurately portray the risk of wildfires given their erratic behavior and that these phenomena are not predictable using traditional drivers of wildfire hazards (*see Figure 31*). The absence of any designation of risk within the outlined Coffey Park neighborhood as shown on this map is presumed to be the result of: 1) its location in the LRA where FHSZs that falls below the 'Very High' designation are omitted; and/or 2) it falls outside the area considered to be Wildland Urban Interface or intermix. In the third map that follows, the extent of the Tubbs fire is detailed. This fire advanced across several streets including a major multi-lane highway (Highway 101) to reach Coffey Park (outlined in blue). Much of the neighborhood burned completely, as did other residential areas just to the east. The last map details the WUI, color coded to indicate housing density. None of the Coffey Park neighborhood that was destroyed in the Tubbs fire was actually classified as WUI.

[83] Berlin (2020)
[84] Finn (2020)
[85] Cappucci (2018)
[86] Chadosh (2020)

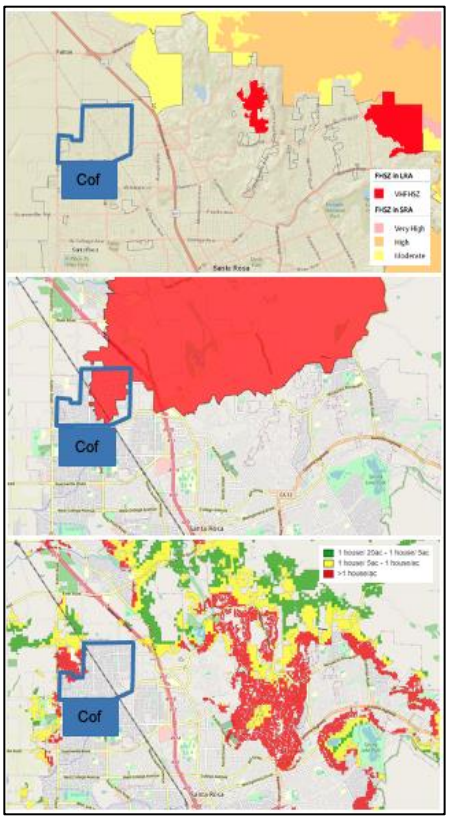


Figure 29. Coffee Park area (outline highlighted in blue and labeled Cof) wildfire maps using CAL FIRE FRAP WHRZ Data. Top: Excerpt of the 2008 CAL FIRE FRAP WHRZ Map showing no wildfire risk; Middle: Excerpt of the Tubbs Fire Extent showing the actual burned area from Coffee Park, 2017; Bottom: Wildland Urban Interface zone illustrating non-traditional wildfire risk classifications for Coffee Park. Source: CAL FIRE FRAP, 2007.

THE INDIRECT IMPACTS OF WILDFIRES

As evidenced by recent experience, wildfires produce an array of indirect impacts that affect Windsor residents. Most notably, smoke from local and regional fires present a significant threat to the health and wellbeing of Windsor residents. Wildfires create an acute and particularly severe form of air pollution through the smoke clouds they generate. New research shows that smoke is more harmful than pollution from other sources, including car exhaust.[87] These clouds contain a number of dangerous pollutants, some which cause immediate and direct impacts (especially for those with breathing difficulties like asthmatics or those with COPD), and others that are carcinogenic or otherwise damaging to public health and present long-term implications for the populations exposed. Smoke also creates social and economic problems. Because exposure to areas of high airborne pollutants as is present in wildfire smoke can cause mass public health emergencies, it is not uncommon for governments and organizations in impacted communities to cancel activities and close facilities. Schools may be forced to close or curtail activities, businesses may close or be required to protect employees' health, and certain economic or social drivers may be negatively impacted (such as occurred when wildfire smoke impacted tourism in California's wine growing regions and impacted the quality of the grapes themselves).

[87] Aguilera et al. (2021)

At the community level, it is impossible to prevent wildfire smoke given it can travel hundreds of miles. Fires burning in other states can cause prolonged periods of smoke in Windsor. As fires burn more often and for longer periods of time, smoke will become an increasing hazard even if wildfire hazard remains relatively constant in Windsor. Unlike wildfires, vulnerability to smoke has little to do with construction materials or distance from the WUI. Rather, it is a factor of an individual's health status inclusive of their age, weight, blood pressure, history of pulmonary problems, and other factors. Addressing the impacts of smoke relies on the capacity to provide clean air spaces, whether in homes, workplaces, schools, or public buildings. The community must have the capacity to monitor and predict air quality conditions as wildfires burn and communicate information to citizens that enable early action. Protocols to address the curtailment of school activities or school closures, and the direction of public and commercial activities throughout the town, will be critical. Public health facilities must be prepared to deal with a surge in associated medical conditions especially if prolonged periods of smoke occur. The greatest risk is from small particulates that are difficult to filter. These particles that are smaller than 2.5 micrometers, or less than one third the thickness of a human hair, can cause both immediate and long-term health impacts, affecting the eyes, throat, and lungs, and contributing to asthma and heart disease through prolonged exposure. Moreover, exposure suppresses the immune system which increases the prevalence of other diseases (especially during the presence of highly transmissible viruses and bacteria as is the case with the ongoing COVID-19 pandemic).

As wildfire seasons become longer, and more acreage burns as a result of increasing fire size and prevalence, the severity and scope of smoke inhalation hazards will continue to increase. Windsor is already experiencing increases in the number of days where smoke inhalation hazards exist. As exemplified in Figure 29, which reports the number of days that wildfire smoke was present in each part of the state in 2020, illustrates the scope of the problem.

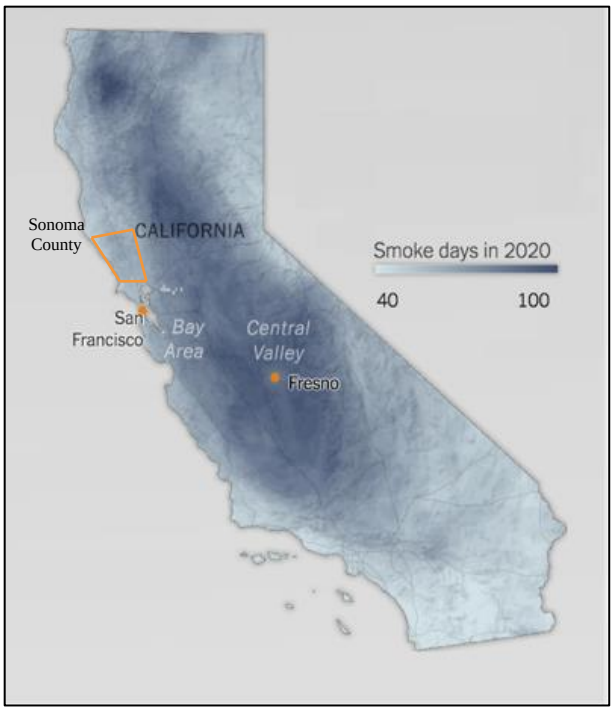
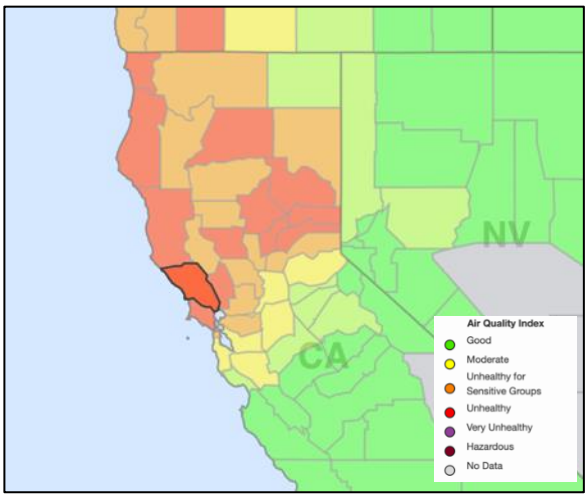


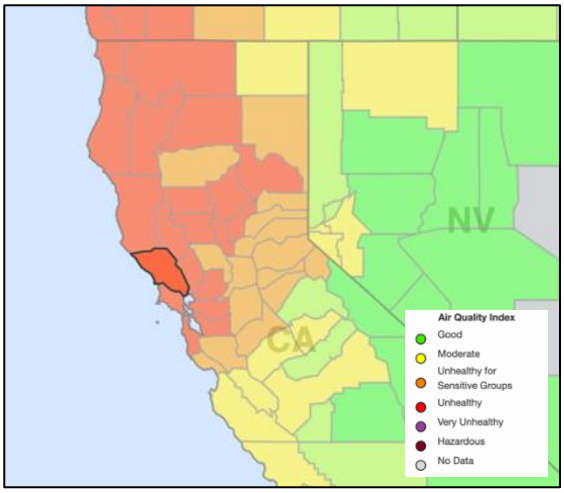
Figure 30. Wildfire Smoke Days, 2020. (Source: Stanford University, based on NOAA data)

Looking forward, it is expected that smoke inhalation hazards will increase in conjunction with an increase in wildfire risk. A study[88] that considered wildfire smoke generation behavior in past events in relation to expected climate change impacts (from weather, changes in vegetation, and other drivers of air pollution) projected smoke inhalation hazards in the western states. According to this study, smoke inhalation risk in Sonoma County is already at a very high level and will increase in intensity over the next 30 years. The study also predicted the occurrence of 'Smoke Waves', which are periods of at least two consecutive days of elevated concentrations of PM 2.5 particulates. Risk is measured according to a Fire Smoke Risk Index (FSRI) which combines wildfire frequency, intensity, and length for each county. The following maps (*see Figure 31)* portray the high and increasing risk that exists in Sonoma County, and by extension, in Windsor. The greatest change that will occur with respect to this hazard in Windsor over the next 30 years, as portrayed in these diagrams, is that smoke intensity will increase considerably.

[88] Liu et al. (2017)



Sonoma County Wildfire Smoke Risk Index – Present



Sonoma County Wildfire Smoke Risk Index - 2050

Figure 31. Current and projected wildfire smoke risk index maps for Sonoma County show an increase in wildfire smoke days. Wildfire smoke is particularly problematic for older individuals or those with pre-existing health conditions.

APPLYING LESSONS LEARNED FROM PAST WILDFIRES

In the past five years, the Town of Windsor has experienced several significant wildfire events and evacuations. In 2017, the Tubbs fire burned nearly 37,000 acres, destroyed more than 5,500 structures, and killed 22 people. While the Tubbs fire ultimately spared the Town of Windsor, it significantly impacted nearby Santa Rosa and resulted in severe smoke for weeks. In 2019, the Kincade fire - which burned more than 77,750 acres and over 350 structures - presented a more immediate and direct threat for the Town. Nearly 190,000 people were evacuated across all of Sonoma County including the entire Town of Windsor. And in 2020, multiple fires approached the Town from both the east and west directions.

For Windsor, the Tubbs and Kincade Fires represented a wake-up call by signaling that 'curb and gutter' communities in the suburbs and town center are less safe than previously believed.

Thus far, every major wildfire to have impacted the region in the past 80 years has spared the Town, and only in one instance have structures burned within the Town's jurisdictional limits. That being said, the 2019 Kincade Fire brought the reality of changing wildfire risk to Windsor's doorstep. As the wildfire advanced towards the Town, state and county modelers assessed the possibility that the entire town could be destroyed, thereby prompting a total evacuation of Windsor's residents. Windsor Police conducted a street-by-street clearing of the town over the course of four hours, aided by County fire officials, mutual aid partners, and State responders. Ultimately, the advance of the Kincade fire was stopped just as it entered the Town from the northeast at Foothills Regional Park. Not all homes were spared, but the destruction sustained was nonetheless a fraction of what has undoubtedly become possible in a similar future event. Moreover, the event created a new risk for debris flows where none had previously existed; the

result of damaged stabilization elements. By 2020, these fire scars resulted in actual threats to the parts of town located in their paths.

For Windsor, the Tubbs and Kincade Fires also represented a wake-up call by signaling that 'curb and gutter' communities in the suburbs and town center are less safe than previously believed. These events, and others that have since followed, reveal an elevated potential for loss anywhere in the Town of Windsor, and the possibility that the entire town could experience significant loss under specific conditions. A wider lens capable of accounting for alternate drivers of risk is required to better capture wildfire risk in light of firestorms, fire-generated smoke, and debris flow.

EVACUATIONS AND "TRAFFICSHEDS"

Wildfire exposure has a direct influence on local emergency response mechanisms such as wildfire evacuation. Planning for evacuation, including establishment of coordination mechanisms and methods of communicating between responders and with the public, is guided by the manner in which the wildfire hazard threatens Windsor, its resources, and its residents. Emergency evacuation procedures and principles can differ markedly between hazards in terms of warning availability, speed of approach and onset, geographic distribution, the manner in which the hazard affects human and animal life, and other factors. As wildfires become increasingly unpredictable, with ember cast and wildfire tornadoes having the capacity to travel great distances in short amounts of time, evacuation capabilities become all the more important. Multiple recent evacuations, in both 2019 and 2020, highlight both the increasing nature of wildfire risk in Windsor and the importance of having effective evacuation protocols in place. Sonoma County law decentralizes the authority to issue an evacuation order to the local level, unless arrangements (formal or informal) exist according to which the County government assumes such responsibility. The Sonoma County Sheriff's office will inform Windsor officials of the need to conduct an evacuation, yet the law does state that the declaration can be made at the Town level.[89] Therefore, the Town has the authority to issue a local evacuation order if deemed necessary. Once this notification is issued, the County Sheriff's office coordinates the evacuation effort from a local Emergency Operations Center with input from the Sonoma County Fire Department, Town staff, and other local stakeholders. Evacuation notifications are made using several channels, including app-based messages which are received by residents who have downloaded the software, local radio coverage, and through the use of 'high-low' sirens installed on Town police vehicles that are driven through priority (event specific determination) neighborhoods. The County also is the primary alert activator for SoCoAlert, WEA, EAS, and Nixle alert messages.

In May 2021, the Town of Windsor published updated evacuation sub-zone maps (see Figure 31). These maps were originally developed by representatives of the Town Emergency Operations Center during the Kincade Fire and were crosschecked with the police and fire departments. Since that time, the maps have been maintained and updated, and informed the evacuation coordination for the Wallbridge and Glass Fires in 2020. County deputies and Town officers coordinated in their efforts to go door to door to ensure that residents were evacuating.

[89] Sonoma County (2021b)

Since that time, the Town has identified a need for continued public education and awareness with these maps to ensure that all residents are aware of their own evacuation zones if needed.[90]

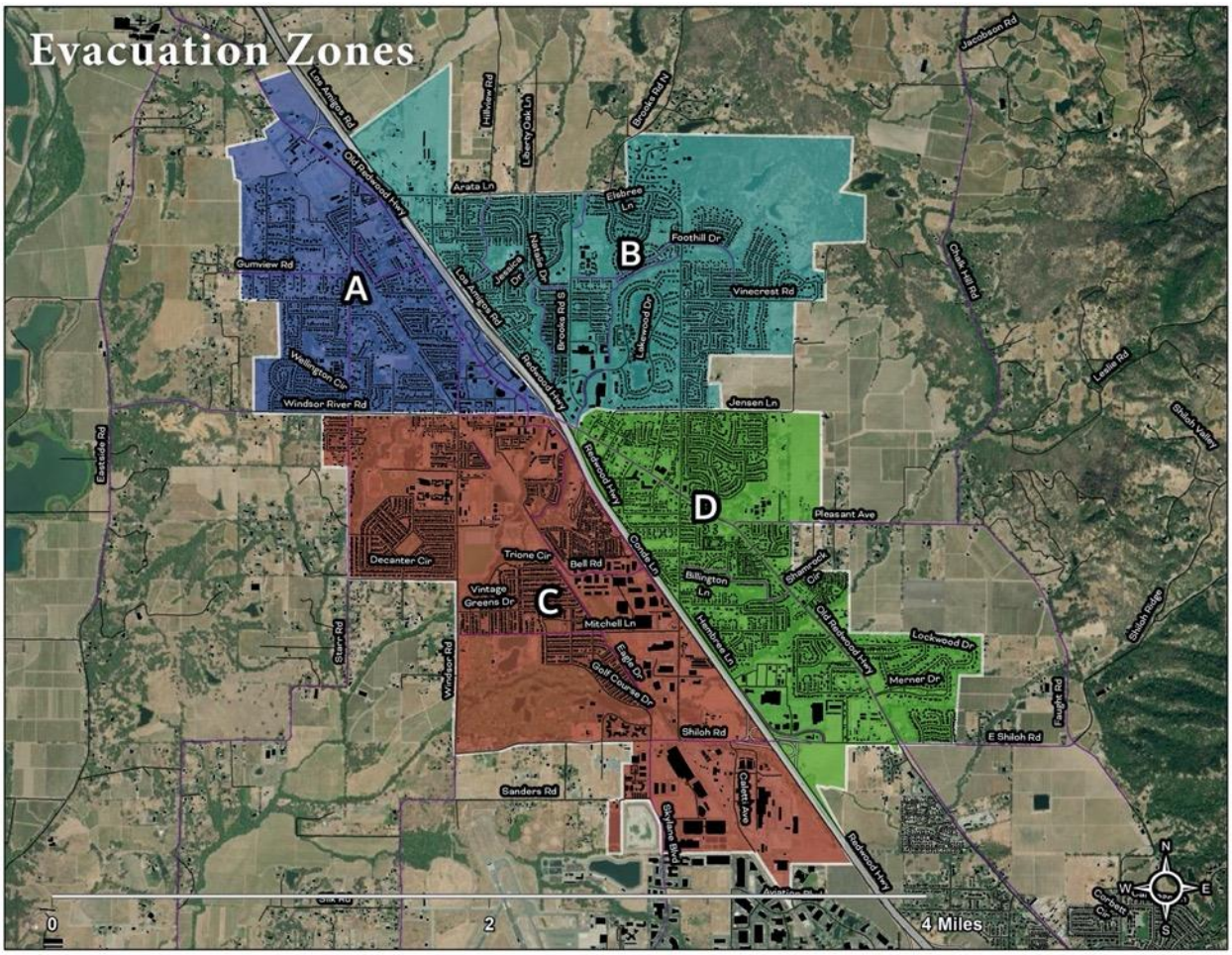


Figure 32. Evacuation zone map for the Town of Windsor published May 2021. Source: Town of Windsor.

A recent study highlighted the significance of wildfire ignition points and wildfire detection times when planning for extreme wildfires,[91] demonstrating the unique challenges that emergency planners are faced with when planning for evacuations during catastrophic wildfires exacerbated by climate change. In this current planning reality, there are a number of factors that determine whether or not an evacuation is carried out successfully including: fire spread rates, wildfire ignition points, the time it takes to detect a wildfire, warning technologies, evacuation decision-making and communication, and random adverse events.

In 2019, California State bills SB 99 and AB 747 were signed into law and added new requirements for including evacuation routes in the Safety Element of a community's General Plan. According to Cal OES, SB 99 specifically required that the safety element "must be updated to include information identifying residential developments in hazard areas that do not have at least two emergency evacuation routes."[92] AB 747 specifically required that evacuation

[90] Town of Windsor (2021b)
[91] Cova et al. (2021)
[92] State of California (2021)

routes must be identified including "their capacity, safety, and viability under a range of emergency scenarios," in an emergency operations plan, LHMP, or other community planning document. Generally speaking, this information should be included in a community's Emergency Operations Plan (EOPs) and/or Emergency Action Plan (EAPs) as both documents are updated annually and are used to guide a community's emergency response during a disaster. Neither bill requires a standard nor provides recommendations for how many homes are "allowed" a single evacuation route in any particular community.

"TRAFFICSHEDS", CHOKEPOINTS, AND CRITICAL INTERSECTIONS

Any evacuation event will put stress on the existing transportation network as most, or all, of Windsor residents, as well as people residing in rural areas to the east and west of the town, will require access to just a few critical road segments that allow travel away from the threat. The curvilinear nature of some of the Town's neighborhood street networks, especially east of the 101, increase the criticality of certain intersections as many evacuees will feed into these exchanges that provide access to the regionally connected network. This has the potential to create evacuation chokepoints particularly at major arterials that will likely require additional attention from the Town either in the form of personnel deployment during an evacuation event, redesign of street geometries, or evacuation signal timing -- all methods of increasing adaptive capacity.

In an effort to identify which specific neighborhoods and intersections might face the biggest risks of bottleneck formation, the project team developed a "trafficsheds" approach. This approach looks at networks of residential and commercial streets, lanes, courts, other smaller roads that are linked to one another - and the various points at which these self-contained networks are connected to the major roadways and arteries throughout the Town. These points of connection between neighborhoods and the main road network are "exit nodes," also referred to in other state planning documents as "ingress/egress points" and, if unable to handle the traffic loads during evacuation events, have the potential to become severe bottlenecks. In normal times, they also represent critical infrastructure for the specific neighborhoods that rely on these intersections to go about their daily activities. Identifying these nodes and the areas served by them, can highlight where potential congestion might be the highest. The areas defined by a shared set of ingress/egress points to the main road network are "trafficsheds" (derived from the term watersheds, which comprises the total area into which precipitation drains to a particular stream).

A trafficshed includes the total area and structures that "drain" to an internally linked set of major road network access points (*see Figure 34*). To develop this dataset, the project team used 2019 USDA NAIP imagery, ESRI and Google satellite composite imagery services, Microsoft Bing Building Footprint layers, Sonoma County parcel data, USGS road network, and manual identification of 153 distinct trafficsheds within, and immediately surrounding, the town.

This work highlights:

- Residential or commercial road networks with limited connections to the larger road system, especially those with only one way in or out (i.e., one ingress/egress point);
- The number of structures and their zoning designation served by each particular sub-network of roadways; and
- The ratio of structures (primarily residential homes) to the ingress/egress points available to them, highlighting both areas with few ingress/egress points and those with multiple but high numbers of structures dependent upon them.

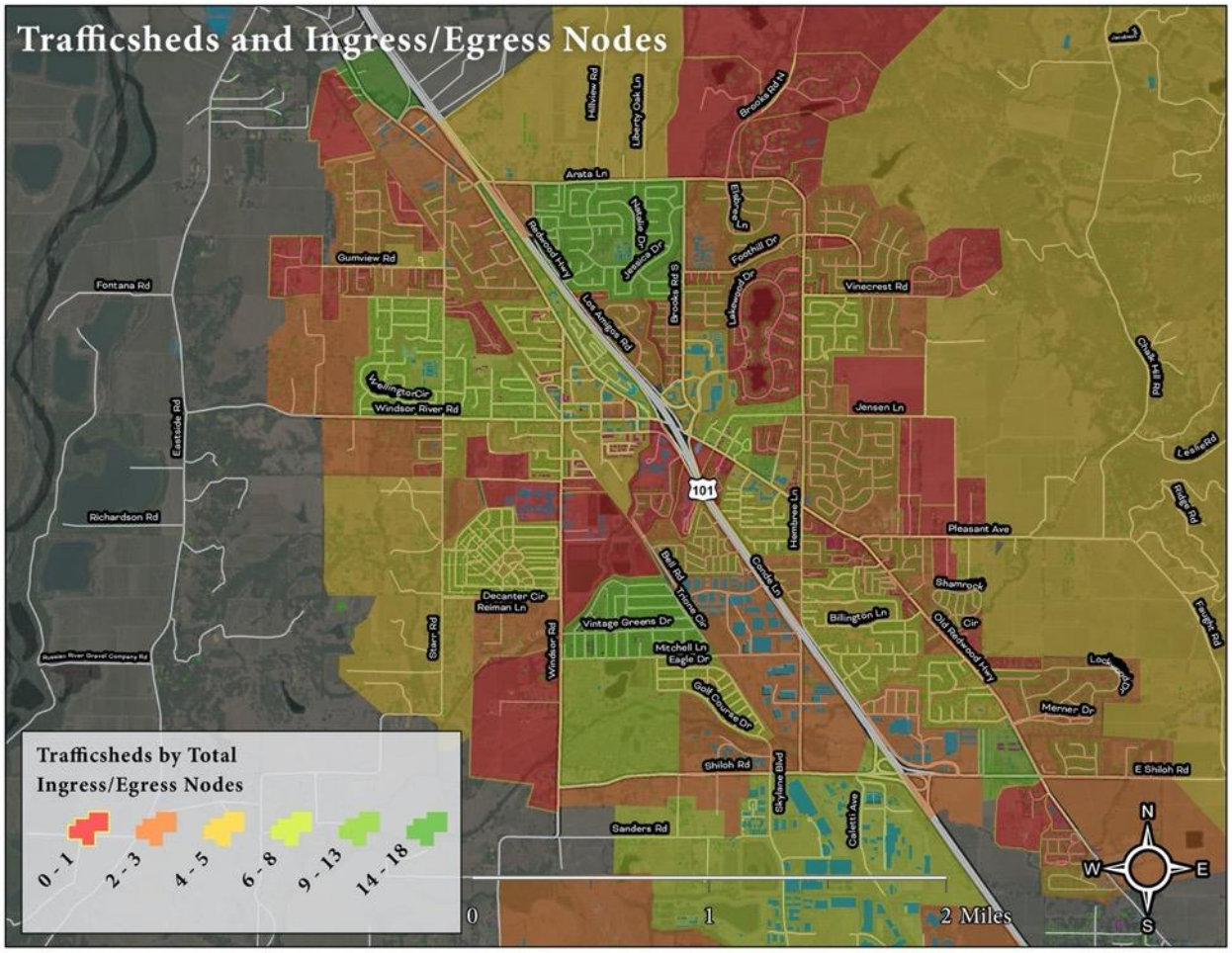


Figure 33. Map of Trafficsheds for the Town of Windsor and surrounding areas. Trafficsheds are areas defined by a shared set of ingress/egress points to major roadways. Areas shown in reds and oranges have fewer ingress/egress points. Those shown in light green and dark green have more access points. The number of access points per residential structure or business can affect or limit the flow of traffic and people during emergencies, especially those that require large numbers of people to evacuate.

CONSEQUENCES/IMPACTS

PEOPLE

Wildfire poses a direct threat to the safety and wellbeing of all Windsor residents. Due to the small size of the Town and to the changing dynamics of wildfires, wildfires pose a significant and direct threat to the health and safety of the residents of the Town of Windsor. As exemplified by past examples (e.g., Coffey Park), changing fuel, weather, and climate conditions increase the exposure of Windsor residents to wildfire. This is particularly true due to limited evacuation routes in the Town and the proximity of the Town to the wildlands, especially for residents with limited access to vehicles, disabilities, older adults, children and families with children, and those that experience mobility issues. The proportion of Windsor residents below 17 and above 65 make up a significant percentage of Town demographics (in some areas of the Town, as high as 42.4%), which presents unique evacuation challenges during a wildfire.

Limited regional transportation network connectivity and limited egress/ingress for some Windsor neighborhoods pose significant safety and health concerns during an evacuation due to wildfire. Due to a combination of reliance on personal vehicles and chokepoints in the roadway network, Windsor residents and emergency responders may face congestion while traveling in and out of the Town during a wildfire. In addition, access to/from homes and critical services, such as hospitals, social services, water, energy and food supplies, is essential during and after a wildfire.

There are a significant number of sections located in the Windsor network that service a considerable number of people and have limited roadway connectivity. As evidenced in Table 3, there are several trafficsheds (as defined in this analysis) with limited ingress/egress points, which could significantly limit the ability of residents to evacuate the Town safely in the case of an emergency. Although not in Windsor, technically, the area to the east of Town is also of some concern, as it includes over 800 residential and agricultural structures and is confined to 4 feasible evacuation points for accessing Highway 101, 2 of which are Pleasant Ave and East Shiloh Rd. These roads both intersect Old Redwood Highway (Sonoma County evacuation zones 2L7, 2M1, 2N1), complicating potential evacuation considerations with Windsor Evacuation Zone D (208+ structures per exit). Other neighborhoods clearly in the WUI zone with limited exit points include: Vinecrest Road and Foothill Drive (253 structures, 2 exit points); Glen Miller Way (124 structures, 1 exit point); Winemaker, Reiman/Oak (491 structures to 4 exits); and Broadleaf Circle (333 structures, 3 exit points); that all have more than 100 structures to each exit point. There are 58 trafficsheds that have only 2 or 3 exits, containing 3083 single-family residential structures, 11 multifamily structures, 490 commercial structures, and 47 agricultural structures. Among these, the Shadetree/Leafhaven neighborhood (500 structures, 3 exits), Foothill Dr. neighborhoods (253 structures, 2 exits), and Merner/Savannah neighborhoods (197 structures, 2 exits) are the most prominent in terms of likely residents dependent on a small number of outlets during an emergency. Although not directly located in the WUI (and therefore not included in Table 3), another couple of areas of concern are the Herb/Kidd/Gumview intersection which contains 295 structures and only one exit node at Gumview and Starr. In addition, Lakewood Drive at the Lakewood Hills subdivision has 185 structures and only one 1 exit node.

Table 3. Select critical intersections that serve trafficsheds located in the WUI. While the WUI is no longer the sole determinant of wildfire risk for the community, these intersections provide ingress/egress routes for a large number of structures (and therefore people) and provide critical connections to the broader transportation network for these residents, both to allow residents to leave in the event of an emergency evacuation and to allow first responders and firefighters into these neighborhoods during a wildfire event. All intersections in this table serve a minimum of 50 structures.

Critical Intersections That Serve Trafficsheds Located in the WUI				
Key Intersections for Trafficshed	**# of Structures**	**# of Residential Zoned Structures**	**# of Exit Nodes**	**Structure : Exit Ratio**
Herb/Kidd/Gumview Rd	295	291	1	295
Mountainous Area (Access to Windsor via Pleasant or Shiloh)	833	479	4	208.25
Vinecrest Rd and Foothill Dr	253	253	2	126.5
Glen Miller Way and Brooks Rd	124	124	1	124
Winemaker/Windsor, Reiman/Oak, H/Starr	491	491	4	122.75
Broadleaf/Circle/Basswood/Conde	333	333	3	111
Savannah/Merner/Old Redwood	197	197	2	98.5
Elabree/Arata	195	191	2	97.5
Old Oak/Armondo Renzulo/Conde Ln (Windsor Creek Elementary)	90	77	1	90
Lazy Creek/Foxwood/Los Amigos	153	149	2	76.5
Jessica/Brooks; Arata/Camelot; Amigos/Cordelia	755	742	10	75.5
Old Redwood/Shamrock Cir (Shamrock MHP)	141	132	2	70.5
8th, 9th, 10th Hole and Mitchell Ln	274	274	4	68.5
Ventana/RioCamino/Macero and Foothill Dr	132	132	2	66
Pulteney Pl/Bond Pl and Brooks Rd S	128	128	2	64
Billington/Northampton and Hembree Ln	315	315	5	63
Starrview/Bingelli/Orion, Buckingham/Starr	414	400	7	59
Jones Rd and Windsor Rd	53	44	1	53
Vinecrest Cir	50	50	1	50

Regional transportation considerations may impact the ability of Windsor residents to evacuate in an emergency. The town has four main evacuation zones (shown in detail in Figure 35). Each evacuation zone contains potential chokepoints in the case of an evacuation. If heavy traffic from Santa Rosa emerged due a wildfire coming from the Southeast, the ability of Windsor residents to evacuate will also be affected. Another example are the houses and facilities off of Brooks Rd to the north of Town and Evacuation Zone B, where 91 mostly residential structures empty through a single ingress/egress node onto Arata Lane. These areas are both directly exposed to wildland vegetation in difficult to manage areas and have shown substantial regrowth in areas where the Kincaid Fire burned. Furthermore, many homes outside the Town boundary in the nearby WUI are only accessible through narrow, one-way, and/or heavily vegetated roads.

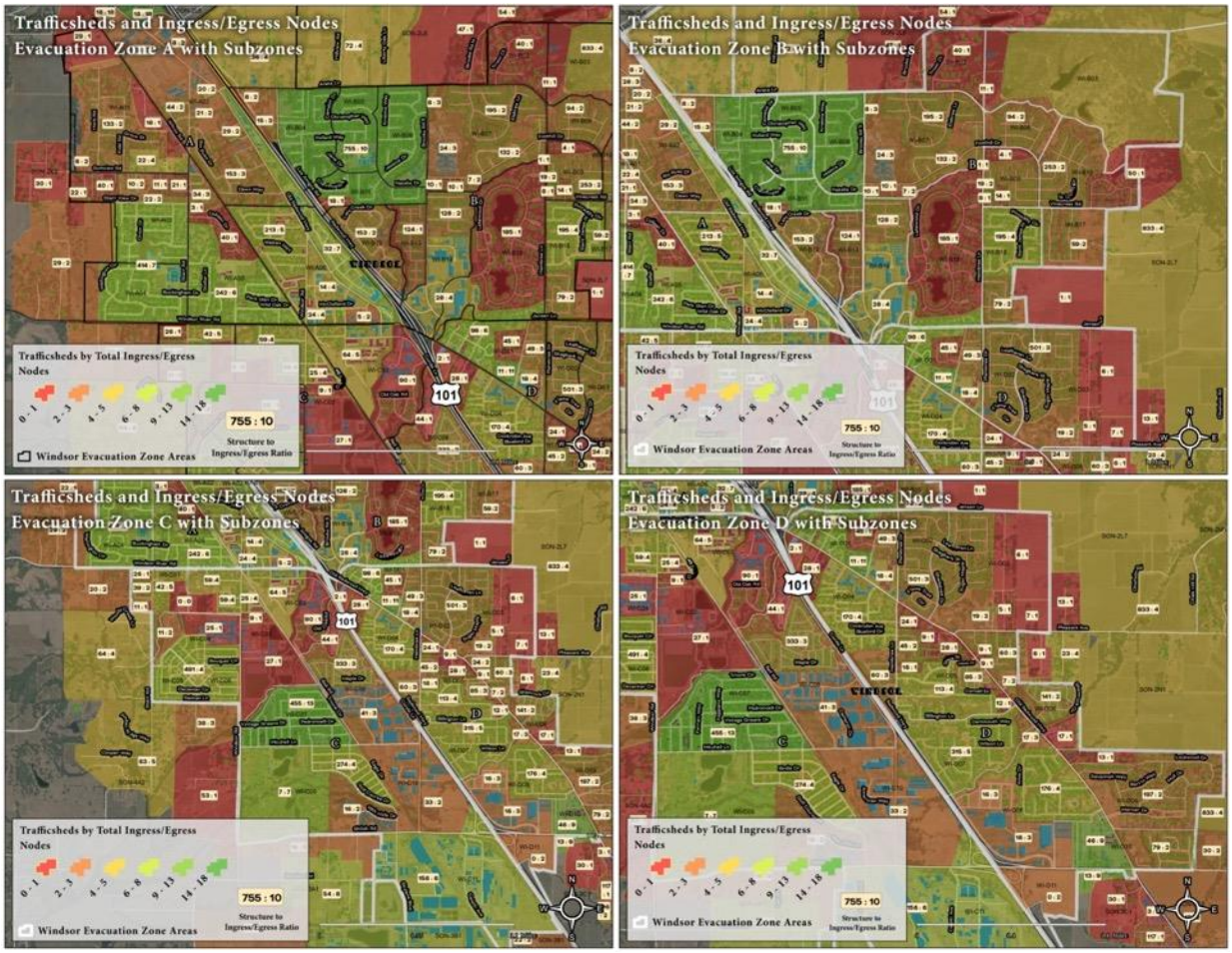


Figure 34. Trafficsheds for the Town of Windsor's Evacuation Zones. Trafficsheds (areas defined by a shared set of ingress/egress points to major roadways) for the Town of Windsor and Windsor's Evacuation Zone A (Top Left), Zone B (Top Right), Zone C (Bottom Left), Zone D (Bottom Right). Areas shown in reds and oranges have fewer ingress/egress points. Those shown in light green and dark green have more access points. The number of access points per residential structure or business can affect or limit the flow of traffic and people during emergencies, especially those that require large numbers of people to evacuate. To reference larger versions of these graphics, see Appendix A.

Smoke from near and distant wildfires pose a significant health concern for the residents of Windsor, particularly community members that have pre-existing health conditions like asthma, heart disease, and more. In some instances, residents recall smoke from distant fires having more of an impact on the region than smoke from fires in much closer proximity. New research shows that smoke is more harmful than pollution from other sources, including car exhaust.[93]

Specific indicators (including race, socioeconomic status, mental health, and ethnicity, among others) influence the ways in which residents will be impacted during and after a wildfire. A 2018 study highlights that more than 29 million people in the U.S. are at risk of wildfire, but 12 million people would be devastated by the event because they lack the financial means or insurance to rebuild.[94] A variety of factors exacerbate the risk of wildfire that certain Windsor residents face. This is especially true for parts of Town that experience poverty, extreme housing cost burdens (in some areas as high as 22.6%), and renters with severe housing burden. In some parts of the Town, over 49% of the population are of minority status and may face unique barriers to evacuating (e.g., linguistic isolation) and recovering post-wildfire. In addition, many people exposed to extreme events or natural disasters, such as wildfires and prolonged smoke exposure, experience stress reactions or serious mental health consequences. These can include symptoms of post-traumatic stress syndrome (PTSD), depression, and general anxiety as well as mental health effects such as grief/bereavement, increased substance abuse or misuse, and suicidal thoughts. All of these reactions can exacerbate existing mental health conditions or lead to the onset of new ones that can significantly impact the lives of residents and be especially problematic for sensitive populations.[95]

BUILDINGS

Due to ember cast, firestorms, and other changing wildfire dynamics, all structures within the Town of Windsor are vulnerable to loss and/or damage from wildfires. Very few of the Town's buildings and homes are located in the WUI - a traditional indicator of sensitivity to wildfire. Yet, increasing wildfire exposure due to climate change (among other factors) is exacerbating wildfire risk and the potential impact on Windsor homes continues to increase. Under an extreme wildfire scenario, all Windsor homes and businesses are sensitive to the impacts of wildfire - particularly those in closer proximity to the wildlands, as evidenced by past regional wildfires (e.g., Coffey Park). Wildfire embers can travel up to ~5 miles in extreme weather conditions, therefore due to the proximity of Windsor to the wildlands on the East and West sides of the Town, and the fact that Windsor is only ~3 miles wide at its greatest width, the general exposure of all Windsor homes and businesses to wildfire is high. Most of Windsor's commercial buildings and critical facilities (e.g., police and fire department buildings) are located in the central part of the Town, which may be easier to protect in the case of a wildfire. Across the county, over 30 fire stations are located in "high wildfire risk areas," potentially limiting the emergency responders to protect local assets in the Town.[96] Several Windsor schools and retirement homes are located near the periphery of the wildlands, resulting in increased exposure to wildfire.

[93] Monroe (2021)
[94] Davies et al. (2018)
[95] USGCRP (2016)
[96] FireSAFE Sonoma (2016)

Most homes within Town boundaries do not use fire-resistant materials or construction methods. Most of the homes built within the town boundaries (where wildfire risk has historically been considered as limited) were not built with fire-resistant materials or construction methods because they were built prior to the Town's incorporation. As a part of the 2019 Building Code updates, the Town adopted additional 7A building standards to create additional requirements for existing and new construction to meet more rigorous fire-resilient building standards. New homes are required to meet those standards, and there are trigger mechanisms in place for older homes to become wildfire code compliant, yet new builds and homes that have already undergone this process represent a small proportion of homes located within Town boundaries. This means that the sensitivity of homes and businesses within Town boundaries to wildfire is classified as high. Adaptive capacity of homes to be retrofitted with fire-resistant building materials and construction methods is relatively medium/high, but additional municipal codes, policies, or programs that require or support these changes would improve this.

INFRASTRUCTURE

Infrastructure damaged and destroyed by wildfire can have significant impacts on the safety, health, and well-being of Windsor residents, particularly during an evacuation. Most telecommunications and electric utilities infrastructure in Windsor were built prior to codes requiring utilities to be undergrounded, therefore are at risk from being damaged or destroyed due to wildfire. If damaged or destroyed, telecommunications infrastructure - which is essential during an evacuation or emergency response - can pose significant safety and health concerns for residents. This is particularly true for residents who live in hard-to-reach areas, who experience technological barriers, or those who face linguistic isolation. Overall, the sensitivity of telecommunications infrastructure that supports the Town is considered high.[97] Regionally, the county relies on a wireless communications network for its broader public safety and emergency response communication, and 6 out of 11 total tower sites are located in areas considered at high risk of wildfire.[98] Specifically, Windsor's infrastructure was not developed with emergent fire risk in mind, which has left both networks and nodes more vulnerable to the effects of wildfires, and the capacity to meet the demands that are likely to arise in a rapidly-escalating wildfire emergency as inadequate.

Regional wildfire risk impacts the functionality and use of electric, water, and telecommunications infrastructure that residents rely on. Some of the Town's water, telecommunications, and electric utility infrastructure that residents rely on is at risk of being damaged or destroyed due to wildfire. For example, the Town's water distribution lines - while buried at depths ranging from 32 inches to over eight feet - are made of PVC, which can distort at fairly low temperatures (~180 °F). In the case of a large wildfire, damage to these lines could generate leaks in the water distribution system resulting in disruption to water supplies and expensive repairs (as seen in the Fountaingrove area of the City of Santa Rosa due to the Tubbs Fire).

Recent catastrophic wildfires across the State triggered by damaged or downed power lines have also led utility companies like PG&E to take short-term measures to reduce the risk of power

[97] FireSAFE Sonoma (2016)
[98] FireSAFE Sonoma (2016)

line-induced wildfire ignitions.[99] This includes implementing Public Safety Power Shutoffs (PSPS) - regional power shut offs for homes and businesses - during Red Flag Warning days (days with low humidity levels, sustained winds above 25 MPH, wind gusts above 45 MPH, and dry fuel conditions).

NATURAL SYSTEMS

Extreme wildfires can cause biodiversity loss and significantly impact the ability of ecosystems to regenerate post-wildfire. Wildfires and toxic smoke can cause significant biodiversity loss that is hard for some systems to recover from. For example, a recent study connected wildfires in 2020 to massive migratory bird die-offs in the west.[100] In addition, wildfires exacerbate the ability of invasive species to outcompete native grasses, forbs, shrubs, and trees and also are more susceptible to fueling additional wildfires.

Post-wildfire precipitation events can create additional hazards that impact natural systems, people, infrastructure, and buildings. Catastrophic wildfires can lead to increases in water runoff, erosion, and landslides due to the destruction of soils, shrubs, forbs, grasses, trees, and additional organic materials on the forest floor (aka detritus or litter layer). Extreme wildfires inhibit the ability of soil to absorb water and increase the rate of precipitation runoff and erosion, particularly on steep hillsides. In addition, it also limits the ability of seeds to germinate and survive, creating a negative feedback loop for forest regeneration.[101] These secondary impacts can be particularly damaging to sensitive aquatic ecosystems, especially those that support threatened and endangered species (e.g., California Coast Coho Salmon).

ECONOMY

Wildfires can have significant direct and indirect impacts on the regional economy. Regional wildfires and the subsequent smoke that they produce close businesses, disrupt operations, or limit businesses to operate at full capacity. An analysis by Moody's Analytics estimated that the Kincade Fire caused $235 million in lost economic output. In the broader region, wildfires limit the ability of tourists to travel to popular destinations (e.g., wineries) in the county which also impacts the local economy. Wildfires directly impact agriculture and viticulture economies by destroying essential and critical infrastructure, vines and vineyards, and wine stocks.[102] [103]In addition, wildfire smoke can impact vintners and wineries due to "smoke taint," a process in which grapes are exposed to wildfire smoke producing a charred, smoky, burnt, or medicinal flavor.[104] These systems can take significant time to recover.

[99] Pacific Gas and Electric (2021)
[100] Learn (2021)
[101] Chen et al. (2019)
[102] Tatko-Peterson, A., & Orlin, M. (2017)
[103] Canon (2020)
[104] Ramakrishnan (2020)

Flooding

VULNERABILITY SUMMARY

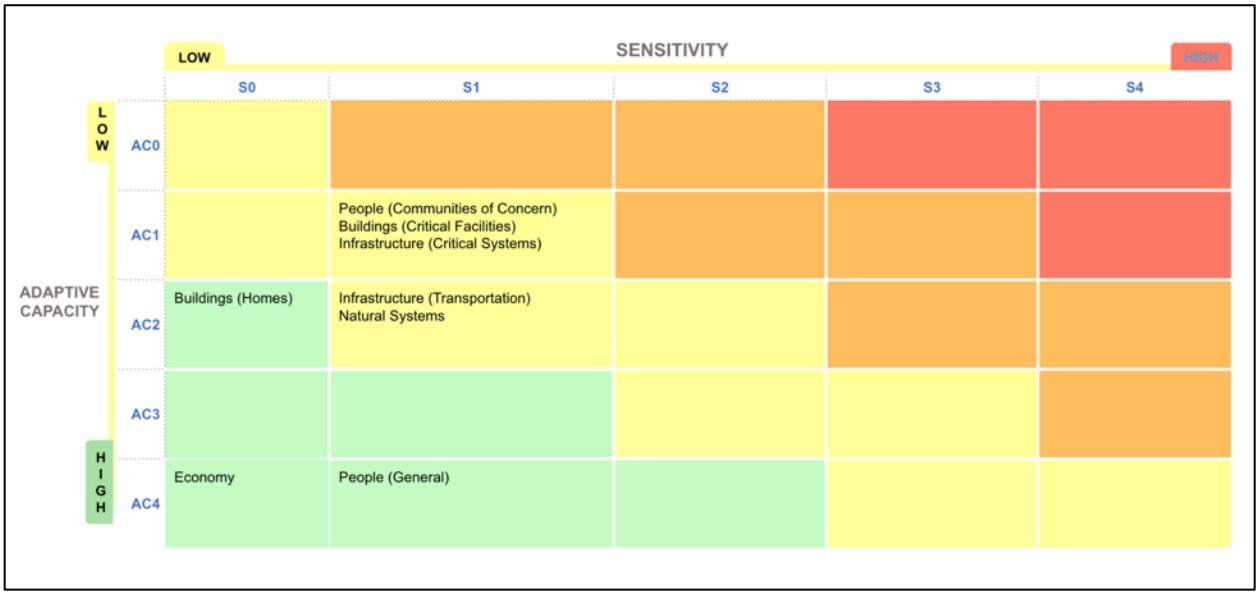


Figure 35. Relative vulnerability assessment of flooding for Windsor's primary assets. Vulnerability is shown by the different colors of the matrix (Red = Extreme Vulnerability; Orange = High Vulnerability, Yellow = Medium Vulnerability; and Green = Low Vulnerability). Given the climate hazards, relative vulnerability is based on the assessment of sensitivity (x-axis ranging from S0 = not at all sensitive to the projected changes to S4 = extremely sensitive to the projected changes) and adaptive capacity (ability to respond to those changes ranging from AC0 = no ability to respond to AC4 = ability to respond to projected changes in a beneficial way).

PEOPLE: Windsor's residents have limited vulnerability to flooding; however, Communities of Concern are moderately vulnerable due to their sensitivity to secondary and tertiary flood impacts (e.g., transportation disruptions, water quality threats, or power outages). From a life safety standpoint, it is highly unlikely that any resident would be injured or killed as a result of fluvial (riverine) or pluvial (rainfall-induced) flood forces other than in attempting to drive through moving flood water that has accumulated at intersections and roadway segments with known flood risk. This results in a low sensitivity rating (S1) and a high adaptive capacity (AC4) of the general Windsor population. If flood waters were to result in contamination of Town water supplies, a boil water order may have a more severe impact on people who may not receive or understand boil water warnings, or whose health status puts them at greater risk if they are to accidentally ingest contaminated water. And finally, those whose health or safety require continuous delivery of one or more utility services (water, electricity, communications) or services (e.g., daily medical support) that might be temporarily impacted by flooding are more vulnerable than the general population. While the overall sensitivity of Communities of Concern remains the same as the general population (S1), the ability of these populations to adapt to changing flood conditions is much lower (AC1) than the general population.

BUILDINGS: Homes and critical facilities are moderately vulnerable to flooding. Most homes and critical facilities have a low sensitivity to flooding (S1) because they are constructed outside of the 100- and 500-year floodplain or are elevated above areas exposed to pluvial flooding (e.g., ponding, runoff). The vast majority of at-risk properties (homes and critical facilities) that have been identified as being exposed to a flood event of 1% annual likelihood (a 100-year flood) are unlikely to sustain inundation of a depth exceeding 12 inches, and almost no properties would experience greater than 18 inches of inundation.[105] Climate change will increase the number of exposed buildings over the next thirty years, but only by a small number. The most widespread impact will be street flooding leading to and in front of exposed buildings. Buildings inherently have a lower adaptive capacity to flooding (AC1 for critical facilities and AC2 for homes) rating due to their fixed nature.

INFRASTRUCTURE: Windsor's infrastructure is moderately vulnerable to flooding. Flooding has the potential to impact several networked transportation systems, including water, transportation, power, and communications, yet the sensitivity of these networks is generally low (S1). There are a small number of key infrastructure nodes, including schools and assisted living facilities as well. Of greatest concern is that contaminated flood waters will negatively impact Windsor's fresh water supply. Past flood events have impacted power infrastructure, leading to widespread yet short lived power interruptions. Transportation infrastructure is the most regularly impacted infrastructure system, but the impacts are generally limited in duration to the time required for drainage to occur, and with little to no long-term damaging effects. The schools and assisted living facilities are unlikely to sustain flooding within the facilities themselves, but access to and from these facilities, and primary utility services, may be interrupted. The Town has jurisdiction over local road infrastructure but less over other utility networks, and the ability of these systems to adapt to changing flood conditions are inherently low due to the permanence of the infrastructure, leading to a low adaptive capacity rating for transportation networks (AC2) and other infrastructure systems (AC1).

NATURAL SYSTEMS: Windsor's natural systems have limited vulnerability to flooding. Exposure to fluvial flooding within Windsor itself has remained largely consistent with the natural 100- and 500-year floodplains, while pluvial flooding has not increased in an appreciable way as to impact natural systems. The natural adaptive capacity of flood prone areas has typically limited the loss of grasses, plants, shrubs, and other protective vegetation, nor has there been a high incidence of erosion. The potential for contamination exists if a flood triggers the release of hazardous materials, but to date this has not been found to be a significant threat within Windsor.

ECONOMY: Windsor's economy has limited vulnerability to flooding. Direct financial costs associated with the flooding of public and private property and infrastructure in Windsor remains low on account of the availability of risk transfer mechanisms, and the low likelihood that transportation infrastructure is heavily damaged. Disruptions caused by flooding are relatively limited in duration, and do not tend to disrupt business operations or government services. Temporary roadway disruptions represent inconveniences, but the existence of viable alternatives (detours) mitigates larger economic costs associated with such disruptions.

[105] Flood Factor (2021)

WINDSOR FLOOD EXPOSURE OVERVIEW

Flooding occurs when there is an overabundance of water on land (or which engulfs property) that is normally dry. A flood can result from very different conditions and causes, which include sustained or heavy rainfall, melting snow, obstruction of natural waterways (e.g., by beavers, ice, debris, or landslides), reduced absorptive capacity of land, rapid release of stored water, and others.

Major floods affecting large geographic areas are typically associated with large-scale weather systems that generate prolonged rainfall. However, flood events with significant impact can develop over very short periods of time as occurs following an intense thunderstorm or the failure of a dam, for example. There is much less opportunity for warning with flash floods, dam breaks, and other rapid onset flooding events that reach peak velocity within minutes, making these types of events much more likely to require rescue efforts or result in the loss of human or animal life. The complexity and multifaceted nature of impacts associated with flooding often make this hazard the most highly prioritized in at-risk communities. First and foremost, floodwaters can be highly destructive to anything they contact, whether that is the built environment, natural resources, or people.

Flooding remains the most frequent and economically damaging[106] natural hazard worldwide. This statistic is also true at the national level in the United States, where flood-related damages amount to a staggering $17 billion[107] per year on average. Flood exposure in the United States is primarily the result of an extensive stock of housing and other community infrastructure that has been constructed within the designated floodplain (the technical distinction for land that subject to a 1% annual chance of flooding, often referred to as the '100-year flood' even though several 100-year flood events can and often do occur in quick succession). The First Street Foundation, a nonprofit organization that uses a combination of Federal, academic, and other sources of flood risk assessment data, estimated in 2020 that at least 14.6 million US properties, including the homes of 41 million people,[108] are exposed to this threshold 1% annual risk from flooding.
A risk assessment conducted during the development of Sonoma County's Hazard Mitigation Plan found that flooding is the County's leading natural hazard threat (mirroring the national experience). However, as it applies more specifically to Windsor , flood risk has a *comparatively lower* associated risk on account of the town's climate, topography, and hydrology. This is largely due to the fact that the Town's flood exposure is relatively small in size, and a low number of buildings - including almost no components of critical infrastructure - lie within this area.

Windsor's flood risk is almost exclusively fluvial (relating to or produced by a river or stream), though a small risk posed by pluvial (relating to excess rain) flooding exists and is growing on account of climate change and development practices. Multiple areas in Windsor that are not indicated in the FEMA Flood Insurance Rate Map as being at risk from riverine flooding (typically annotated as zone AE) or sheet flooding / ponding (typically annotated as a zone AO or AH) do nonetheless experience shallow flooding, sheet flooding, and/or roadway flooding. The current Windsor Flood Damage, Flood Control, and Drainage Ordinance (Title IX, amended

[106] Meyers (2016)
[107] Duguid (2021)
[108] Varanasi (2021)

by Ordinance 2008-249) contains provisions that limit exacerbating construction practices within the Special Flood Hazard Area, but does not address the full extent of pluvial roadway flooding and ponding that has been reported in TWG meetings, through consultant interviews, and which is supported by external independent technical analysis (e.g., First Street Foundation's Flood Factor). Moreover, with plans to increase housing and commercial development in multiple locations outside the SFHA, regrading, paving, hardscaping, and other practices that increase the imperviousness of land, coupled with an increase in the prevalence of heavy precipitation events associated with climate change that are expected to occur during the next 30 years, pluvial flooding should be expected to increase without more comprehensive floodplain restrictions that apply to the whole community. A single interconnected system of creeks and tributaries drains all of the Town's floodwaters (*see Figure 36*), which merge at a point southwest of Windsor and just west of the Sonoma County Airport (*see Figure 37*).

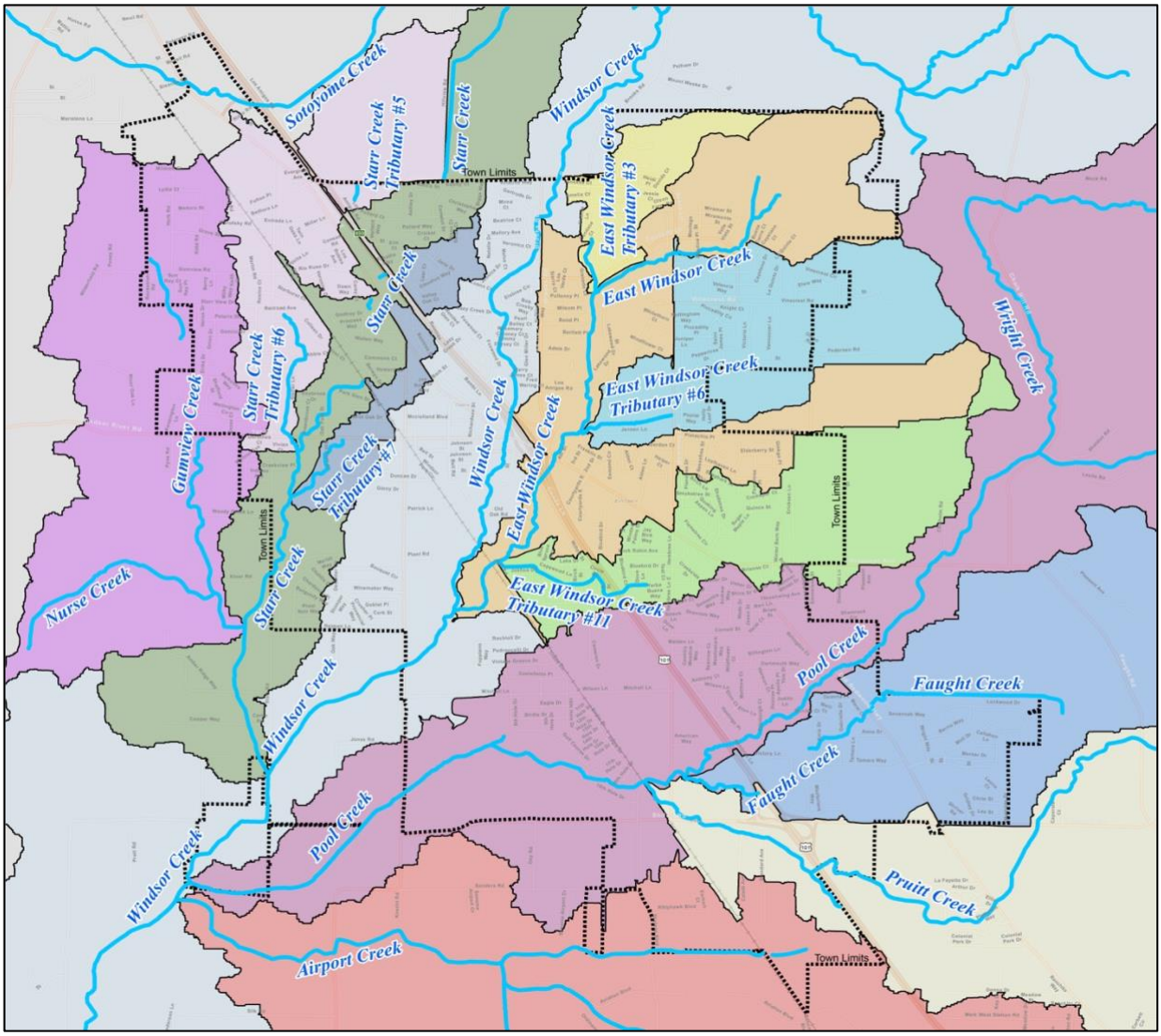


Figure 36. Windsor Creek Watersheds (Town of Windsor Storm Water Program, 2018)

The FEMA digital flood insurance rate maps (DFIRMS), which provide the official designation of flood risk in participating National Flood Insurance Program (NFIP) communities,[109] indicate that flood exposure in Windsor is largely confined to the land that is located within close proximity to five interconnected stream systems that transect the town. These include Windsor Creek, East Windsor Creek, Pool Creek, Pruitt Creek, and Starr Creek.

FEMA DFIRMs depict two levels of risk: 1) those that have a 1% (100-year) annual chance of flooding, for which the purchase of flood insurance is a requirement under Federal mortgage program provisions; and 2) those that have a 0.2% (500-year) risk of flooding, which would only be expected to occur in the most severe flood events. Figure 37 shows flood hazard zones, buildings, roads, and critical facilities both within those zones and throughout the Town.

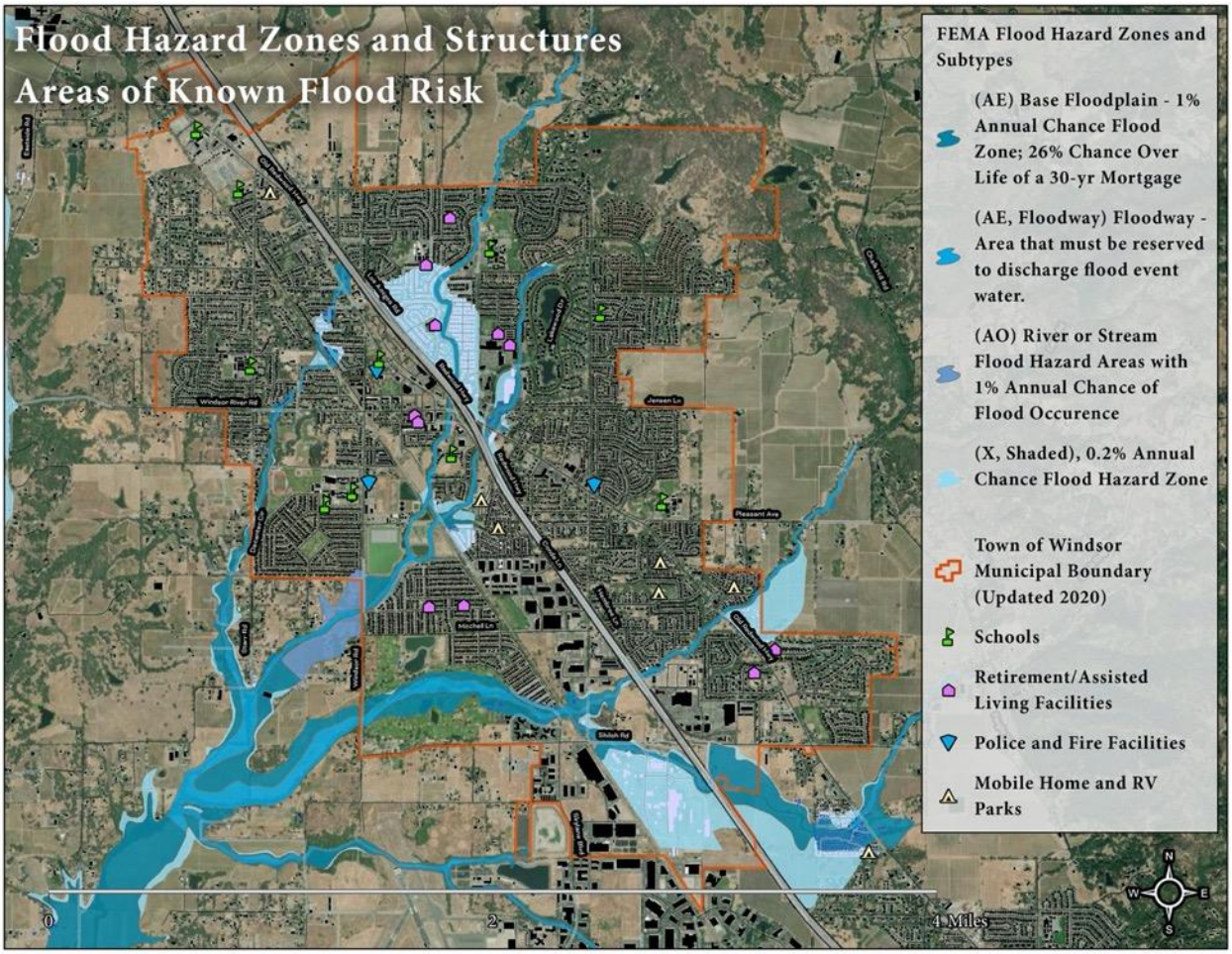


Figure 37. Flood exposure in Windsor. The main flooding exposure in Windsor as identified by FEMA. Generally confined to areas within and around existing creek beds, along with areas of low to moderate flood risk in the 0.2% annual chance floodplains in the vicinity of Old Redwood Hwy and Hwy 101 as well as south of Shiloh Rd near Hwy 101.

[109] Windsor is an NFIP Participating Community (https://www.fema.gov/cis/CA.pdf)

HISTORICAL EXPERIENCE WITH FLOOD HAZARDS

Flooding typically occurs in the region over a few particular months (December through February). That said, flooding can occur in Windsor at any time of year. Flooding has been observed most often during and after periods of heavy and/or sustained precipitation, especially when the Russian River is at or above flood stage and/or saturation excess overland flow is expected to exist.

Inundation experienced in Windsor has almost always presented as shallow in depth and has been confined to known risk areas as mapped on FEMA Digital Flood Insurance Rate Maps (DFIRMs). Inundation has also impacted the Windsor Golf Club, which is partially located within the floodway and flood zone of Pool Creek.

Past periods of widespread flooding in Sonoma County have resulted in significant physical damage to homes, businesses, and the environment. In Windsor, however, this has not been the case on account of the Town's geography and because of actions taken to limit or otherwise address development in the floodplain.
Dates of notable past flood events in Windsor include the following:

- December 17, 2005 to January 12, 2006 (multiple events, including one single precipitation event that resulted in almost 7 inches of rain and caused flooding in several areas in the south part of Windsor)[110]
- January 2010 (Power failure for over 4,500 Windsor residents; Windsor Golf Club flooded)[111]
- Fall/Winter 2012 (Starr and Mark West Station Roads)[112]
- December 15, 2016 (Starr and Mark West Station Roads)[113]
- January 6, 2016 (Starr and Mark West Station Roads)[114]
- January 9, 2017 (Russian River)[115]
- February 13, 2019 (Skylane Blvd., Windsor Road)[116]

REGIONAL/WATERSHED PERSPECTIVE (RUSSIAN RIVER, DAMS, ETC.)

The physical risk associated with flood hazards in Windsor is relatively low relative to other hazards. However, flooding has much greater significance at the regional level, and flood events that occur close to the town can and have had severe, and potentially unexpected secondary consequences for Windsor. On account of geography, flooding is more impactful to and generally more frequent in the towns to the north and south of Windsor as well as in the unincorporated areas that surround the town. For instance, nearby Guerneville, situated less than 20 miles downstream from where Windsor creek flows into the Russian River, has experienced 38 devastating flood events since 1940[117], or an average of one event every other year. A recent flood in that town, which occurred in February of 2019, inundated almost all of the town's land area. This resulted in the evacuation of nearly half of Guerneville's 4500 residents, and the damage to or destruction of over 2500 homes and businesses. To the north of Windsor,

[110] Town of Windsor (2018a)
[111] Town of Windsor (2018a)
[112] Porter (2012)
[113] Johnson, J., & Mason, C. (2016)
[114] ThePressDemocrat (2016)
[115] Moore et al. (2017)
[116] Rossmann (2019)
[117] Rogers (2019)

Healdsburg is also situated on the Russian river, and as a result has a flood experience similar to Guerneville in its frequency (although much less of Healdsburg's land area is exposed to flooding than in Guerneville).

PLUVIAL FLOODING

Fluvial flooding is the dominant source of flood exposure and risk in Windsor, the result of expansion and contraction of drainage in the watershed's associated floodways. Pluvial flooding - which occurs away from these streams and is the result of excess rainfall or from patterns in precipitation runoff - poses increased risk for the Town. Ponding, as it is often called, is most often the result of rainwater draining from normally dry land at a rate that is lower than it accumulates. Ponding is increasing in Windsor on account of two factors: 1) increased development, namely that which results in the sealing of previously porous landscape (e.g., the paving of roads, parking lots, and driveways, construction of sidewalks, pouring of foundation slabs) which decreases the absorptive capacity of that land; and 2) a trend towards increased frequency and severity of heavy rainfall events. Ponding is further exacerbated after severe wildfires,[118] when extended drought hardens topsoil,[119] and when groundwater levels are very high on account of extended precipitation. Ponding is indicated in newer FEMA flood risk maps where it is affiliated with stream systems, but it still can occur away from such systems where large areas of runoff collect in low-lying land (and thereby affecting homes and other structures whose owners may not have known to take action to mitigate potential impacts).

The following maps display emergent flood risk and zones (dark blue circles with orange borders) where ponding occurs in or adjacent to floodways, as indicated on the most recent FEMA flood maps. They also indicate areas where ponding occurs outside of these floodways, as identified by the Technical Working Group members.

[118] Nyman et al. (2014)
[119] Jenkins et al. (2020)

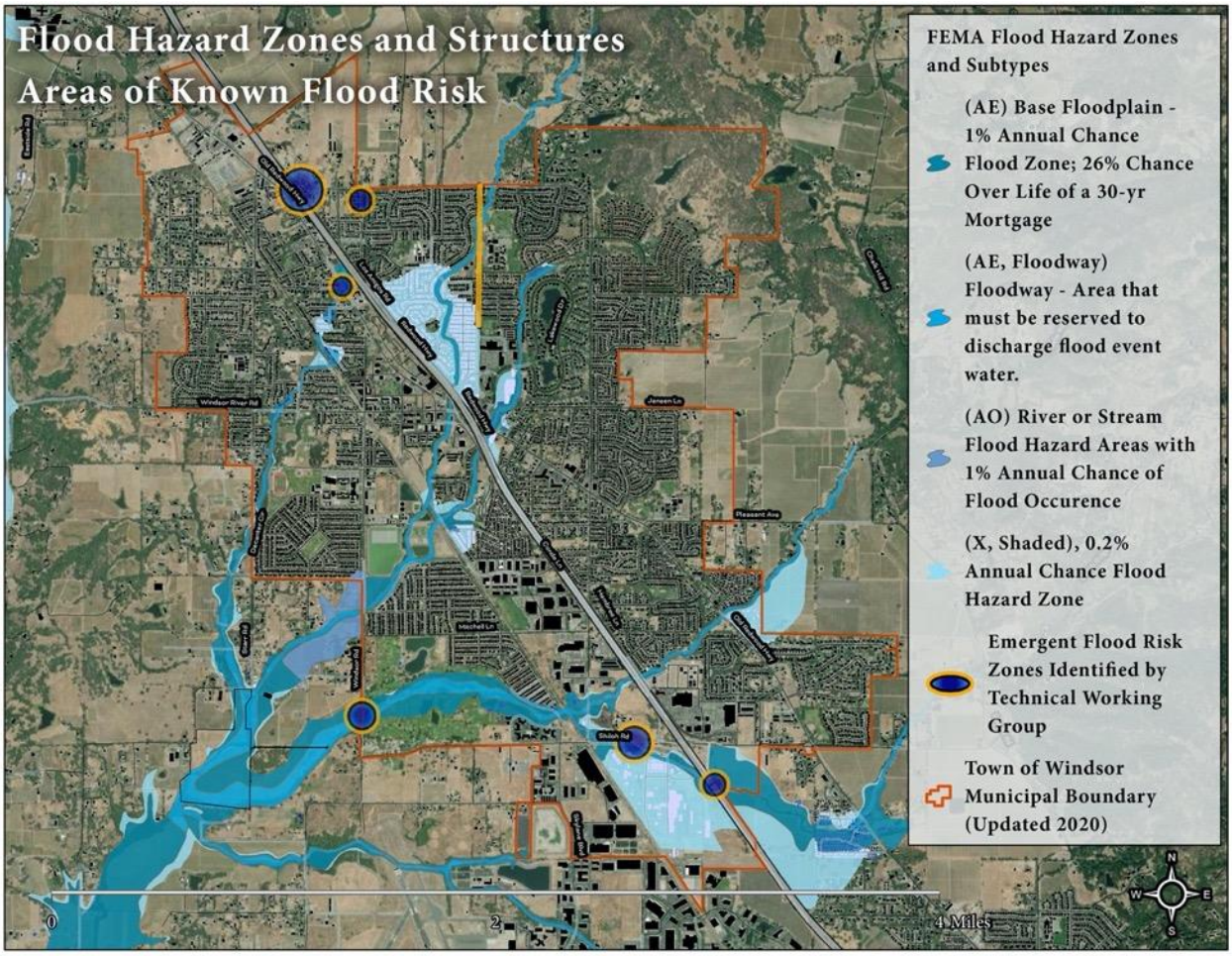


Figure 38. Flood hazard zones for the Windsor. FEMA flood zones are show in light and dark blue. The Dark blue circles with orange borders show emergent flood risk areas (some in flood zones and some outside those zones where flooding is observed. Source: Discussions with Technical Working Group members and FEMA, 2021.

Without interventions to address both the increase in prevalence of heavy rain events and development practices that reduce the absorptive capacity (infiltration) of land in and around Windsor, it is likely that the number of intersections and roadway segments impacted by ponding and flash flooding will increase over time. It is important to note that emergent problem areas may not necessarily occur in designated flood zones. The most likely locations are those areas where roadways are at natural depressions within watershed areas.

FLOOD EXPOSURE AND VULNERABILITY OUTLOOK

Stormwater management plans exist in Windsor and are helping to address the identified areas of concern, but flood exposure is nonetheless expected to increase in terms of both the geographic area affected and the frequency of events due to climate change. The greatest future threat exists for homes in the 1% and 0.2% areas of flood risk, and in areas of emergent flood risk outside of these areas, that lack adequate freeboard (elevation above the base flood elevation) to account for increases in predicted inundation depths. Ultimately, all neighborhoods will be exposed to flood risk as the intensity of rainfall events increase, as determined by stormwater management capabilities. And while this represents a very real source of secondary impacts from

transportation and other infrastructure disruptions, whether or not structures are inundated will almost exclusively be dictated by the existence of sufficient freeboard.

From a frequency standpoint, little can be done to address global trends that point to more highly variable swings in precipitation (with some years marked by drought while others have much higher-than-normal total sustained rainfall) and more frequent heavy rainfall events (large volumes of rainfall experienced in single events), several options exist to limit how much runoff (non-absorbed water) exists and how that runoff is managed. As such, the best available option is one of minimizing physical vulnerability.

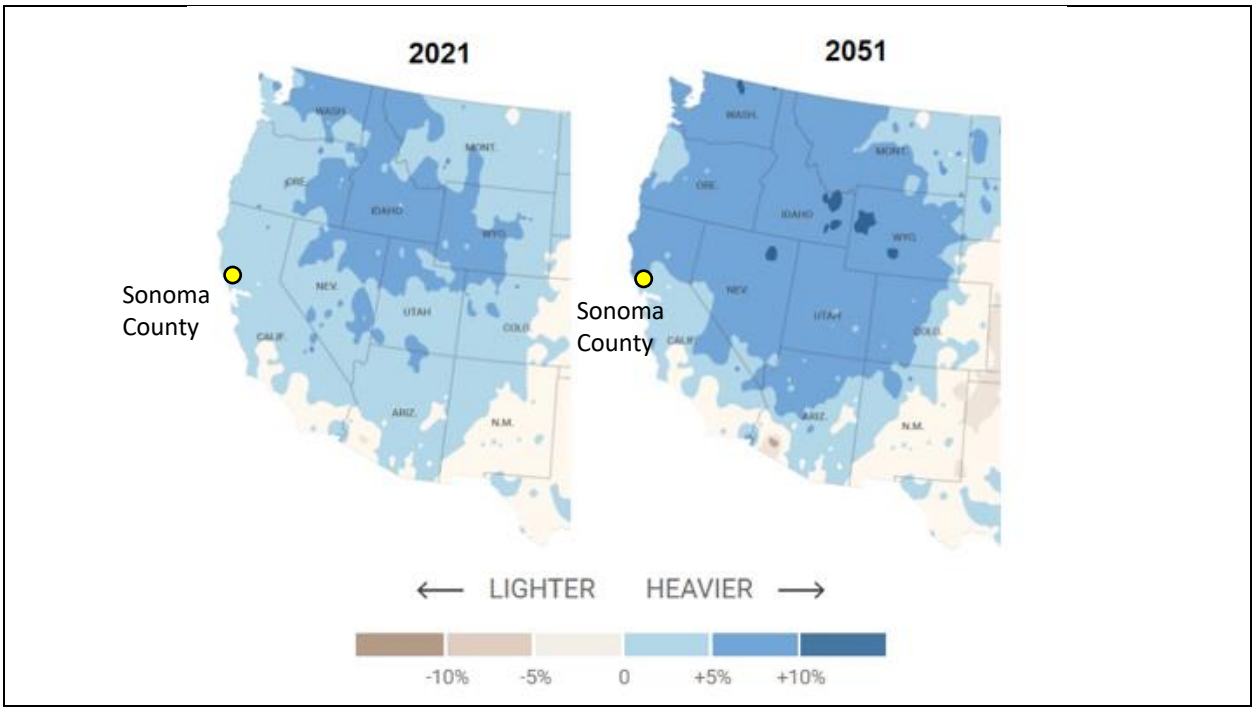


Figure 39. Precipitation projections for the Western United States. Source: Floodfactor, 2021.

Given the comparatively small geographic area in Windsor that is classified as having a 1% or greater annual likelihood of flooding (as compared to Sonoma County as a whole), and the relatively small amount that inundation depths increase between the 100-year and 500-year flood zones (in most cases this is less than one foot of depth - see Sonoma County Flood Insurance Study 06097CV003E), the increase in exposure over time is nominal. In fact, the First Street Foundation study found that the number of structures exposed to flooding in a 1% likelihood flood event will increase by only 38 structures between 2021 and 2051, and the number of structures exposed to flooding in a 0.2% likelihood flood event will increase by only 40 structures (without intervention).

DAM-RELATED FLOOD EXPOSURE AND RISK

Flooding related to dam failure poses a risk to Windsor that is very different from that of pluvial or fluvial flooding that is more directly linked to climate change. There are a number of different reasons that a dam might fail. The most common cause of dam failure, overtopping (exceeding its holding capacity or being subject to wave action), is rare but increasing in likelihood on

account of climate change and the potential for extreme precipitation events. Though less likely, a dam may also fail because of defects in construction or because of some other natural or technological hazard (such as an earthquake), including excessively high or low water levels.[120] Exposure to dam-related flooding poses an especially dangerous threat to Windsor residents and property because there may be little or no notice prior to occurrence of a dam failure, and because both the depth and the velocity of flood water may be very high. The implications of flooding due to dam failure are covered in more detail in the Windsor Local Hazard Mitigation Plan and are not addressed further in this analysis due to the unlikely event of a dam failure occurring due to climate changes. It is important, however, to mention that extreme precipitation events could exacerbate the risk of a dam failing in the event of a tectonic event or catastrophic structural failure.

FLOODING IMPACTS ON WATER QUALITY

Floodwater, regardless of the source or type, has the potential to pick up hazardous materials as it moves across land and makes contact with objects and features its path. Chemicals and contaminants are found on lawns, on farms, in storage tanks, in vehicles, in buildings, and elsewhere. Once in the flood water, these hazardous materials move with the water until deposited or carried into rivers, streams, lakes, ponds, or groundwater stores. Windsor's drinking water supply is almost exclusively locally sourced. It is also subject to limited treatment because it is considered groundwater (and therefore not subject to more stringent surface water treatment regulations). Disinfection is provided to address bio contaminants, but introduction of heavy metals to drinking water supplies,[121] as can occur in a large-scale release of hazardous materials into the Russian River or other sources of groundwater supply, would present a unique and major hazard to Windsor's drinking water supplies. The potential for contamination exists if a flood triggers the release of hazardous materials, but to date this has not been found to be a significant threat within Windsor.

CONSEQUENCES/IMPACTS

PEOPLE

The flood impacts to people in Windsor are presumed to be relatively low. There is the possibility that people may be injured or killed if they attempt to cross fast moving water in their automobiles either at inundated intersections or on road segments that are alongside or crossing the floodway. Only six inches of moving water is enough to knock a person over, while only two feet of water can carry away most automobiles.[122] Where dam-related flooding is concerned, impacts to the immediate health and safety of people is much higher. Just a few inches of moving floodwater crossing a roadway can carry away vehicles, their drivers, and any passengers, if an attempt is made to cross them.

It is unlikely that evacuations of Windsor residents would be necessary in the event of a flood event caused by fluvial or pluvial flooding. Emergency shelter may be required if a high number of homes are damaged in a single incident, but this is also unlikely given almost all homes that

[120] United States Bureau of Reclamation (2019)
[121] Town of Windsor (2011)
[122] NOAA (2021b)

are at risk of being inundated face less than 1.5 feet of inundation risk).[123] At this time, fluvial and pluvial flooding are not considered likely reasons for a need to issue evacuation orders. However, there are few areas, such as the Windsor Mobile Home Park (evacuation subzone C-08), located off of Conde Ln, that has 333 structures tucked behind 3 feasible exit routes and exposed to both 1% and 0.2% annual change in floodplains. If this area were flooded, the residents could require emergency assistance, support evacuation, or an emergency shelter.

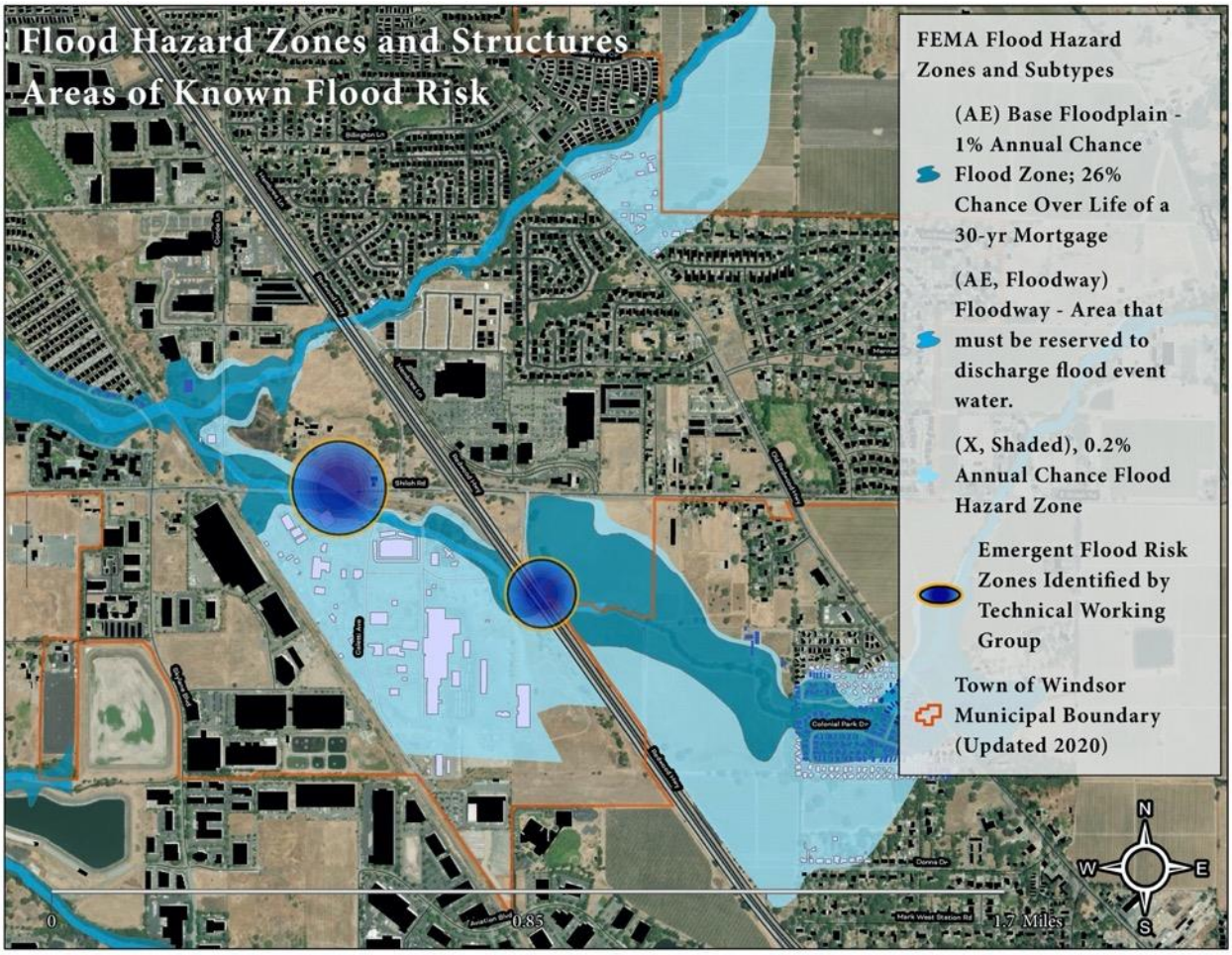


Figure 40. FEMA 1% and 0.2% annual chance of flood risk maps for the Southeast part of the Town. The Windsor Mobile Home Park (bottom right corner) located off of Conde Ln, has 333 structures tucked behind 3 feasible entrance and exit locations and located almost entirely within the FEMA flood zones. Note emergent flood risk zones identified by the Technical Working Group (dark blue circles with orange borders).

The impact risk for people that is posed by a dam break, namely the Warm Springs Dam on Lake Sonoma, is significant even though the likelihood is small. While the probability of a dam failure is low, it is important to consider the magnitude of impacts to human safety if such an event does occur, and the fact that climate change effects increase the probability of a future dam failure event. Sustained high rates of precipitation can lead to overtopping, which is associated with

[123] Flood Factor (2021)

compromising the integrity of a dam in sudden and dramatic ways. In the unlikely event of a dam failure, especially of the Warm Springs Dam, an evacuation order would be likely.

Repetitive, chronic, or long-term flood exposure can have negative impacts to indoor air quality and mold exposure. People generally spend the majority of their time indoors, and poor indoor air quality can impact the health of Windsor residents, especially those with asthma, allergies, or other respiratory illnesses. Repetitive exposure or even a single exposure to flood waters can lead to increased humidity, mildew, and mold growth in building materials, all of which can have a negative impact on indoor air quality and overall health.

BUILDINGS

The Windsor LHMP identified no critical infrastructure that exists in the 1% likelihood flood zones, and only two (a utility facility and a community resource) together valued at just over $3 million in the 0.2% likelihood flood zone.. Risk to infrastructure from fluvial and pluvial flooding is very low. Even for the two critical facilities, both of which are assisted living facilities, known to be located in the 500 year exposure zones the expected flood depth for these facilities is nonetheless very low.

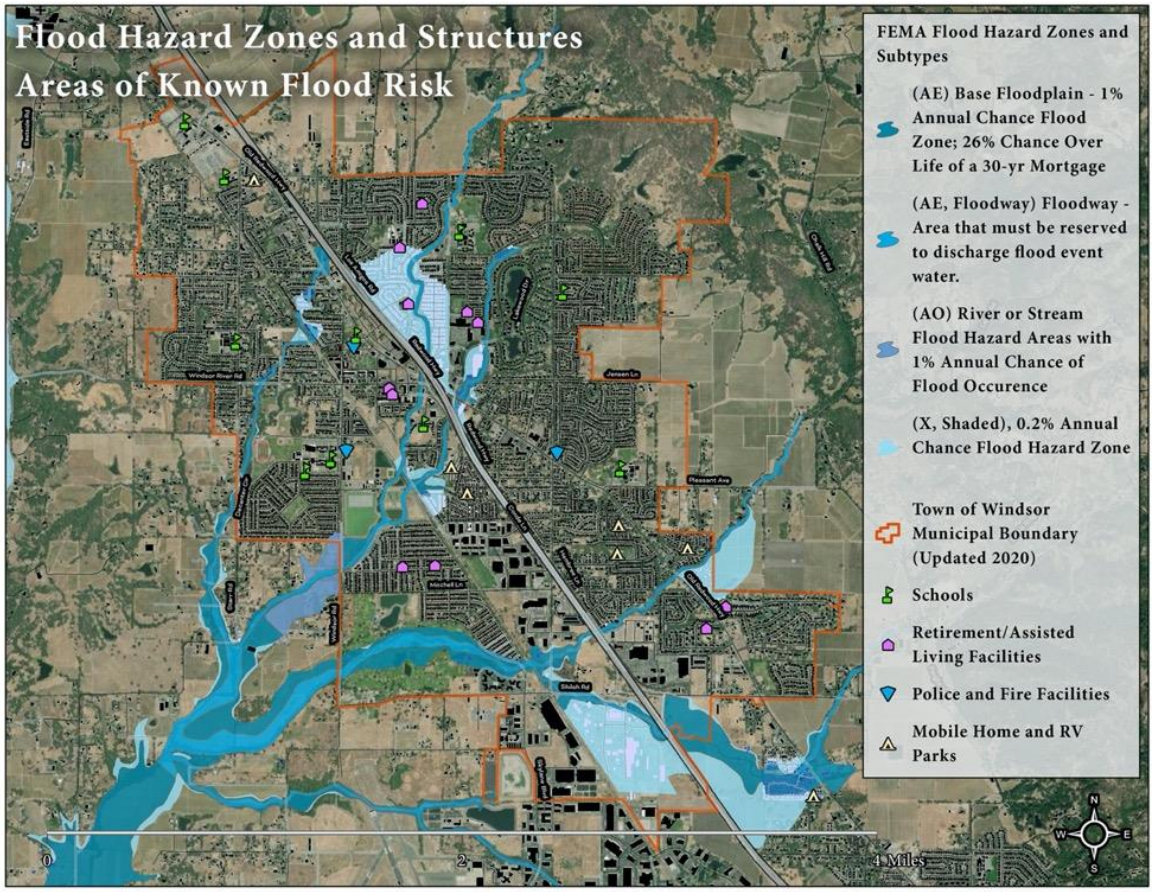


Figure 41. FEMA 1% and 0.2% annual chance of flood risk maps for Windsor. Note Buildings are show in black outlines throughout the Town. Critical facilities are show per the legend throughout Town. Only two critical facilities (both assisted living facilities) are located in the 0.2% annual flood risk zone.

Windsor's buildings have a generally low flood exposure. About 10% of Windsor properties (about 829) currently have some level of flood risk for a 500-year flood event (0.2% annual probability or greater).[124] This number is considerably lower than the United States average, which is approximately 25%. By levels of expected impact severity, the properties at risk in Windsor include:

- Minor: 47 (5.4%)
- Moderate: 207 (23.8%)
- Major: 357 (41%)
- Severe: 204 (23.4%)
- Extreme: 55 (6.3%)

Of these, 600 properties have at least a 1% annual risk of flooding, though only 93 would be expected to experience over 1.5 feet of inundation in a 1% (100-year) likelihood flood event.



Figure 42. Example neighborhood level flood impacts in Windsor. Note that while properties may be shown in the flood areas, the exact finished floor elevations of the structures is not shown, so these individual homes and buildings may not be at direct risk of flooding. Source: Floodfactor, 2021.

The financial impact of flooding on properties is high despite the relatively low flood exposure of properties in Windsor. Annualized flood costs associated with Windsor properties have been assessed to be approximately $267,200. This figure accounts for the fact that some years will be characterized by almost no flood-related impacts while in others there will be costs that far exceed this average. Floods are the most expensive hazard in the United States because of the great amount of damage that can be caused by even a small amount of flood water. In fact, one inch of standing water in a home can result in tens of thousands of dollars in damage (while a few feet will likely result in a total loss).[125] Interestingly, in Windsor almost all (95.4%) of the anticipated costs are likely to be incurred by 55 properties identified as having an 'extreme' level of risk.[126]

[124] First Street Foundation (2021)
[125] Jones (2021)
[126] Flood Factor (2021)

INFRASTRUCTURE

The most common impact of flooding in Windsor is disruption of roadways that transect the six major streams. The main flooding risks related to roadways and infrastructure are road blockages from debris, road erosion, bridge overtopping, and excess flooding from stormwater infrastructure along roads. The likelihood of direct impact from fluvial flooding, ponding, and flash flood events is almost completely limited to transportation infrastructure within the Town. Each of these impacts can potentially limit emergency services access to homes and services, such as hospitals. Furthermore, roads themselves can contribute to intensified flooding and run-off since they do not absorb water. The rescue of trapped motorists has been required in several past events as a result of attempts to cross deep and/or flowing water on roadways.

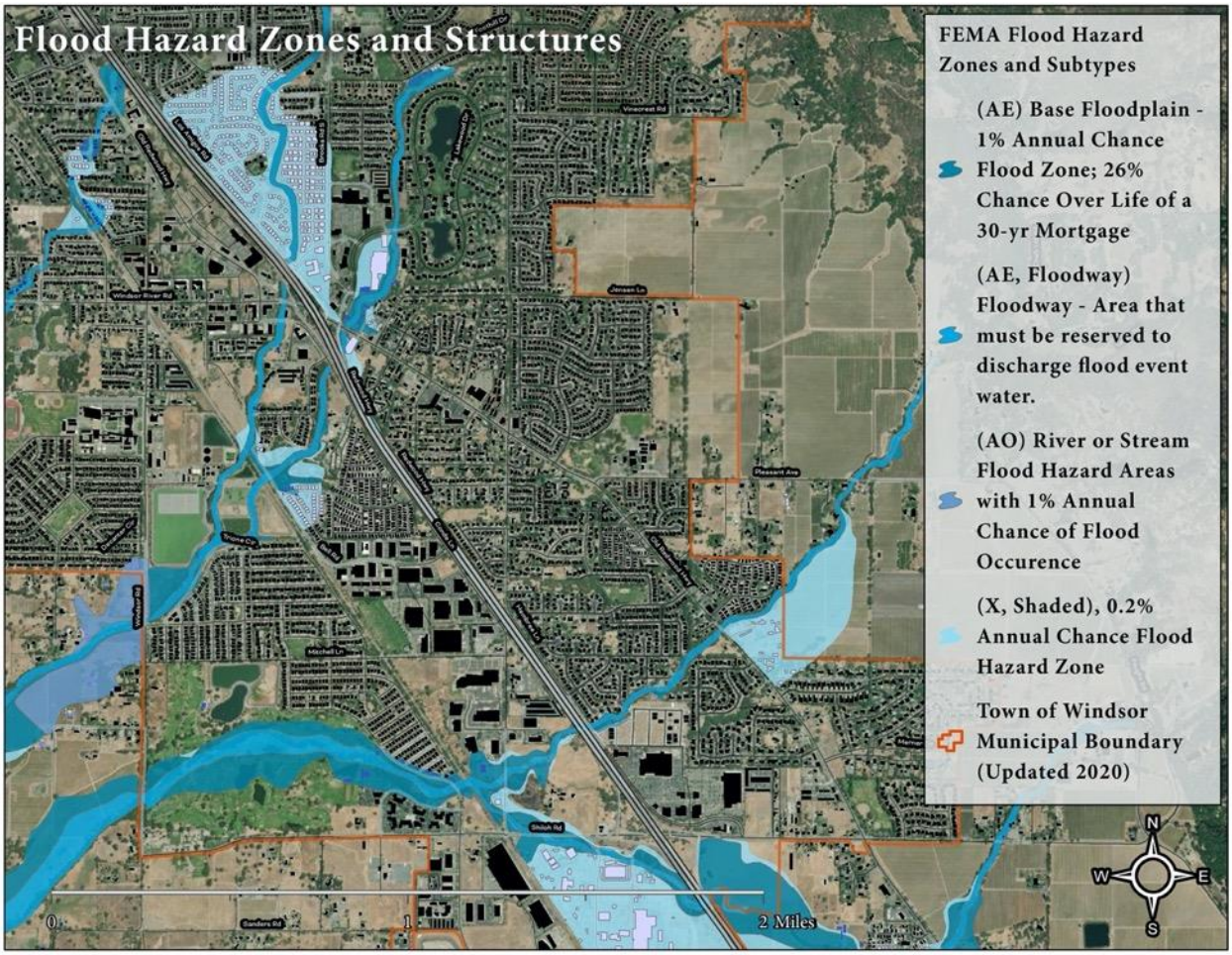


Figure 43. 1% and 0.2% annual chance of flood risk maps for the northern part of the Town. Impacts to infrastructure (primarily transportation) can be seen on key roadways and select intersections that are within those flood zones.

Flooding to the north and south of Windsor has, on a fairly frequent basis, resulted in disruption in transportation routes when key intersections that cross nearby floodways become overtopped, as often occurs along heavily trafficked Mark West Station Road. Similar frequent flooding occurs on Old Redwood Highway to the north of town between Windsor and Healdsburg. Even

Highway 101, the main thoroughfare to and from town, has experienced intermittent flooding[127] that has closed all lanes in at least one direction, as occurred in 2014 when all northbound lanes were closed near the Arata Lane off ramp. Windsor's electrical infrastructure is similarly vulnerable to regional impacts. In a January 2010 regional flood event, over 4500 Windsor residents lost electricity.

Table 4. Select critical intersections located in the FEMA's 1% annual chance of occurrence flood layer. These intersections provide ingress/egress routes for a large number of structures (and therefore people) and provide critical connections to the broader transportation network for these residents, both to allow residents to leave in the event of an emergency evacuation and to allow first responders and firefighters into these neighborhoods during an extreme weather event. All intersections in this table serve a minimum of 50 structures. Simply because the intersection is flooded does not necessarily imply the structures (homes and buildings) within the associated trafficsheds will be flooded.

Key Intersections for Trafficshed	# of Structures	# of Residential Zoned Structures	# of Exit Nodes	Structure : Exit Ratio
Lakewood Dr	185	185	1	185
Glen Miller Way and Brooks Rd	124	124	1	124
Winemaker/Windsor, Reiman/Oak, H/Starr	491	491	4	122.75
Broadleaf/Circle/Basswood/Conde (Windsor MHP)	333	333	3	111
Elabree/Arata	195	191	2	97.5
Old Oak/Armondo Renzulo/Conde Ln (Windsor Creek Elementary)	90	77	1	90
Lazy Creek/Foxwood/Los Amigos	153	149	2	76.5
Jessica/Brooks; Arata/Camelot; Amigos/Cordelia	755	742	10	75.5
Old Redwood/Shamrock Cir (Shamrock MHP)	141	132	2	70.5
8th, 9th, 10th Hole and Mitchell Ln	274	274	4	68.5
Ventana/RioCamino/Macero and Foothill Dr	132	132	2	66
Pulteney Pl/Bond Pl and Brooks Rd S	128	128	2	64
Billington/Northampton and Hembree Ln	315	315	5	63
Jones Rd and Windsor Rd	53	44	1	53
Rio Ruso/Dawn and Old Redwood	153	153	3	51

Contamination of flood waters could pose a risk in the areas contained within the flood exposure zone of the floodway(s) affected. For instance, the potential release of hazardous materials into Russian River as a result of heavy upstream inundation poses a significant threat to five of the town's potable water system's six active wells[128] that are situated along the river's banks to the west of town. Beyond Windsor itself, there is the indirect risk of drinking water contamination if the Russian River is affected by the release of hazardous materials, especially to the west of Windsor where municipal wells are located.

[127] Schena (2014)
[128] Town of Windsor, Department of Public Works website: https://www.townofwindsor.com/225/Water

Increased precipitation or heavy precipitation events can decrease the response timing and effectiveness of emergency response throughout the Town and surrounding areas. While most of the Town's critical facilities are not in current or projected flood risk areas, heavy precipitation events and even temporary road closures or inundation of certain intersections can impact the amount of time needed before emergency responders are able to arrive on site to attend to residents' needs (even if the emergency is not directly related to flood hazards, such as a medical emergency). Every minute counts when emergency services are requested, and extended service time can increase the risk of mortality and harm in health and safety situations.

Moving flood water can cause significant erosion to land, undermining buildings and bridges, eroding riverbanks, and tearing out trees. Although floods do not currently have erosive effects on land and property, changes to stormwater quantities and patterns of drainage can affect the manner in which they cause damages in future flood events. In addition to posing an increased life-safety risk to those who find their way into the path of such water, floods are highly disruptive to the functioning of society by destroying roads and bridges, knocking out power, water, and gas transmission systems, and leading to the closure of buildings, housing, businesses, and organizations, among other impacts.

Increased ponding will affect Windsor's infrastructure and housing stock in several ways. Water that ponds regularly creates-increasingly deeper depression of the land, in turn further increasing the severity of ponding in future events. On roads, ponding results in uneven surfaces and cracking that increase the frequency of repairs. On private property, ponding often requires remediation that is not covered by insurance policies, and if next to a home can cause dampness and mold. Windsor residents have reported ponding in several neighborhoods and subdivisions, in some cases reaching levels that resulted in water entering garages or the first floor of the home. Ponding ultimately results in both public and individual burdens in terms of the associated remediation costs. The Town's Storm Drain Master Plan includes proposed storm drain capital improvement projects to help address existing flooding problems.

NATURAL SYSTEMS

Contamination of public and private land can occur when hazardous materials are released into flood water. Just as contaminants picked up by or deposited into flood waters threaten freshwater resources, they also pose a contamination risk to any land that such waters flow over or are absorbed into. Raw sewage, heavy metals, pesticides, and other chemicals and biological contaminants can impact the capacity of impacted land to support plant or animal life and can decrease the value of private property. Remediation costs associated with the removal of contaminants from land can be very expensive and may not be covered by standard insurance policies.

ECONOMY

During flood events, temporary disruption may occur for local businesses and commercial areas. Although widespread economic impacts are unlikely, individual businesses or organizations may be severely impacted if their location is heavily affected. The more likely flood events in Windsor have impacts that will cause temporary interruption to business activity, depending on where the flooding occurs and the extent to which individual businesses and

structures are affected. More significant flooding can have longer-lasting impacts to local businesses and commercial areas.

Floods can lead to the loss of agricultural and farmlands as well as crops and livestock. While the majority of agricultural lands and farms are located outside of the Town of Windsor, impacts to these economic assets can have indirect impacts on the residents and lead to a temporary (or more permanent in severe situations) decline in tourism and visitor activity in the Town and surrounding area.

Extreme Heat

VULNERABILITY SUMMARY

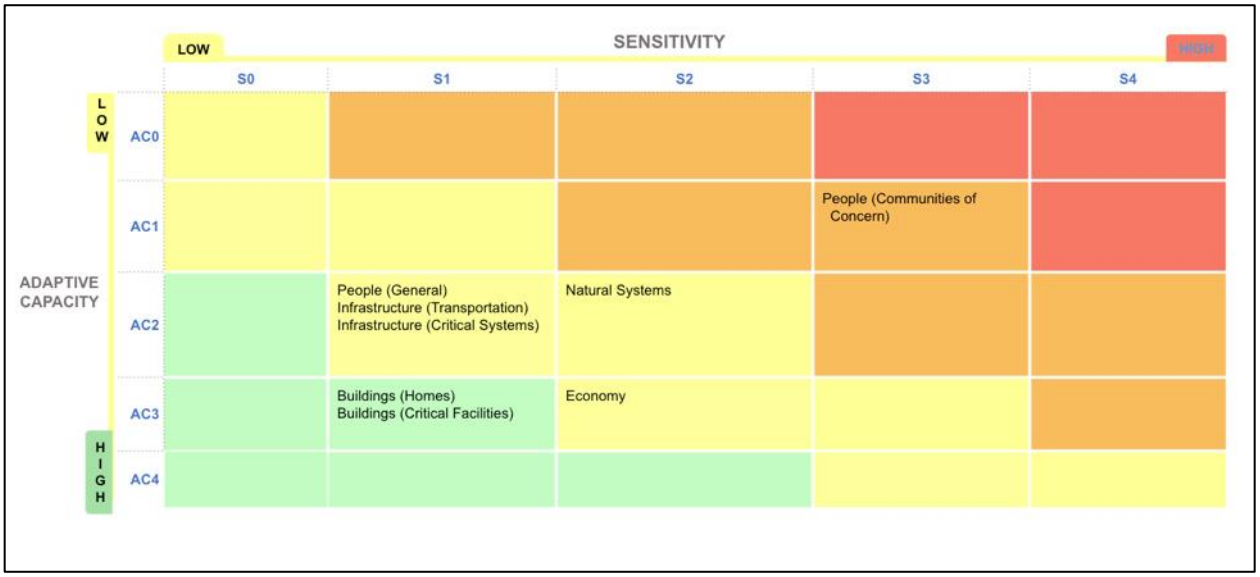


Figure 44. Relative vulnerability assessment of extreme heat for Windsor's primary assets. Vulnerability is shown by the different colors of the matrix (Red = Extreme Vulnerability; Orange = High Vulnerability, Yellow = Medium Vulnerability; and Green = Low Vulnerability). Given the climate hazards, relative vulnerability is based on the assessment of sensitivity (x-axis ranging from S0 = not at all sensitive to the projected changes to S4 = extremely sensitive to the projected changes) and adaptive capacity (ability to respond to those changes ranging from AC0 = no ability to respond to AC4 = ability to respond to projected changes in a beneficial way).

PEOPLE: Communities of Concern within Windsor are highly vulnerable to extreme heat, and the general population is moderately vulnerable. Of all the categories assessed, people are the most vulnerable of Windsor's assets to extreme heat events. While the general exposure of all Windsor residents to extreme heat will be similar, different populations - particularly the elderly, children, those with pre-existing health conditions, and outdoor workers - are more sensitive (S3) to the increased number, intensity, and duration of extreme heat events as well as the decreased air quality due to the increase in ground-level ozone. Windsor is located in a relatively cool climate within California, so residents have less experience with extended periods of extreme heat; therefore, residents may not be as knowledgeable about the impacts of extreme heat or ways to adjust their daily activities to avoid heat-related health impacts (Communities of Concern AC1 - general residents AC2).

BUILDINGS: Homes and critical facilities have limited vulnerability to extreme heat. Extended exposure of the built infrastructure to extreme heat can lead to potential warping of certain materials, but generally, buildings are not very sensitive (S1) to increased heat exposure and can handle the projected increase in temperature for the region well (AC3) with only minor issues.

INFRASTRUCTURE: Infrastructure is moderately vulnerable to extreme heat, mainly due to the increased demand on utility systems during heat waves. Most infrastructure systems for the Town have limited sensitivities (S1) to extreme heat events. There are some vulnerabilities - for example during extreme heat events, there is an associated increased energy demand to cool homes and buildings. The heat itself can decrease the efficiency of the power distribution systems, and when paired with increased demand, extreme heat events can lead to more frequent brown or blackouts in the electric grid if proper measures are not in place. Generally, infrastructure systems have a moderate amount of adaptive capacity (AC2). Similar to certain building materials, rail and road infrastructure may warp under certain high heat exposure conditions, which can result in major or minor impacts to the multi-modal transportation network.

NATURAL SYSTEMS: Natural systems are moderately vulnerable to extreme heat. Increased temperatures and frequency of extreme heat days and events leads to increased rates of evaporation and loss of moisture in soils and vegetation. In an area that does not have the historical exposure to such heat, the natural systems are somewhat sensitive (S2) and less able to adapt (AC2) to changes in conditions, especially towards the end of the century as extreme heat events become longer and more pervasive.

ECONOMY: The economy is moderately vulnerable to extreme heat, mainly due to the importance of outdoor recreation and winery tourism for the Town of Windsor. Agricultural crops, such as grapes, are well adapted to the climate of this area of Sonoma County and are sensitive to temperature extremes. While the temperatures may not influence the desire to travel to Windsor for certain retail or economic purposes, the impacts to the water recreation and wineries make the economy somewhat sensitive (S2) to extreme heat but more able to adapt (AC3).

EXTREME HEAT EXPOSURE FOR THE TOWN

Excessively warm temperatures and extreme heat rank as one of the deadliest natural hazards nationwide, yet heat-related illnesses and deaths can be largely prevented.[129] The effects that extreme heat events have on people are determined and characterized by a "heat index", which is a combination of temperature and humidity, and the threshold for these events can be different based on the location. The threshold for an extreme heat event for a particular location is generally defined as falling within the top 2% of historical temperatures for the location or region of interest.

In the State of California, the National Weather Service generally issues an Excessive Heat Warning/Advisory for any area of the state when a heat wave is expected to exceed a heat index of 105 degrees Fahrenheit or greater for two or more consecutive days (the temperature threshold is different for the various regions throughout California). These criteria and thresholds are not standardized, and different local forecasting offices can use different criteria for these heat warnings. It is generally recommended that particular areas use the relative temperature extremes for the area of concern to drive these advisory recommendations.[130] This is because people living in areas that are generally cooler are at risk of heat-related illness at cooler temperatures than

[129] California Climate Action Team (2013)
[130] California Climate Action Team (2013)

people who are more acclimatized to heat and who are likely to have more access to air conditioning and cooling systems. For example, what feels like an extreme heat event for people in the central valley or the Inland Empire in southern California would be at a higher temperature than something that feels like an extreme heat event for people living in San Francisco.

For the purpose of this assessment, historically observed and projected extreme heat days for Windsor are defined by Cal-Adapt and are based on an average estimate for Sonoma County. An extreme heat day is above the 98th percentile of the maximum temperature for Sonoma County using data from 1961-1990 for the May-October warm season.[131] The threshold temperature for an extreme heat day is 93.9 degrees Fahrenheit, which has been surpassed on average 4 days per year over the 30-year period. By mid-century, Windsor could experience up to 12 extreme heat days/year and 23 days/year by the late century under a high emissions scenario (RCP 8.5). For areas that are not accustomed to prolonged exposure to extreme heat, this nearly five-fold (475%) increase in extreme heat days can pose potentially serious issues for the community, especially more sensitive populations, and other systems in the Town and surrounding areas. Not only is the average annual total number of extreme heat days projected to increase for the Town, but the frequency of heat waves, defined by Cal-Adapt as at least 4 consecutive days of extreme heat, and the maximum duration, or the potential maximum number of days in a heat wave, are both projected to increase. Sonoma County has not observed a heat wave lasting at least 4 days between 1961-1990 (the average heat wave lasting about 2.3 days) but is projected to incur up to four of these events per year by the end of the century under RCP 8.5. In addition, the duration of a heat wave could increase to up to 7.7 consecutive days of extreme heat by the end of the century.

The number of extreme heat days (over 93.9°F) a year are projected to triple by the middle of the century.

Windsor is no stranger to hot days or heat waves. On the 14th of August 2020, high temperatures in Windsor were 108 degrees Fahrenheit as part of a regional heat wave. Soaring demand for electricity led to rolling outages as PG&E worked to maintain the integrity of the electrical grid.[132] Temperatures stayed high for weeks with high temperatures in Windsor hitting 114 degrees Fahrenheit on September 6th. Continued strain on the electrical system along with high winds caused a "red flag warning" with high risk of wildfires due to the high temperatures, high winds, and low humidity.[133] PG&E ended up conducting a Public Safety Power Shutoff event from September 7-9, 2020, that affected approximately 40,000 people in Sonoma County, primarily to the East of Windsor, but ultimately did not affect the Town directly. Power shut off events typically come with watches and warnings but can be detrimental to those who rely on power supplies for durable medical equipment, have limited mobility, and lose access to air conditioning during those events.

Like many other communities across California and the rest of the country, Windsor has a designated cooling center in the community where residents, particularly senior citizens and

[131] Cal-Adapt (2018)
[132] Kovner, G., & Chavez, N. (2020)
[133] The Press Democrat (2020)

those without adequate air conditioning in their homes, can go during extreme heat events. The senior center is currently designated as a cooling center, and the community center, while not officially designated a cooling center, is considered a "charging center" in the event of extreme weather, PSPS events, or blackouts. A charging center is designed to support residents in meeting basic needs like charging cell phones and/or laptops, accessing fans for cooling, and obtaining additional critical information. The Town of Windsor has been more conservative than neighboring Santa Rosa on the number of times per year that the cooling centers have been opened, opening them in the past only a few days per year. The decision to open the cooling center and the environmental criteria and thresholds around when these decisions will occur is ultimately at the discretion of the Town Manager. There is not currently a temperature threshold or heat index that, when met, would necessitate the opening of a community cooling center.

CONSEQUENCES/IMPACTS

PEOPLE

While all residents are sensitive to prolonged heat exposure, Communities of Concern (older adults, children, outdoor workers, socially isolated, economically disadvantaged) have a higher risk of health complications, becoming seriously ill, or dying due to extreme heat. Impacts of extreme heat are some of the most understood and preventable impacts of climate change on human health. Rising temperatures will lead to more frequent and more extreme heat waves in the region. These events, in turn, can affect the health and wellness of Windsor residents, visitors, and workers. A heat index of only 80 degrees Fahrenheit can cause fatigue with prolonged exposure or physical exertion, and even higher temperatures can lead to more serious conditions such as heat cramps, heat exhaustion, and heatstroke. If left untreated, heatstroke can lead to damage or failure of internal organs or even death.[134] While everyone is vulnerable to extreme heat, certain populations are more vulnerable to extreme heat, such as the elderly, the very young, low- to no-income residents, those that work outdoors, and individuals with pre-existing health conditions.[135] High temperatures can worsen chronic conditions such as cardiovascular disease or diabetes related conditions and lead to increases in hospital admissions for cardiovascular, kidney, and respiratory disorders.[136]

Another way to look at consequences of extreme heat events to people in the Town is to look at what the State of California calls Heat Health Events. These are determined to be heat events that lead to adverse health impacts.[137] Generally, Windsor has not been subject to many of these events; historical averages range from 0.1 events a year on average for the general population in the Highway 101 corridor to 0.7 events a year in the south side of Town.[138] The number of these heat health events is projected to increase (particularly under the higher change, RCP 8.5 scenario) to between 2.9 and 3.9 events a year for the Highway 101 corridor and southern portions of the Town (respectively) by the middle of the century and between about 7 and 5 events a year for the 101 corridor and southern portions of the town (respectively) by the end of the century.

[134] Sarofim et al. (2016)
[135] Kinney et al. (2008)
[136] Kinney et al. (2008)
[137] California Heat Assessment Tool (2021)
[138] California Heat Assessment Tool (2021)

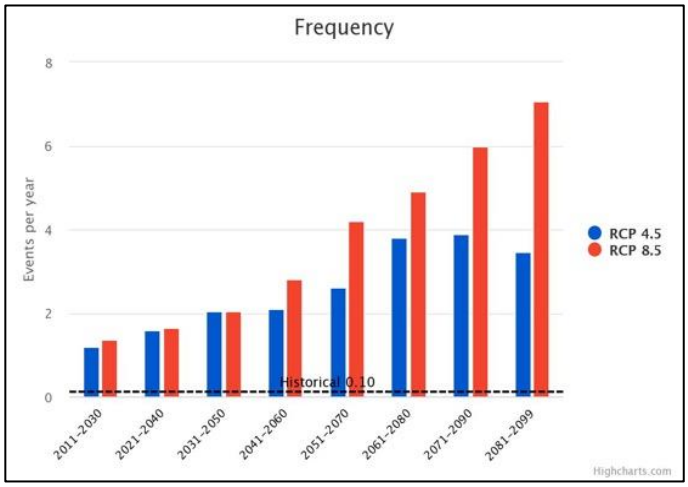


Figure 45. Heat health events for central Windsor around Highway 101. Projected number of heat health events for the 101 corridor tract (Census Tract: 6097153808) in Windsor according to the California Heat Assessment Tool (www.cal-heat.org) averaged by climate period. Historical average for the general population, RCP 8.5, and the 95% heat threshold event is shown on the dotted line. Other projections are shown for the different climate scenarios.

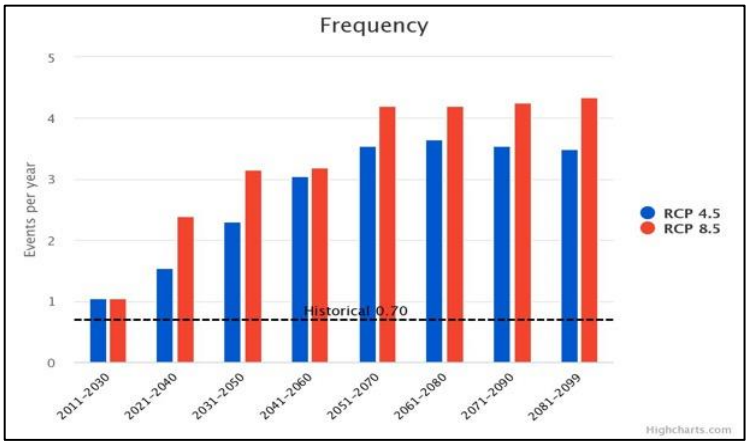


Figure 46. Heat health events for Southern Windsor. Projected number of heat health events for Southern Windsor (Census Tract: 6097152702) according to the California Heat Assessment Tool (www.cal-heat.org) averaged by climate period. Historical average for the general population, RCP 8.5, and the 95% heat threshold event is shown on the dotted line. Other projections are shown for the different climate scenarios.

How extreme heat events, or heat waves, affect the Town and its residents will depend significantly on the characteristics of individual neighborhoods as there will be local variations in the urban heat island effect and on the individuals themselves and their differential sensitivity to these higher temperatures. Populations more vulnerable to these impacts are the elderly, the very young, outdoor workers, and those with chronic diseases.[139] Older adults, particularly those who have preexisting diseases or are taking medications that affect thermoregulation are at

[139] USGCRP (2016)

greater risk of mortality or morbidity associated with these events. Children can spend more time outdoors, have higher metabolic rates and can see complications related to dehydration or heat stress.

Race, ethnicity, and socioeconomic status can also affect vulnerability to extreme heat events. Those community members with lower socioeconomic status and minority populations can be more sensitive to extreme heat events. This is not necessarily due to genetic differences, but to other multi-dimensional factors such as historical discrimination, access to air conditioning, access to health care, lack of tree cover or shade and more intense urban heat island effects in the neighborhoods where these residents live.[140] Poverty is a key risk factor that can exacerbate the effects of extreme heat on low-income individuals. With future financial resources, these community members will be less able to prepare for, respond to, and recover from extreme heat and other extreme weather events.[141]

The impact of extreme heat on mental health becomes evident with increased incidence of disease and death, aggressive behavior, violence, and suicide. There is also evidence of increased hospital and emergency room admissions for those with preexisting mental health and psychiatric conditions. Individuals with mental illness are more sensitive to increases in extreme heat and higher risk for poor physical and mental health due to these events. Extreme heat events are linked to impaired cognitive function, increased rates of insomnia (which can both impair cognitive function and lead to more depressed moods), and increased rates of violence and suicide.[142] Overall, the increased stress of extreme weather events can more dramatically impact sensitive populations.

Communities in cooler areas of California may be at greater risk of heat-related illness. This is due to multiple factors: 1) individuals are less acclimatized to heat; 2) people are not as familiar with behaviors or changes in their daily activities and routines that can reduce their exposure or physiologic stress; and 3) the built environment is not properly equipped to handle warmer conditions or the prolonged exposure to such high temperatures (e.g., homes, businesses, public places may not have adequate air conditioning). In addition, communities that do not have the historical exposure to such high temperatures may not be aware of the risks associated with increased temperatures and prolonged exposure and may not have plans or the existing capacity to handle an increase in emergency room visits, demand for power for indoor air conditioning, or need for cooling centers.

Air quality is negatively impacted by rising average temperatures, especially during extreme heat events. Higher temperatures lead to the degradation of air quality by favoring the formation of ground-level ozone and other air pollutants that form from chemical reactions with pollutants emitted from motor vehicles, power plants, and other emissions sources.[143] Reduced or poor air quality can greatly affect the health of many sensitive populations, with a disproportionate burden on elderly, children, and those with chronic underlying disease. As temperatures increase and extreme heat events become more frequent and pervasive, the demand on power generation will also increase, perpetuating the decline in air quality during these times.

[140] USGCRP (2016)
[141] USGCRP (2016); Ackerly et al. (2018)
[142] USGCRP (2016)
[143] California Climate Action Team (2013)

This can further contribute to the degradation of air quality and adversely affect the health of individuals during extreme heat events.

An increase in extreme heat days and increased frequency and duration of heat waves causes an increased demand for energy for cooling homes and buildings, which can have differential cost burdens to residents. As temperatures warm, there will be an increased demand for air conditioning in homes. This means that individuals living in homes already equipped with air conditioning units will likely incur additional costs to cool their homes for longer periods of time and more frequently than before. There are also likely homes that are not equipped with proper air conditioning that will likely need to be retrofitted to accommodate the increasing temperatures. These additional energy costs can disproportionately affect financially burdened populations within Windsor, putting them at a greater physical risk (if they are financially unable to pay for adequate cooling methods) or mental health risk (due to additional stress of the increased financial burden).

BUILDINGS

Extreme heat can physically damage buildings, homes, and other critical facilities. Extreme heat generally does not cause extensive damage to buildings; however, extended exposure to high temperatures can cause certain materials to warp. Attics in homes not built to withstand high temperatures, especially higher humidity, may trap the heat and humidity causing a more rapid deterioration of roof shingles and materials. These same high temperatures can also heat up shingles and cause them to expand and warp, ultimately leading to cracks that can cause roof leaks. Soil around building foundations can become so dry under extreme temperatures that it could cause cracking. The temperature ratings for different building materials should be known and can be determined for different residential and commercial structures.

INFRASTRUCTURE

Road and railroad materials can expand under high temperatures, causing roads to buckle and railroad tracks to warp. Thermal expansion can occur in asphalt and concrete roads under high heat conditions. Road buckling can be hard to predict and difficult to prepare for. Some tracks, bridges, and ramps are built with expansion joints that are designed to accommodate a certain amount of heat-induced change. In addition, it may be difficult for road maintenance and repair to occur if temperatures are hot enough to reduce the amount of time road maintenance and construction crews can work outdoors.

High temperatures can lead to power shortages and increases in the frequency of brownouts and blackouts. The effectiveness of electrical infrastructure is reduced under high temperature conditions. Additionally, demand on electrical systems drastically increases during these same periods due to increased air-conditioning needs for homes and buildings; this combination of factors can put strain on the electric grid and lead to blackouts if improperly managed.[144] These potential failures in the energy infrastructure, even if they are temporary, can put the health and safety of residents, visitors, and workers, at risk.

[144] Sonoma County RCPA (2014); Town of Windsor (2018a)

Power failure and the failure of critical transportation infrastructure during extreme heat events such as traffic signals and traffic operation failures can impact the transportation network. The threat of extreme heat events is also compounded by greater risk of wildfire during the event, wherein the loss of traffic signal operations would negatively impact evacuation efforts. Town residents and roadway users without access to vehicles are also highly at risk during extreme heat events. Many Windsor residents must use forms of active transportation to commute to work, an activity that may be a health risk in extreme heat events.

NATURAL SYSTEMS

An increase in prolonged extreme heat events contributes to drought conditions and impacts soil moisture as well as surface and groundwater storage and supply affecting plants and animals in the region. Increased temperatures lead to increased rates of evapotranspiration in vegetation and reduce the overall soil moisture and permeability in the soils. Extreme heat events contribute to and can exacerbate drought conditions, which are described in more detail in the context of drought. High heat events can damage trees, other plants, and animals in the region

ECONOMY

Extreme heat can damage or destroy agricultural crops. Extended periods of high temperatures can severely damage agricultural crops, especially when these periods of high temperatures are accompanied by reduced precipitation and drought conditions.

Extreme heat events can negatively impact tourism and businesses serving those visitors. As extreme heat events become more common, businesses may be impacted due to a decrease in tourism and visitors to Windsor and the surrounding area as people choose to remain in their homes.

Drought

VULNERABILITY SUMMARY

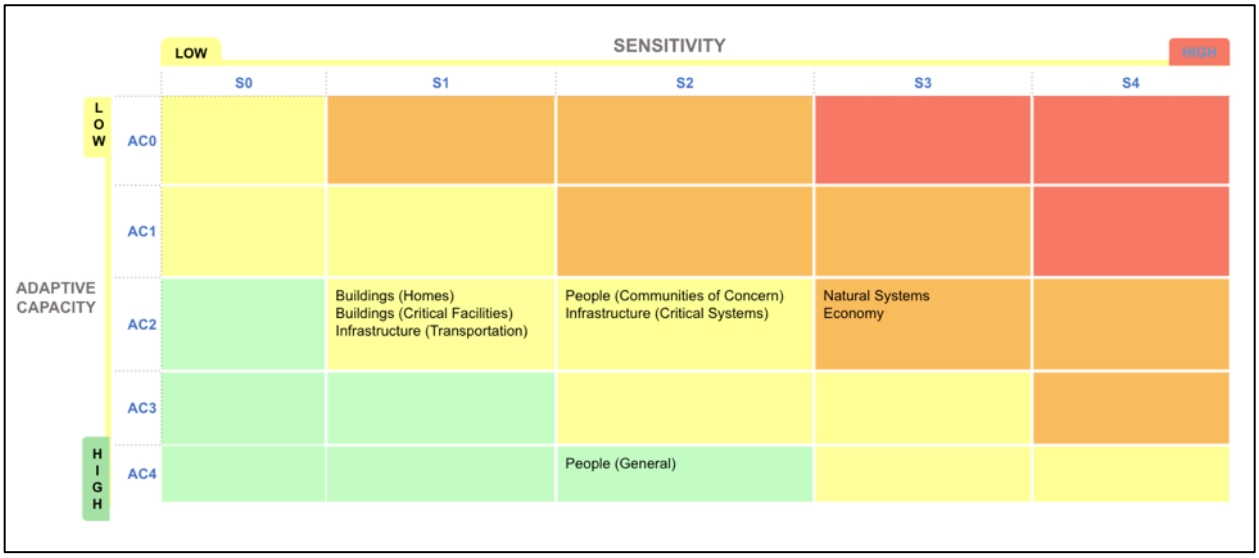


Figure 47. Relative vulnerability assessment of drought for Windsor's primary assets. Vulnerability is shown by the different colors of the matrix (Red = Extreme Vulnerability; Orange = High Vulnerability, Yellow = Medium Vulnerability; and Green = Low Vulnerability). Given the climate hazards, relative vulnerability is based on the assessment of sensitivity (x-axis ranging from S0 = not at all sensitive to the projected changes to S4 = extremely sensitive to the projected changes) and adaptive capacity (ability to respond to those changes ranging from AC0 = no ability to respond to AC4 = ability to respond to projected changes in a beneficial way).

PEOPLE: Communities of Concern are moderately vulnerable to drought, and the general population has limited vulnerability to drought. The general exposure of drought for the Town is uniform, but the sensitivity of residents depends on a variety of factors. Overall, the sensitivity of Windsor residents to drought is medium (S2), particularly when water restrictions impact residents' ability to access water (for physical and property needs) and potentially the cost of water costs (e.g., increases in the price of water and food), or drought directly impacts the ability of residents to meet daily. While droughts rarely disrupt municipal water supplies and drinking water availability, they put additional burdens on low-income or housing burdened residents. Residents with preexisting conditions (e.g., respiratory illness) may be particularly sensitive to longer or more intense allergen seasons or dust due to drought conditions. Overall, the adaptive capacity of people to drought is medium (AC2) for Communities of Concern and high (AC4) for the general resident. Low-income residents and residents that experience poverty or housing insecurity are particularly sensitive if drought conditions damage housing and create additional expenses. Due to current and recent experience dealing with drought conditions, there are on-going planning efforts at the local and county level to limit the impacts of current and future drought events.

BUILDINGS: Homes and critical facilities are moderately vulnerable to drought. Across the Town, buildings generally experience the same exposure to drought conditions and drying soils. And generally, buildings themselves have limited sensitivity to drought (S1). Yet, under

extreme conditions, drought can impact homes and buildings (e.g., foundations can crack due to shifting soils, surrounding vegetation can die and increase exposure to the building). Drought conditions can increase the risk of other climate hazards such as wildfires. The adaptive capacity of individual buildings is medium (AC2). The Town and the region have experience with drought and are working together to plan for and better accommodate drought conditions (e.g., Water Supply Strategy Action Plan, Groundwater Sustainability Plan, etc.), though it will take time for any changes to ripple through the infrastructure system and affect individual buildings.

INFRASTRUCTURE: Infrastructure is moderately vulnerable to drought. The sensitivity of the Town (and broader county's) water system to drought is medium (S1 or S2) due to the reliability of local water sources and the relative severity of drought needed to directly affect the transportation system or other infrastructure.[145] The adaptive capacity of infrastructure to drought conditions is also medium (AC2), due in part to the region's relative familiarity with drought existing planning efforts and technologies being used to accommodate drought conditions (e.g., Sonoma County Water Agency Climate Adaptation Plan).[146] It is unlikely that droughts would affect communication systems, though extreme droughts could affect the ability of the community to provide critical firefighting services which can be a challenge because the risk of wildfires is much higher during periods of drought. The Town's water supply system, especially the intake pump systems - require continued maintenance if not in use - may also be affected.

NATURAL SYSTEMS*: Natural systems are highly vulnerable to drought.* The sensitivity of natural systems in and surrounding the Town of Windsor is moderately high (S3) due to the impact that extended and extreme droughts can have. For example, drought can directly cause stress or mortality for a variety of both plant and animal species, which can increase mortality due to an inability to ward-off pests or disease (e.g., mountain pine beetle). Extreme and/or extended droughts can significantly impact aquatic ecosystems like creeks, streams, and rivers. And low water levels can increase water temperatures, concentrate pollution, and decrease water quality for natural systems. The adaptive capacity of natural systems is also moderately high (A3) due to the long-term evolution of natural systems in this region to drought. As drought conditions worsen due to climate change, the sensitivity of natural systems will likely increase and the adaptive capacity may decrease, especially when coupled with other hazards (e.g., wildfire, flooding, etc.). Research continues to emerge that aims to better understand the sensitivity and adaptive capacity of natural systems in the region.

ECONOMY: The economy is moderately vulnerable to drought. Reduced water availability and more water restrictions can present significant challenges for industries reliant on water (e.g., agriculture industry, wineries or breweries), making them more sensitive (S3) to drought conditions than other industries. Tourism can also be affected if the drought is severe enough that it limits outdoor recreation or affects the natural beauty of the region. The adaptive capacity of the economy to drought generally is considered high (AC3) though some businesses (primarily viticulture and agriculture) that rely heavily on water use may be less able to adapt to droughts.

[145] Sonoma County (2018)
[146] Sonoma County (2018)

DROUGHT EXPOSURE FOR THE TOWN

Droughts occur during extended periods of time with limited or no precipitation, sometimes over years and other times over a series of months. They can take time to develop and dissipate. Drought conditions have both direct and indirect impacts on people, buildings, infrastructure, natural systems, and the economy.

Drought is the result of a natural decline in precipitation over an extended period of time and occurs in virtually every climate on the planet, including areas of both high and low precipitation. The severity of drought can be aggravated not only by high temperatures and a lack of precipitation, but by other climatic factors such as prolonged high winds, low relative humidity, and extreme heat. The following four definitions are commonly used to describe different types of drought and demonstrate the complexity of the hazard:

1. Meteorological drought: Degree of dryness, expressed as a departure of the actual precipitation from the expected average or normal precipitation amount, based on monthly, seasonal, or annual time scales.
2. Hydrological drought: Effects of precipitation shortfalls on stream flows, and reservoir, lake, and groundwater levels.
3. Agricultural drought: Soil moisture deficiencies relative to water demands of crops.
4. Socioeconomic drought (or water management drought): Shortage of water due to the demand for water exceeding the supply. The severity of a drought depends on several factors: duration, intensity, geographic extent, water supply demands for both human use and vegetation.

Drought is difficult to define in exact terms, due in part to the ways it differs from other hazards:

- The onset and end of a drought are difficult to determine because of the slow buildup of effects and the lingering impacts after its apparent end;
- There is no exact and universally accepted definition, adding to the confusion of existence and severity; and
- The impact of drought is less obvious and may be spread over a larger geographic area.

These characteristics have hindered the preparation of drought contingency or mitigation plans and can make it difficult to perform an accurate risk analysis.
Droughts occur with general regularity across the State; therefore, the Town of Windsor (and Sonoma County) is no stranger to its direct and indirect impacts. In the 2017 survey to inform the development of the Windsor LHMP, 73% of respondents indicated that they have been impacted by, and are concerned about, severe drought. Drought was classified as a "High" threat hazard for the Town.[147]

Notable droughts across the region have impacted the Town, including in 1928, 1975, 1987, 2012, 2017, 2019, and 2021. From October 2019 - September 2020, the region experienced the third driest year on record over the last 127 years.[148] More recently, on April 21, 2021, Governor Gavin Newsom declared a drought emergency declaration in Sonoma and Merced Counties due

[147] Town of Windsor (2018a)
[148] Sonoma Water (2021)

to drought conditions in the Russian River Watershed.[149] And on May 6, 2021, Governor Newsom expanded that declaration to 41 of the 58 counties across the State.[150] As of June 22, 2021, the U.S. Drought Monitor - a weekly mapping service showcasing drought conditions across the US compiled in partnership with several federal agencies - indicates that Sonoma County is currently experiencing an "exceptional drought" as indicated in Figure 52.

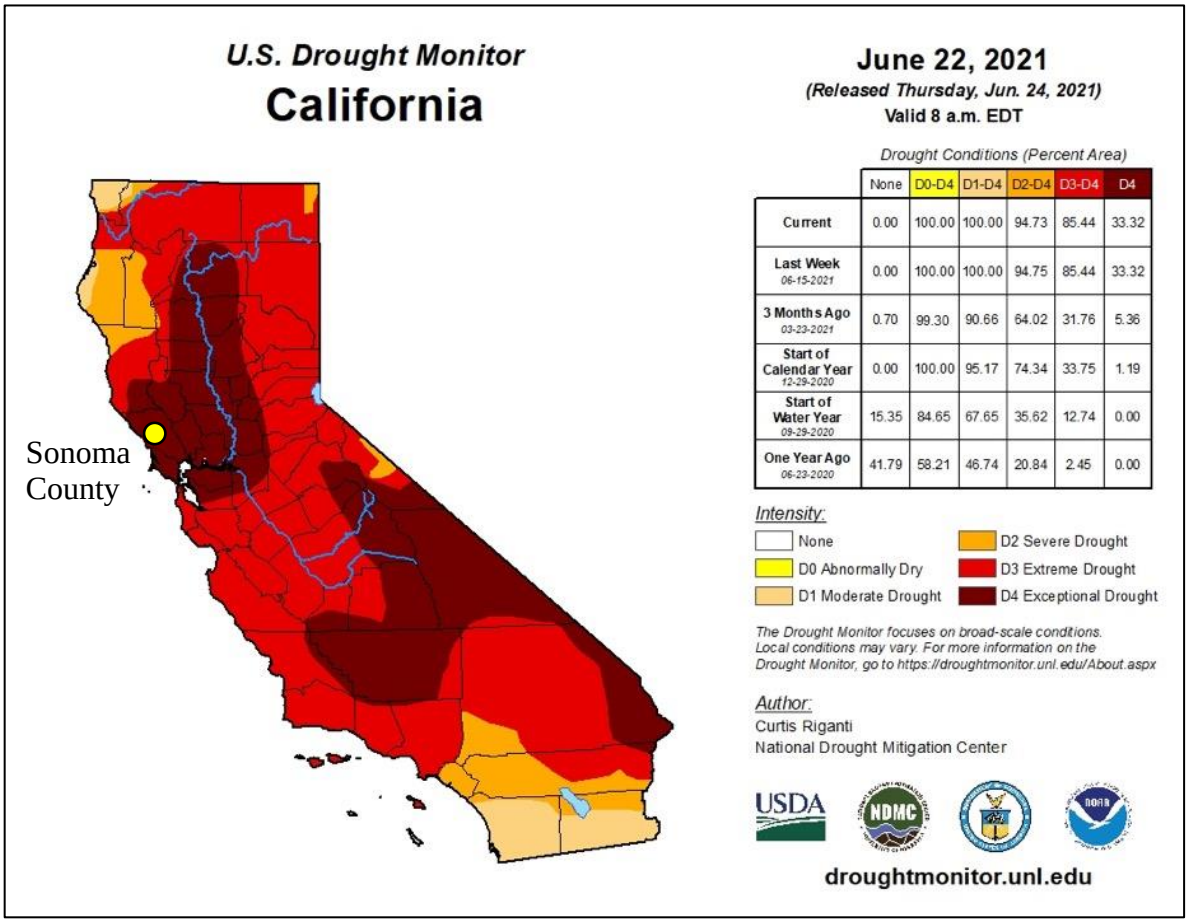


Figure 48. Drought conditions in California as defined by the U.S. Drought Monitor as of June 22, 2021. Sonoma County was in the middle of an "exceptional drought" (D4 intensity) when this map was created. Source: US Drought Monitor, June 22, 2021.

As a result of increasing average temperatures, changing precipitation patterns, and reduced snowpack, droughts are expected to increase in frequency, duration, and severity as the climate changes. In addition to dry spells within a given year (such as the summer dry season), changes to continental and global precipitation patterns may result in annual or multi-year rainfall deficits in the region. Projections show that in addition to a warming trend in the Russian River Valley and Santa Cruz mountains, early and late wet season runoff will likely decrease in frequency and quantity.[151] The intensity of a given drought episode is a function of the amount of precipitation received minus the amount of moisture lost due to plant evapotranspiration and direct

[149] Sonoma County (2021c)
[150] Pinho (2021)
[151] Flint, L.E., & Flint, A.L. (2012)

evaporation from soil and other land cover surfaces. Significant increases in regional temperatures - particularly during spring, summer, and fall months - will cause a deficit of available water, even in situations where precipitation remains generally within historical levels.[152]

Changing regional climate dynamics could lead to up to 10-20% drier conditions overall during the dry summer season[153], especially for areas like Windsor located in the southeastern portion of Sonoma County. Studies indicate that climate change will exacerbate the severity and duration of drought conditions over the coming decades.[154] [155] [156] In situations where rainfall deficits occur over longer periods of time, the intensity of droughts can be expected to go beyond even the significant drought episodes that have occurred in the last two decades. Evidence suggests that "megadroughts" - extreme drought events that can last extended periods of times - are more likely to occur due to climate change. These extended drought events, which could last decades, would likely lead to increases in wildfire risk as well as more complex impacts to the functionality of natural systems, such as intense drought episodes impact plant reproduction, groundwater infiltration, and other landscape-scale factors that contribute to the quality of life that Windsor residents currently enjoy.

CONSEQUENCES/IMPACTS

PEOPLE

Drought conditions may impact Windsor residents due to limited water supply and/or water restrictions. The Town sources the majority of its potable water locally and from surface water sources.[157] Most of its water comes from the Russian River and the remainder is purchased from Sonoma Water. Direct sources include the Russian River Well Field (aka "riverbank wells"), local (off-river) groundwater wells, Russian River surface withdrawals (via the Santa Rosa Aqueduct), and recycled water.[158] Surface water sources are often more susceptible to drought conditions than groundwater. This local dependence on surface water makes Windsor less vulnerable to drought than in other areas of the state but highly vulnerable to regional drought events. Extreme or extended droughts rarely pose a direct safety threat to Windsor residents, but may pose health risks to specific proportions of Windsor's residents. For example, water providers generally respond to drought conditions by increasing water rates or restrictions on water usage, which impacts low-income households, those experiencing poverty, etc. These changes in price and availability of water can cause undue hardships to low-income families as well as to residents who own or work for industries and businesses that are water dependent (e.g., wineries).[159]

Severe and/or extended periods of drought can reduce air quality and increase allergen seasons which impact human health and safety, particularly for those with pre-existing conditions. Drought can have direct health impacts on Windsor residents by exacerbating the frequency,

[152] Sonoma County Water Agency (2015)
[153] RCPA (2016). See Chapter 6 - Sonoma County Climate Readiness
[154] Swain et al. (2016)
[155] Yoon et al. (2014)
[156] Dai et al. (2012)
[157] Town of Windsor (2018a)
[158] Town of Windsor (2011)
[159] Town of Windsor (2018a)

duration, and severity of allergen seasons. Residents with respiratory conditions (including asthma) may be particularly sensitive to these conditions.

Severe and/or extended periods of drought can exacerbate the size, intensity, and duration of wildfires. Despite the fact that native vegetation in California is adapted to drier conditions, drought conditions dry vegetation and fuels that feed wildfires which can directly and indirectly affect the health and safety of Windsor residents.

Drought conditions can lead to water contamination, impacting people through illness-causing bacteria, protozoa, and algal blooms. Water contamination can occur during extended and/or extreme drought conditions.[160] Not only can it impact resident health and safety, treating contaminated water can be extremely expensive.

BUILDINGS

Severe and/or extended periods of drought can result in direct impacts on Windsor homes, buildings, and critical facilities. Extreme changes to moistures in soils around homes, buildings, and critical facilities can result in cracked foundations, damaged siding and roofing materials, damaged pipes, broken sidewalks, and the misalignment of doors and windows. For low-income residents, those experiencing poverty (up to 29.4% of some sectors in Windsor), and those experiencing housing burden (up to 22.6% in some places in Windsor), these damages to their homes can be particularly acute.

Severe and/or extended periods of drought can result in significant secondary impacts (like wildfire or future flooding). Drought conditions can impact the ability of soils to absorb precipitation that can result in flooding due to runoff and ponding.[161] In turn, this can also exacerbate erosion and landslides, which can impact local buildings and infrastructure. Droughts can dry vegetation and make them more likely to burn during a wildfire.

INFRASTRUCTURE

Drought conditions may require extra maintenance for Windsor's infrastructure. Drought conditions are unlikely to directly impact or damage Windsor's critical systems, but water infrastructure that is not regularly used runs the risk of falling into disrepair without regular maintenance or system safeguards.[162] Drought requires an additional burden of maintenance for pipes and other water infrastructure when maintenance procedures require flush outs. Drought also affects the infrastructure of many of the newly-installed low impact development (LID) features that are currently required in new construction to capture and treat stormwater.

Drought conditions may also impact the susceptibility of Windsor's water infrastructure to wildfire. During periods of drought, stressed groundwater resources may necessitate greater reliance on surface water (Russian River), which can be more susceptible to impacts from wildfire impacting both water quality and quantity.[163] In addition, a water emergency may

[160] United States Department of Homeland Security (2015)
[161] Town of Windsor (2018a)
[162] Town of Windsor (2018a)
[163] Sonoma County Water Agency (2015)

develop when multiple climate and non-climate hazards intersect.[164] For example, if an earthquake occurs during a drought, a water emergency - often brought on by depleted water sources, insufficient pressure, or equipment failure - may impact a community's ability to respond to a wildfire due to the increased reliance on local wells.[165] In addition, drought and energy systems are closely tied due to the electric grid's reliance on water to operate.[166]

Drought conditions may directly and indirectly impact Windsor's transportation infrastructure. Extended and/or extreme drought conditions can impact local and regional transportation infrastructure including roads, bridges, railways, bike and pedestrian paths, by cracks or the weakening materials due to the dramatic reduction in moisture in the air and/or soils underneath the infrastructure.[167] The contraction of certain materials in these conditions can lead to minor cracks in asphalt or along sidewalks, but it can also have the potential for greater impacts to ramps and bridges that can weaken materials if they are not properly maintained or built to withstand these conditions. Following extended or extreme periods of drought, small amounts of precipitation can cause significant flooding; as soil is unable to absorb water, the velocity of flood waters increases and can move vegetation, cars, debris, and objects that may cause injury and/or block roadways.

NATURAL SYSTEMS

Drought conditions may significantly impact trees and other plants. Studies show that extended and severe drought conditions stress trees and plants due to a variety of factors including alterations to the carbon and nitrogen cycling process and limited ability to use evaporative cooling, impacting their reproductivity and susceptibility to pests and pathogens (e.g., pine beetle).[168] In addition, drought conditions can result in forest die-off, particularly in forests dependent on a reducing snowpack.[169] This can have cascading impacts on crop yield and ecosystem function. In addition, drought conditions will likely result in reduction to groundwater recharge.[170]

Drought conditions directly impact fish, aquatic species, and aquatic ecosystems. Extreme and/or extended droughts can significantly impact aquatic ecosystems like creeks, streams, and rivers. And low water levels can increase water temperatures, concentrate pollution, and decrease water quality for natural systems. Survival rates of fish decrease as streams, rivers, ponds, and lakes warm due to lower water levels and increasing water temperatures which impact water quantity and water quality. This is particularly critical for threatened or endangered species, like the California Coast Coho and Chinook Salmon and Central California Coast steelhead, all of which depend on the Russian River Watershed.[171]

Drought conditions directly impact wildlife. Drought conditions not only impact water availability for wildlife, but it also increases their susceptibility to pathogens and diseases. This is particularly true for species that rely on wetlands and riparian habitats.

[164] Sonoma County Civil Grand Jury (2020)
[165] Sonoma County Civil Grand Jury (2020)
[166] United States Department of Homeland Security (2015)
[167] https://nca2014.globalchange.gov/report/sectors/transportation
[168] Pedroncelli et al. (2019)
[169] Flint et al. (2017)
[170] Sonoma County Water Agency (2015)
[171] California Department of Fish and Wildlife (2021)

ECONOMY

Drought can directly impact the local economy through market impacts, disruptions to businesses, and increased unemployment. Severe and extended droughts significantly impact the agriculture and viticulture industries through crop loss and associated economic impacts. Sonoma County and the surrounding Windsor area rely on agriculture and viticulture industries not only for food, but for the tourism dollars it brings to the region. Extended and severe droughts may cause significant crop loss and unavoidable costs to local producers and businesses. It will also contribute to increased water needs from natural and human-controlled vegetation, including both agricultural crops and landscaping (e.g., urban trees), requiring increased maintenance, monitoring, and potential threats from diseases and insect pests that can capitalize upon diminished plant function during drought episodes.

Non-climate Shocks and Stressors

Earthquakes

Earthquakes are not directly linked to climate change and are therefore not discussed in detail in this assessment; however, it is essential to address this hazard as a main concern for the Town of Windsor and the potential for the consequences of a minor or major earthquake to exacerbate the vulnerability of the Town to the aforementioned climate hazards. Even impacts from a minor earthquake can have ripple effects across infrastructure systems, emergency response timing and availability, as well as an individual's capacity to respond to an emergency situation or particular hazard. This is particularly true when connected with a climate-related hazard, such as drought or wildfire.[172] While the Town's vulnerability to an earthquake is not linked to a changing climate, it is necessary to understand the interconnected nature of these natural events to the vulnerabilities highlighted in this assessment as well as the potential role that even a minor ground shaking event can have on the cause of a wildfire or dam failure, both of which are relevant to this assessment.

Man-made hazards

Man-made hazards are not directly related to climate change but may be indirectly influenced by climate change and extreme weather events. Man-made hazards include things such as the following: Illegal Drugs that are a perennial public health issue and a constant strain on public resources; hazardous materials release or pollution caused by the uncontrolled release of hazardous materials capable of posing a risk to life, health, safety, property, or the environment (generally from traffic accidents); or school/workplace violence involving edged weapons, firearms, explosives, or other weapons can inflict a high number of casualties in a very short timeframe, overwhelming immediate response capacity and leading to profound secondary effects that disrupt the community and adversely affect lives. These events are not the focus of this planning effort but may need to be considered in designing successful actions to reduce vulnerabilities.

Pandemics

As evidenced by the COVID-19 pandemic in 2020, pandemics impact all facets of our community. While the research continues to emerge on the interconnectedness of land use, biodiversity loss, wildlife trafficking, and climate change on the transmission of communicable diseases to humans, pandemics impact the vulnerabilities highlighted in this assessment in a variety of ways. It impacts successful planning and investment in emergency preparedness, evacuations, and social networks crucial to the resilience of a community. Research suggests that climate change is exacerbating the transmission of communicable diseases to humans and the implications of current and future pandemics on Windsor's social, physical, environmental, and political systems requires further attention.[173] This is particularly true when planning for and building resilience to the vulnerabilities of hazards mentioned in this assessment.

[172] Sonoma County Civil Grand Jury (2020)
[173] Lustgarten (2021)

Conclusion

Climate change is already impacting the Town of Windsor and those changes will continue to get worse. Drought, wildfire, extreme heat, and flooding present significant challenges to the Town's social, physical, economic, and natural systems. Not all aspects of the community, or the systems that it relies on, will be affected in the same ways or at the same time. This is true for both people and specific Communities of Concern as well as for assets, resources, and infrastructure.

This vulnerability assessment serves as the foundation for assessing the relative climate related risk to different sets of assets and will allow the Town and the community to prioritize where to take action. The next Phase of this project will be to develop localized, customized, and innovative resilience strategies to reduce these vulnerabilities and build a more resilient community.

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CLIMATE RESILIENCE PLAN

APPENDICES A-C

February 2022



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APPENDIX A

GIS Methods and Mapping Details



Introduction

In order to better explore the potential climate change related exposures for the Town of Windsor and identify valued assets relative to various hazardous landscape characteristics, Adaptation International completed several spatial analysis and mapping exercises with data from a variety of sources. This analysis - which is summarized in this appendix - was conducted on an iterative basis throughout the resilience planning process. In addition, maps are presented for reference and are intended to be used in the implementation phase of the resilience planning process. Many, but not all, of the maps have been included in the main text of the Windsor Climate Resilience Plan.

It should be noted that while all of these maps and the associated statistics derived from them are based upon the application of the best available spatial data, they should not be taken as the technical foundation for specific infrastructure or related construction projects. Rather, they should be taken as a high-level set of spatially explicit classifications of the spatial datasets themselves, which may be subject to errors of omission, commission, and/or obsolescence as landscape, building, and legal classifications (such as FEMA flood zones) change over time. Similarly, certain hazards, such as flooding and wildfire, may have effects that go beyond the boundaries of the various locations identified in the analyses below, and as such, exclusion of a property, parcel, or area from these hazard zones does not preclude them from negative impacts in the future.

Methods

The spatial hazard analysis process began with repeated consultations with Town staff, County partners, a variety of data sources at the local, regional, and national level, and exhaustive reviews of the extant literature on climate change risks and current climate-driven hazards within the community. From this, the project team determined that spatial analysis efforts included in the Adaptation Assessment would focus on wildfire and flooding risk explicitly.

Given the long history and large amount of climate vulnerability information already, it was decided early on in the process that this risk assessment would not involve novel modeling or direct data gathering approaches. Rather, it would rely upon publicly available datasets with a known provenance and validity for the region, and that had been adopted in one form or another by relevant planning agencies and stakeholders as an adequate signifier of associated risks. In the case of inland flooding risk, this proved a rather straightforward data acquisition and utilization process, as existing Flood Hazard Mitigation Layer datasets (i.e., FEMA Flood Hazard Layers) produced by the Federal Emergency Management Agency were readily available for the area of interest and had immediate relevance to existing understandings of flood risk and property insurance requirements.[1] Additional areas with known flooding or drainage issues were incorporated into visualizations based on conversations with Windsor staff and residents.

Similarly, wildfire risk - a well-known hazard throughout California - had also been the subject of significant study and administrative action, with both statewide (via CalFire) and Sonoma County-level datasets depicting wildland urban interface zones being available through state and

1 Source: The FEMA National Flood Hazard Layer ArcGIS REST Service, accessed at: https://hazards.fema.gov/gis/nfhl/rest/services/public/NFHL/MapServer

county resources.[2] In more recent years, significant new datasets relating to fuel loads, wildfire hazard potential, risk to structures, and various other dimensions of wildfire risk have become available, providing a look at risk categorizations that go beyond what the wildland urban interface concept (i.e., moderate development in previously wildland areas) to capture the actual distribution of fire risk factors that occur on the landscape across the rural to urban spectrum. Where possible and relevant, these datasets were also examined.

Evacuation zone maps and maps showing potential transportation interventions were also produced in partnership with Nelson\Nygaard based on the traffic shed analysis and evacuation needs of the Town. These maps illustrate the concentration of structures within the various branches and grids of the Windsor road network and the available access points associated with those structures.

Maps developed as part of this process are provided below, both for reference and for secondary use in educational outreach efforts.[3]

2 Source: For historical WUI classifications, see: CALFIRE FRAP Wildland Urban Interface v. 3, available at: https://frap.fire.ca.gov/mapping/gis-data/

3 All aerial imagery shown as a background layer in maps below are provided through the ESRI Imagery Basemap Service, credited as: ESRI, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

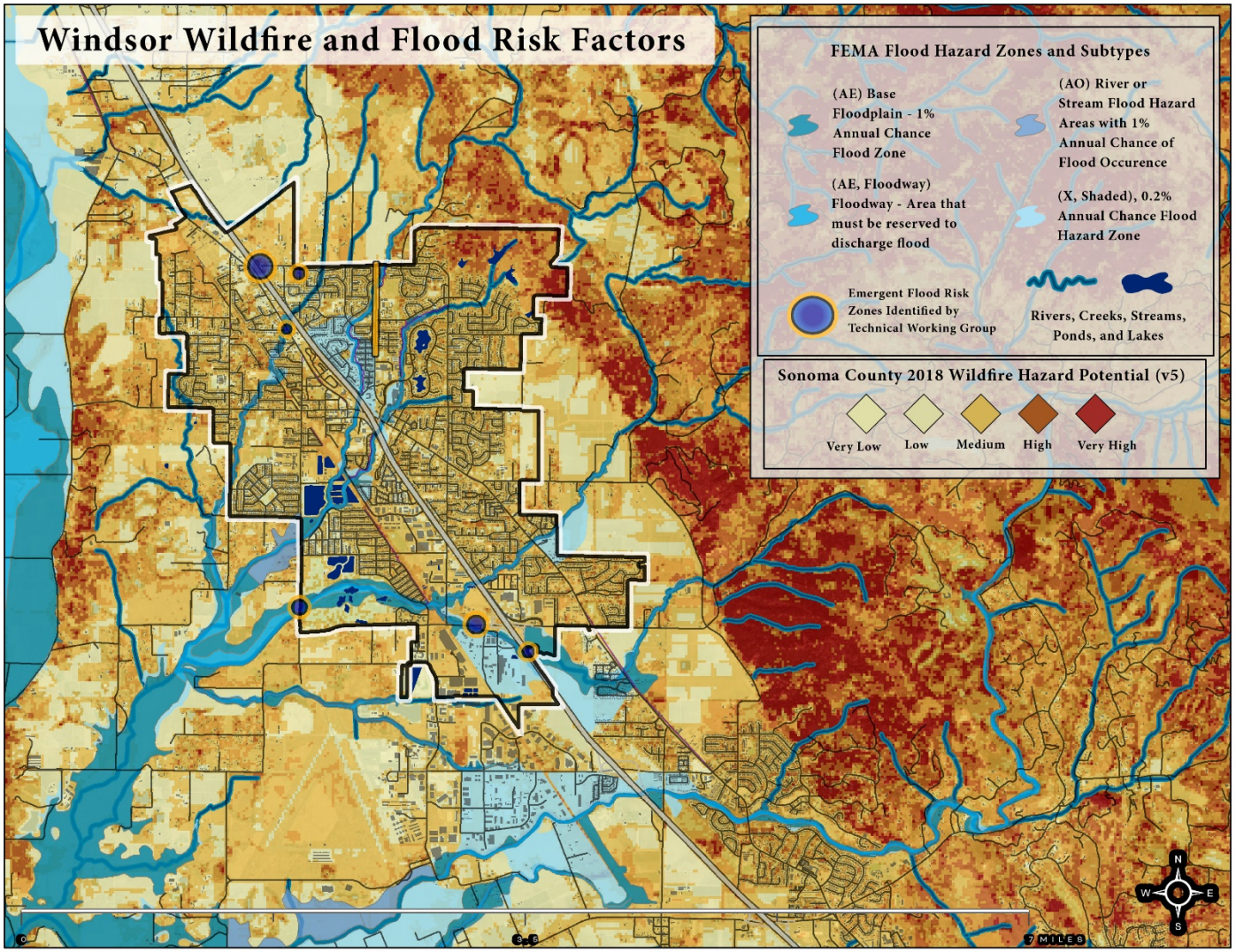


Figure 1. Flood hazard zones and wildfire hazard potential for the Windsor area. FEMA flood zones are show in light and dark blue. The dark blue circles with orange borders show emergent flood risk areas (some in flood zones and some outside those zones where flooding is observed. Sonoma County 2018 Wildfire Hazard Potential layers are an index of fuels, slope, and related difficulties associated with managing wildfire events in an area. Note: this map does not include adequate representation of fuels in the form of houses, urban trees, and other structures within Windsor, as discussed in the main report. Sources: Discussions with Technical Working Group members, FEMA, Sonoma County, 2021. FEMA National Flood Hazard Layer ArcGIS REST Service, accessed at: https://hazards.fema.gov/gis/nfhl/rest/services/public/NFHL/MapServer. Sonoma County Wildfire Hazard Index, accessed at: https://storymaps.arcgis.com/stories/a64d596a8be941c8b28263718880e433.

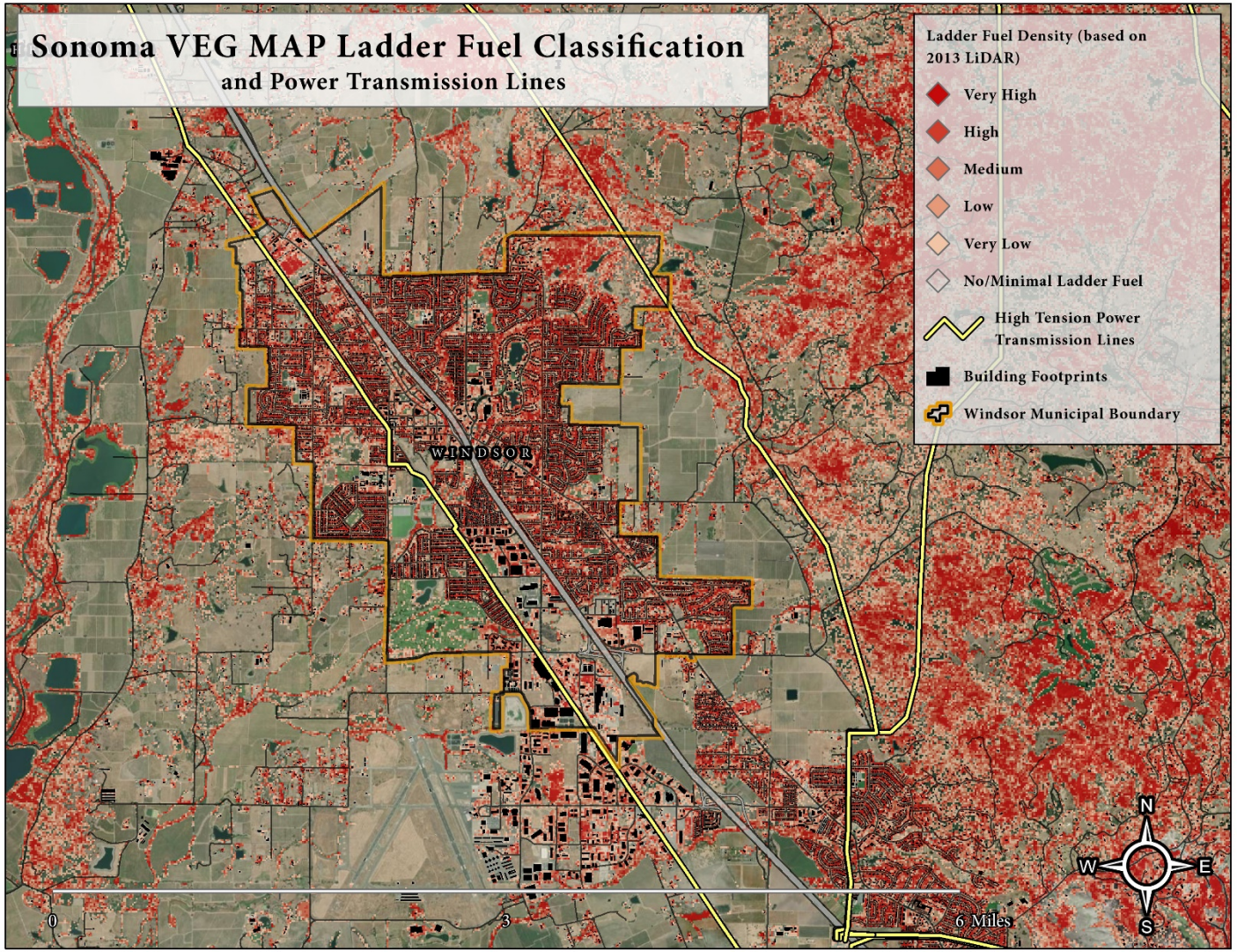


Figure 2. Vegetation and ladder fuel density map for the Town of Windsor and surrounding region. Data Source: Pepperwood Foundation et al. 2019. Sonoma VEG Map Ladder Fuels. Accessed at: https://sonomavegmap.org/data-downloads/

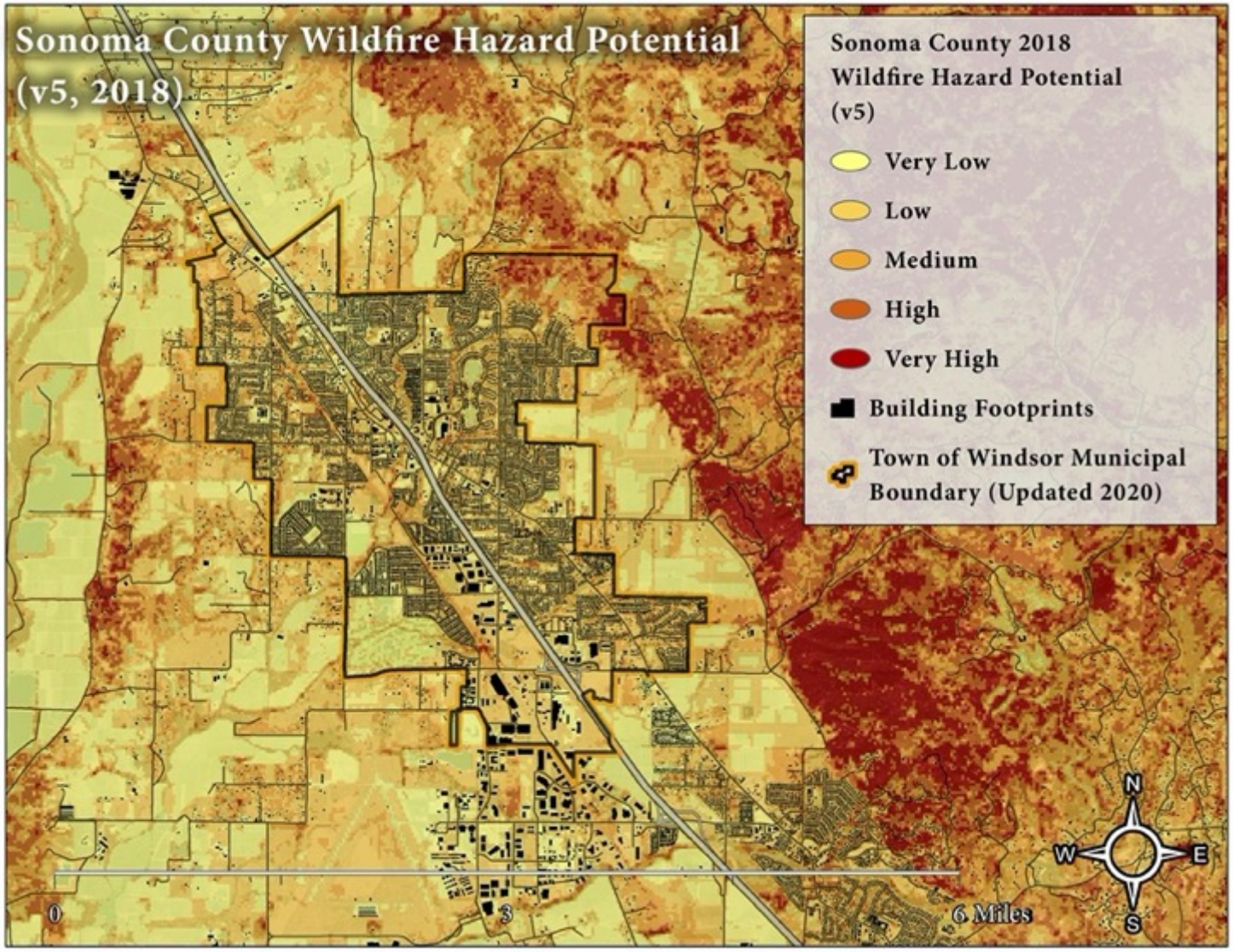


Figure 3. Sonoma County Wildfire Hazard Potential (v5, 2018). Operating independently from USDA and State efforts but sharing many project components, the Sonoma County Wildfire Hazard Index provides another valuable but limited view of the risk factors faced by the Town. Built from analyses of flame length potential, extreme fire weather potential, human development proximity, transmission line proximity, and suppression difficulty, this scheme also classifies much of Winsor and nearby areas as low- to medium severity, relative to all of Sonoma County. However, with much of the town within just a mile or so of potentially dangerous fire hazard areas, these classifications must always be presented in context. Data Source: County of Sonoma. 2021. Sonoma County Wildfire Hazard Index. Accessed at: https://storymaps.arcgis.com/stories/a64d596a8be941c8b28263718880e433

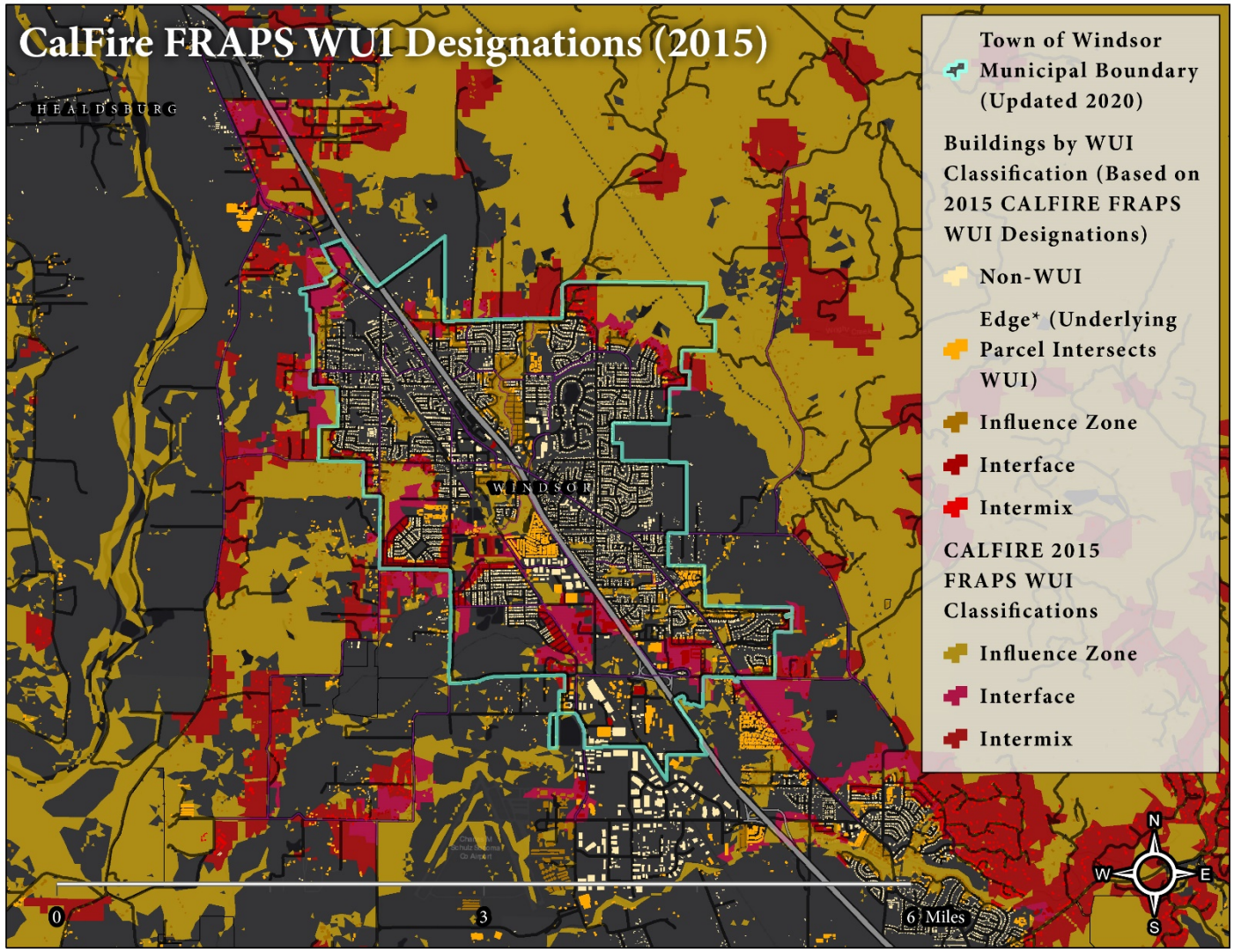


Figure 4. Wildland Urban Interface (WUI) designations as defined by CalFire. Data Source: CalFire FRAPS. 2021. Wildland Urban Interface (WUI). Accessed at: https://frap.fire.ca.gov/mapping/gis-data/

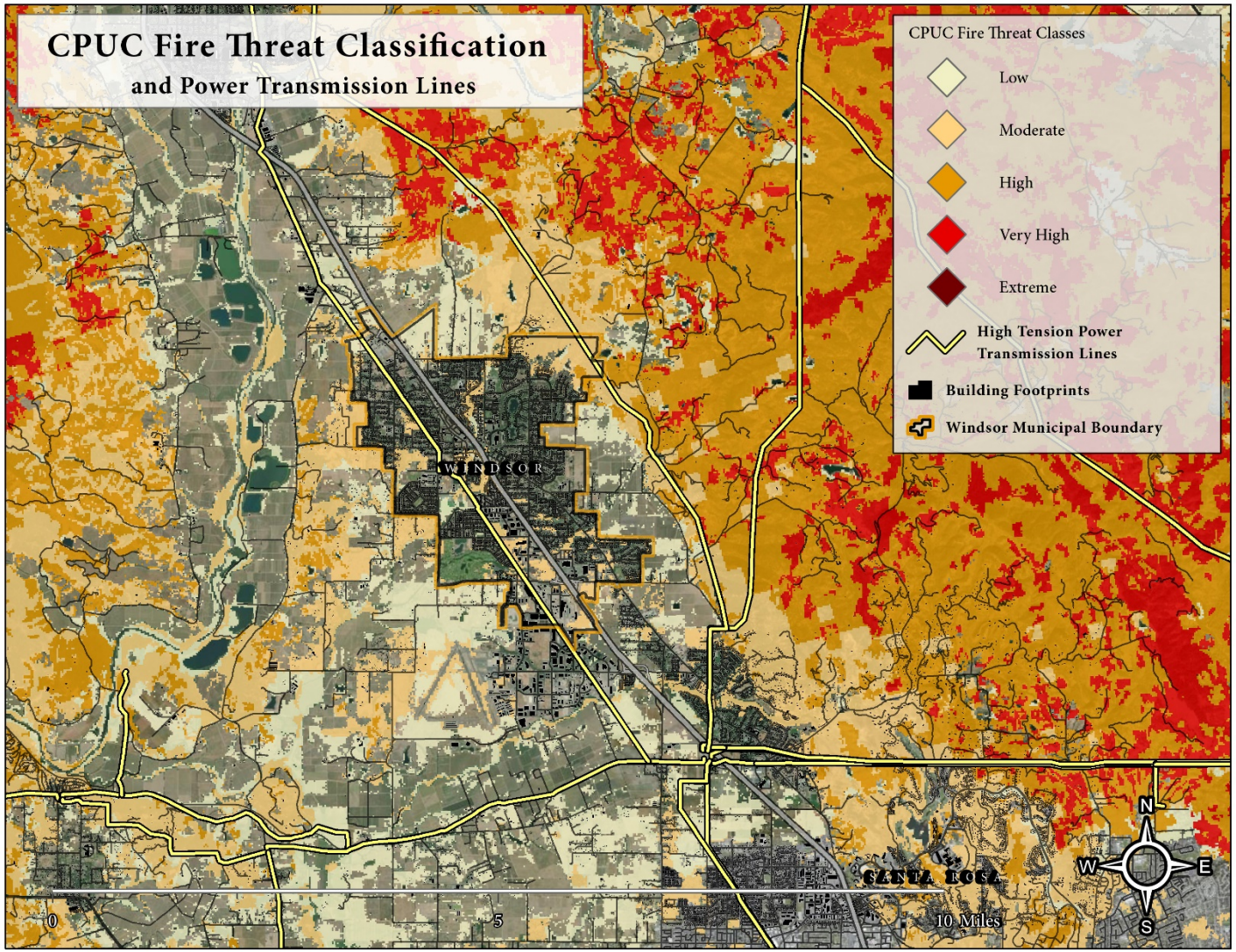


Figure 5. Fire Threat Classification designations as defined by the California Public Utilities Commission (CPUC). Data Source: California Public Utilities Commision. 2017. Fire Threat Maps. Accessed at: https://www.cpuc.ca.gov/industries-and-topics/wildfires/fire-threat-maps-and-fire-safety-rulemaking

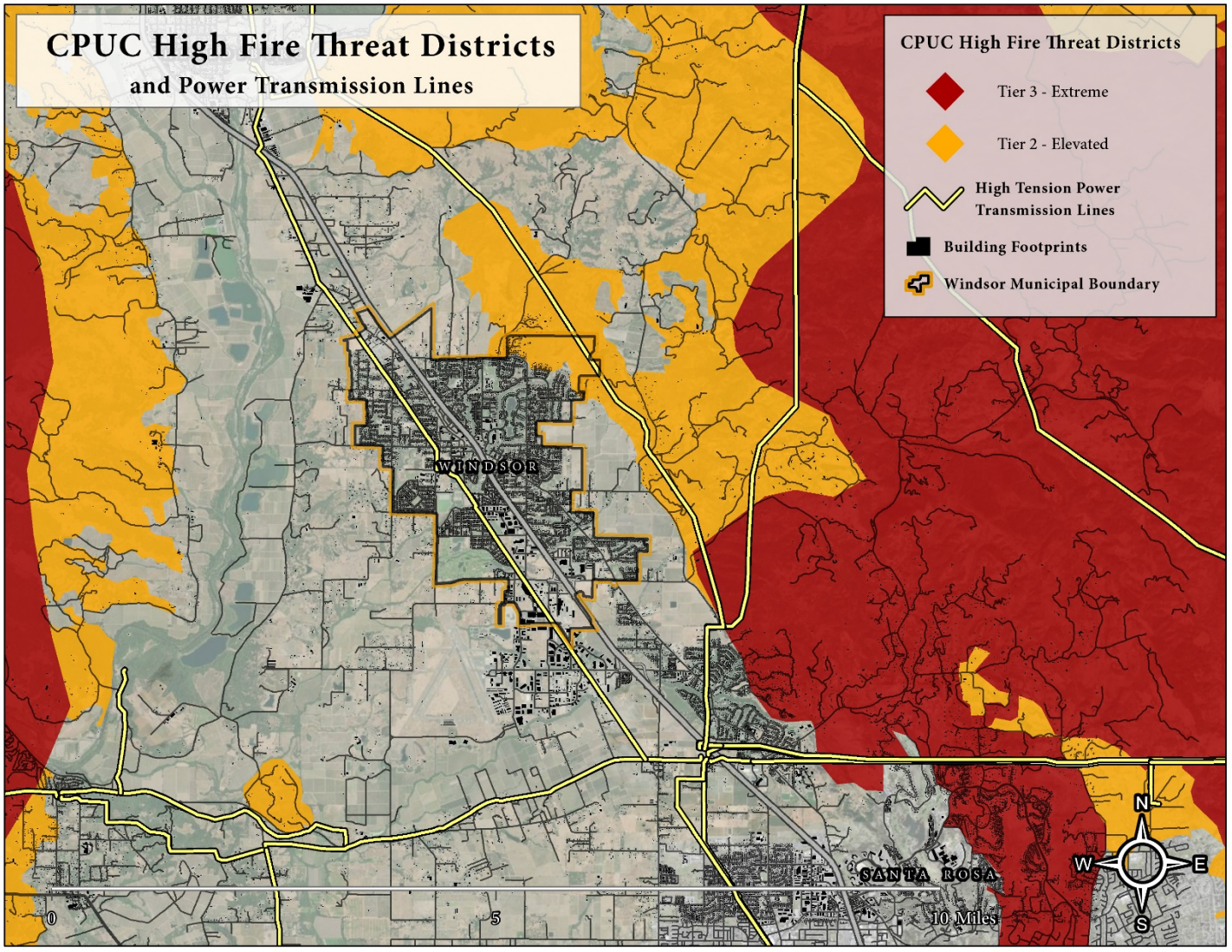


Figure 6. High wildfire threat districts as defined by the California Public Utilities Commission (CPUC). Data Source: California Public Utilities Commision. 2017. Fire Threat Maps. Accessed at: https://www.cpuc.ca.gov/industries-and-topics/wildfires/fire-threat-maps-and-fire-safety-rulemaking

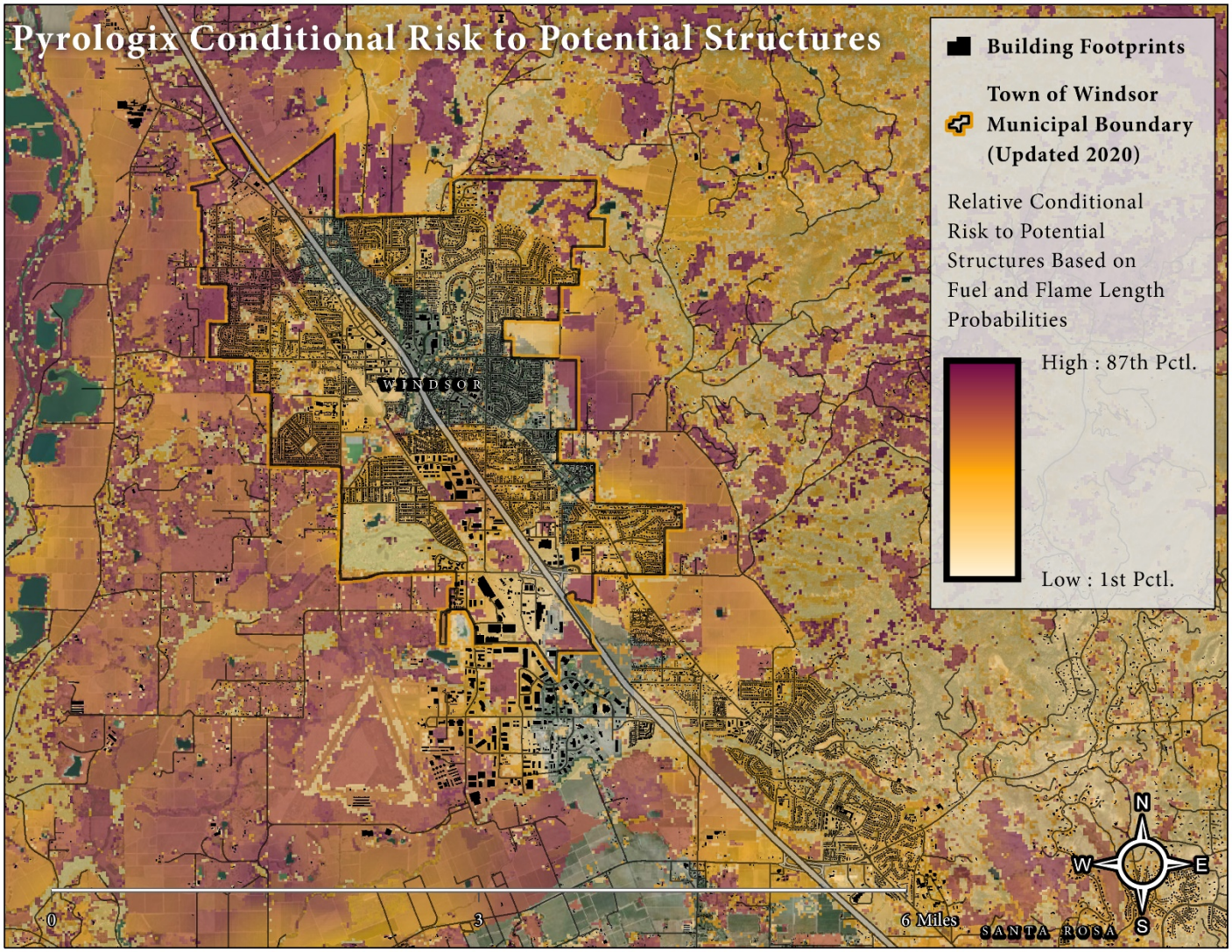


Figure 7. Building footprints and Pyrologix Conditional Risk to Potential Structure percentile rankings (relative to all CA lands). The higher the risk ranking, the more likely structures are to be destroyed during simulated wildfires occurring in the area. Note: this layer depicts relative likelihood of serious impacts to structures but does not incorporate the actual existence of structures and/or their ability to act as fuel into consideration. It also does not fully capture urban vegetation with coverage of less than 10 square meters, thereby excluding many urban trees in central Windsor from its fuel load calculations. Data Source: Pyrologix. 2021. Conditional Risk to Potential Structures Dataset. Accessed at: https://storymaps.arcgis.com/stories/32de73f1cfb040c79f80c189ccefe061 See also: Vogler et al. 2021. Contemporary Wildfire Hazard Across California. Pacific Southwest Region, USDA Forest Service. Accessed at: http://pyrologix.com/reports/Contemporary-Wildfire-Hazard-Across-California.pdf

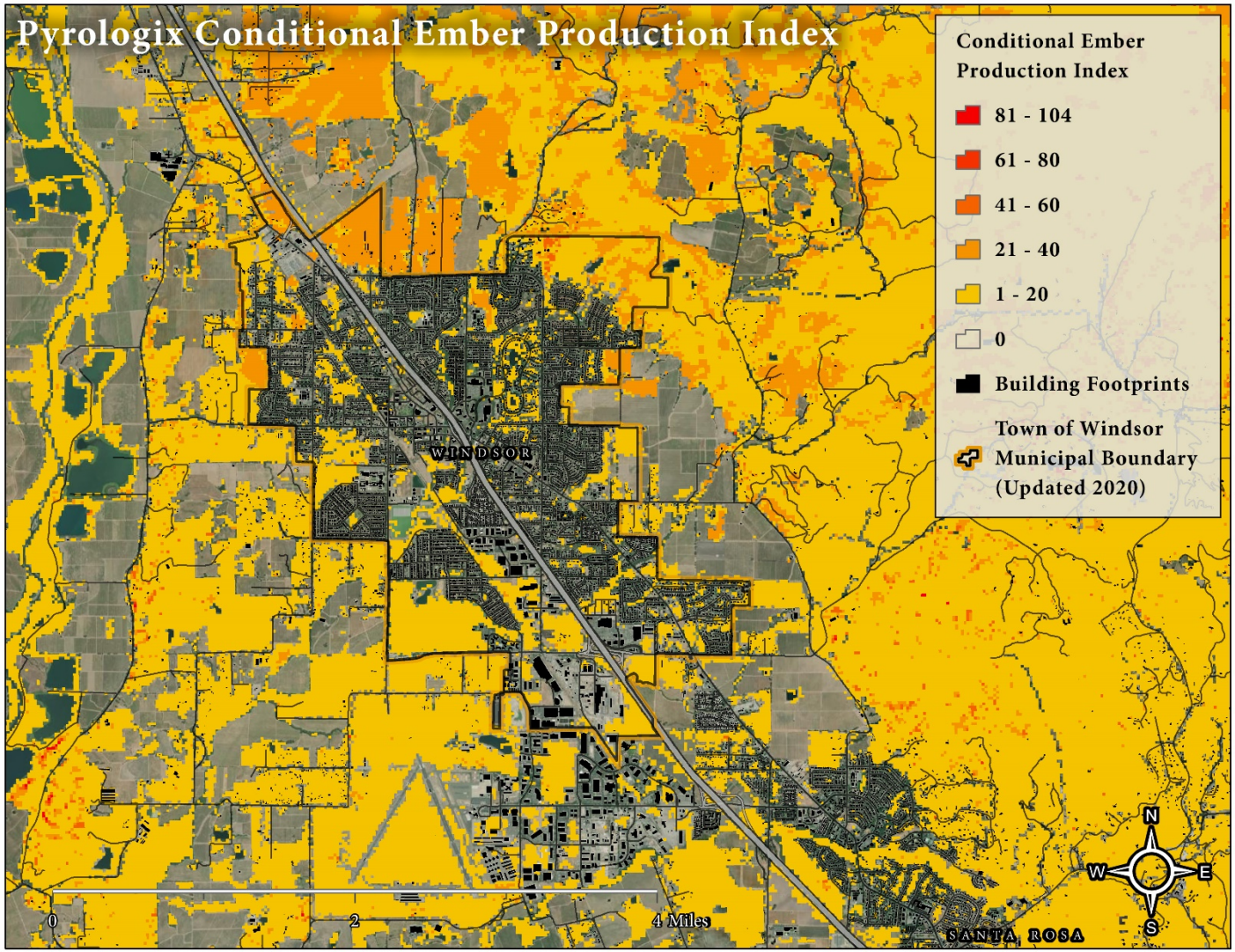


Figure 8. Pyrologix Conditional Ember Production Index for the Town of Windsor and the Surrounding Areas. Based on existing fuels, average wind conditions, topography, and fuel type, this map represents model outputs of an effort to predict the relative volume of embers produced by potential fires in the area. Relative to all of California, the area immediately around Windsor faces low and moderate ember production risks on a percentile ranking basis. However, embers produced in distant areas can be carried significant distances, and given the extreme risks faced elsewhere, "low" ember production risk within the state is no justification for low levels of caution. Forests upwind of the town to the west have significant ember production potential. (Source: Tukman, et al. 2021). Data Source: Pyrologix. 2021. Conditional Ember Production Index Dataset. Accessed at: https://storymaps.arcgis.com/stories/32de73f1cfb040c79f80c189ccefe061 See also: Vogler et al. 2021. Contemporary Wildfire Hazard Across California. Pacific Southwest Region, USDA Forest Service. Accessed at: http://pyrologix.com/reports/Contemporary-Wildfire-Hazard-Across-California.pdf

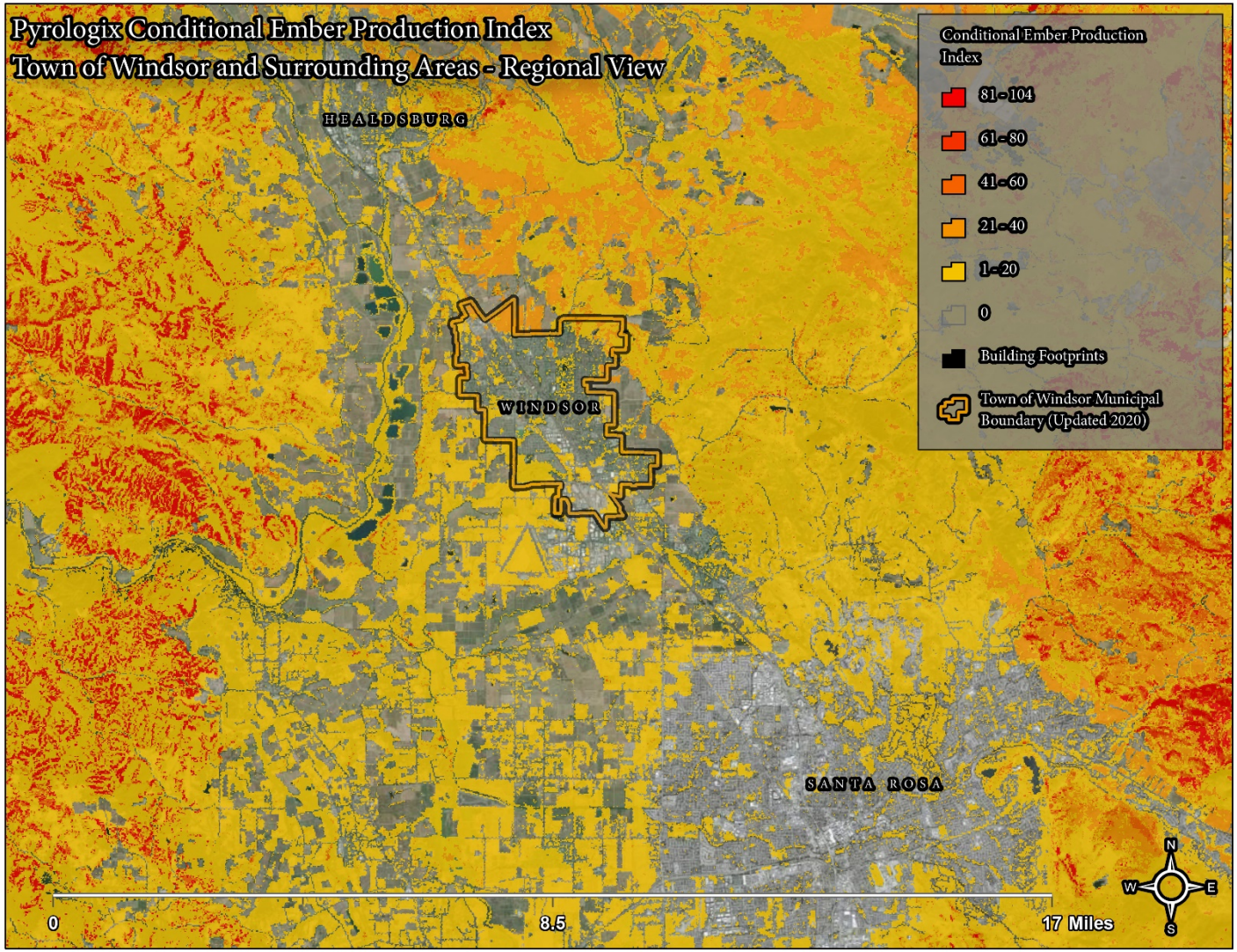


Figure 9. Pyrologix Conditional Ember Production Index for the broader region. Based on existing fuels, average wind conditions, topography, and fuel type, this map represents model outputs of an effort to predict the relative volume of embers produced by potential fires in the area. Relative to all of California, the area immediately around Windsor faces low and moderate ember production risks on a percentile ranking basis. However, embers produced in distant areas can be carried significant distances, and given the extreme risks faced elsewhere, "low" ember production risk within the state is no justification for low levels of caution. Forests upwind of the town to the west have significant ember production potential. (Source: Tukman, et al. 2021). Data Source: Pyrologix. 2021. Conditional Ember Production Index Dataset. Accessed at: https://storymaps.arcgis.com/stories/32de73f1cfb040c79f80c189ccefe061 See also: Vogler et al. 2021. Contemporary Wildfire Hazard Across California. Pacific Southwest Region, USDA Forest Service. Accessed at: http://pyrologix.com/reports/Contemporary-Wildfire-Hazard-Across-California.pdf

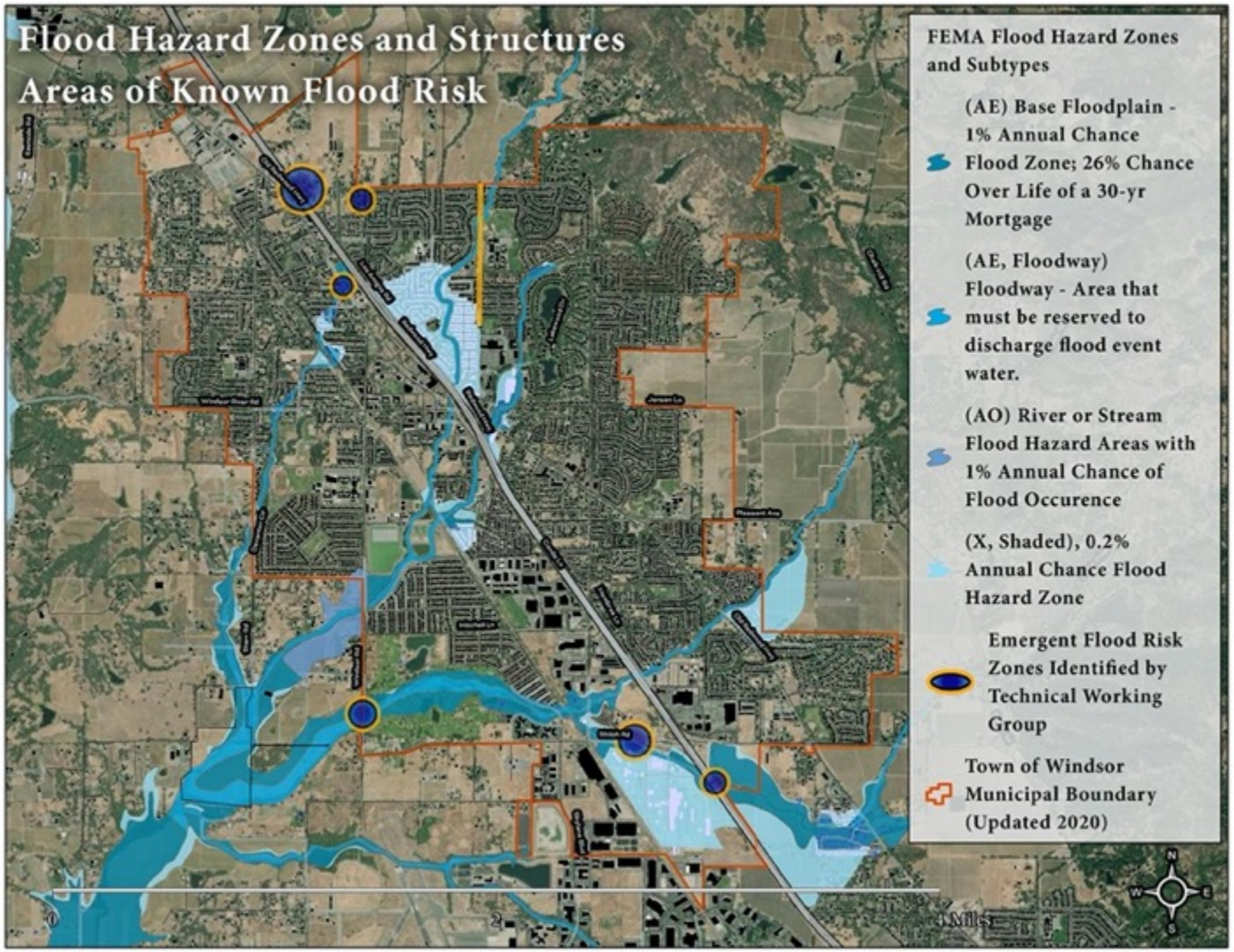


Figure 10. Flood hazard zones for the Windsor. FEMA flood zones are show in light and dark blue. The dark blue circles with orange borders show emergent flood risk areas (some in flood zones and some outside those zones where flooding is observed. Data Source: Discussions with Technical Working Group members and FEMA, 2021.

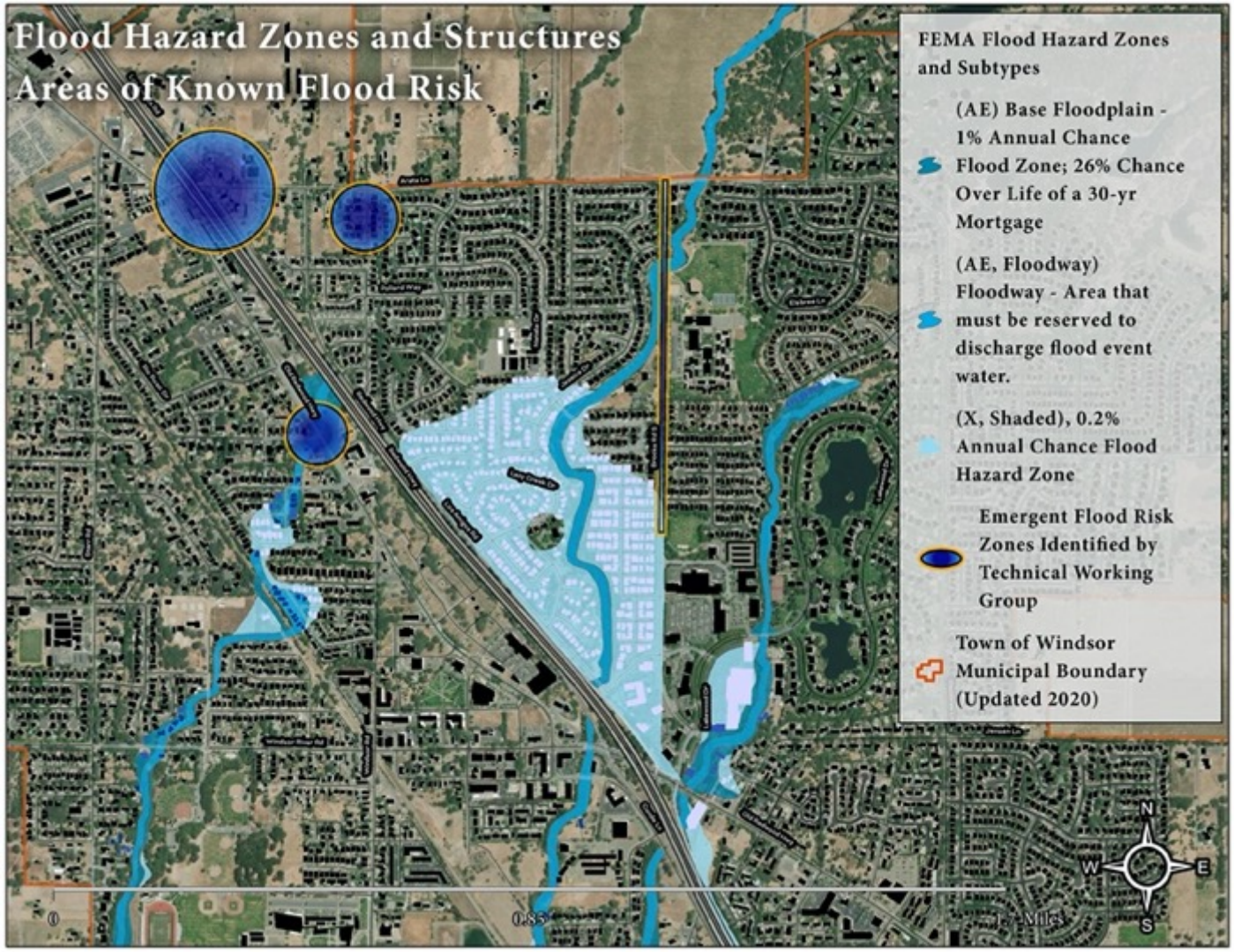


Figure 11. FEMA 1% and 0.2% annual chance of flood risk maps for the Northern part of the Town. Note emergent flood risk zones identified by the Technical Working Group (dark blue circles with orange borders). Data Source: Discussions with Technical Working Group members and FEMA, 2021.

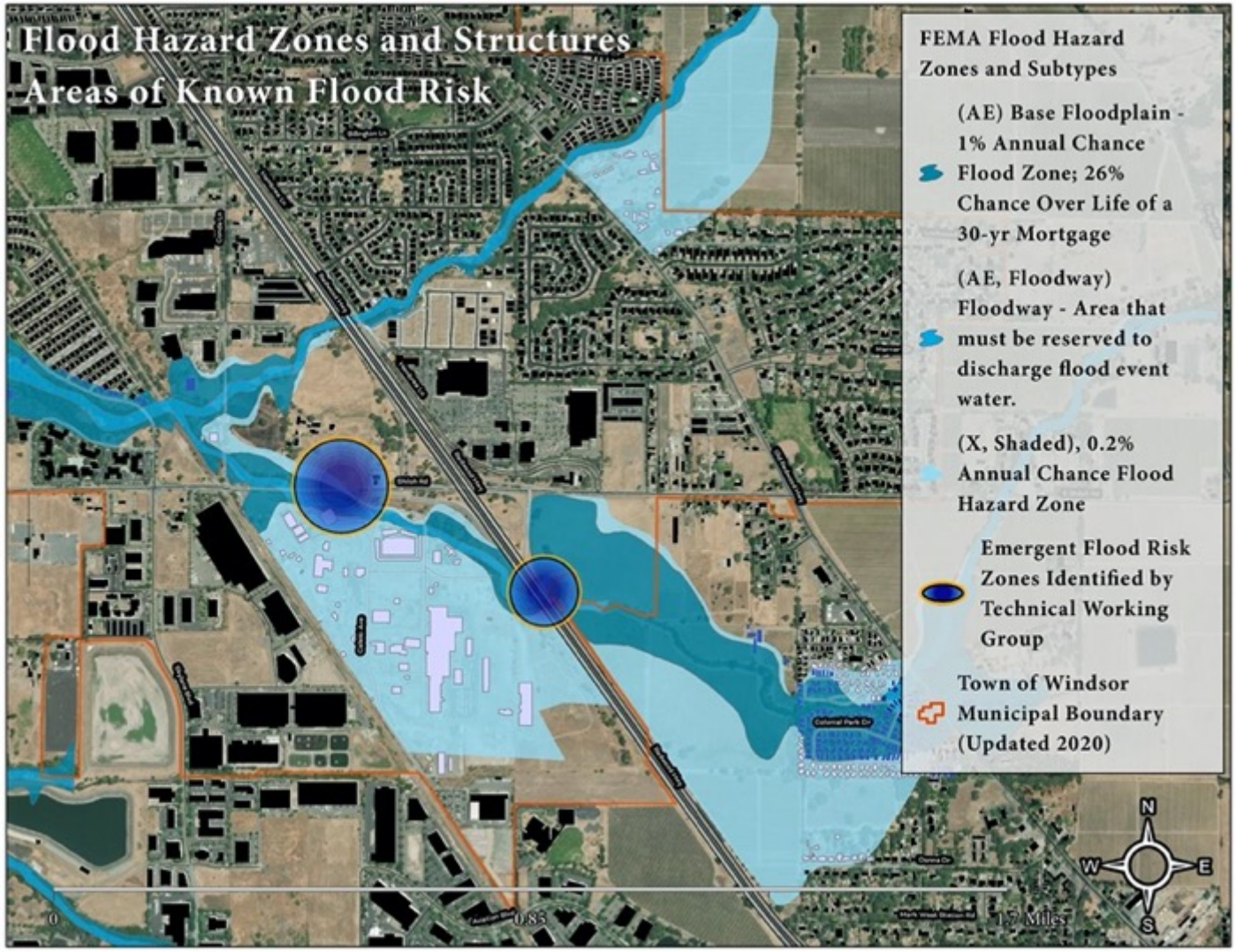


Figure 12. FEMA 1% and 0.2% annual chance of flood risk maps for the Southeast part of the Town. The Windsor Mobile Home Park (bottom right corner) located off of Conde Ln, has 333 structures tucked behind 3 feasible entrance and exit locations and located almost entirely within the FEMA flood zones. Note emergent flood risk zones identified by the Technical Working Group (dark blue circles with orange borders). Data Source: Discussions with Technical Working Group members and FEMA, 2021.

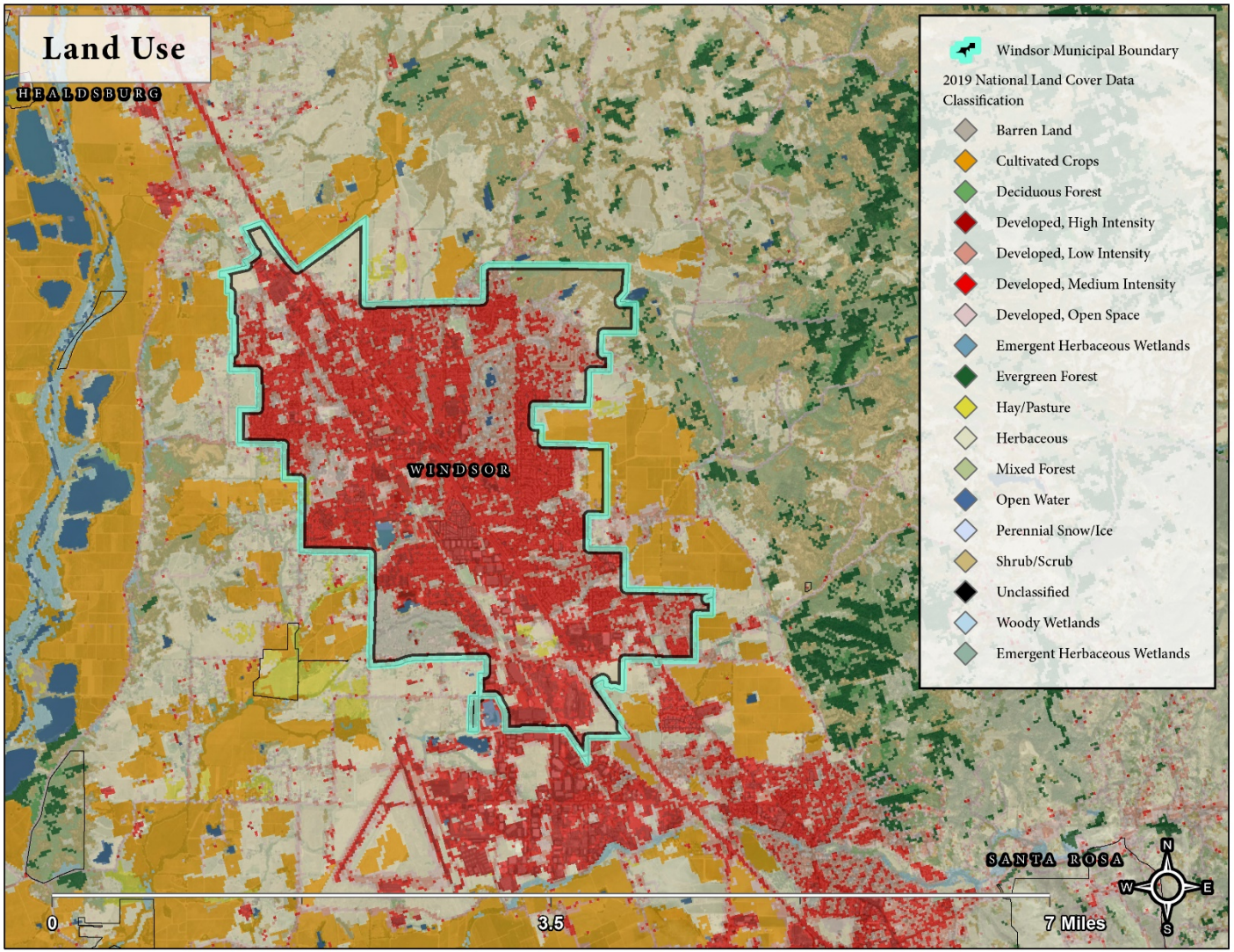


Figure 13. Land use designations for the Town of Windsor and surrounding area. Data Source: Multi-Resolution Land Characteristics Consortium. 2021. NLCD 2019 Land Cover (CONUS). Accessed at: https://www.mrlc.gov/data/nlcd-2019-land-cover-conus

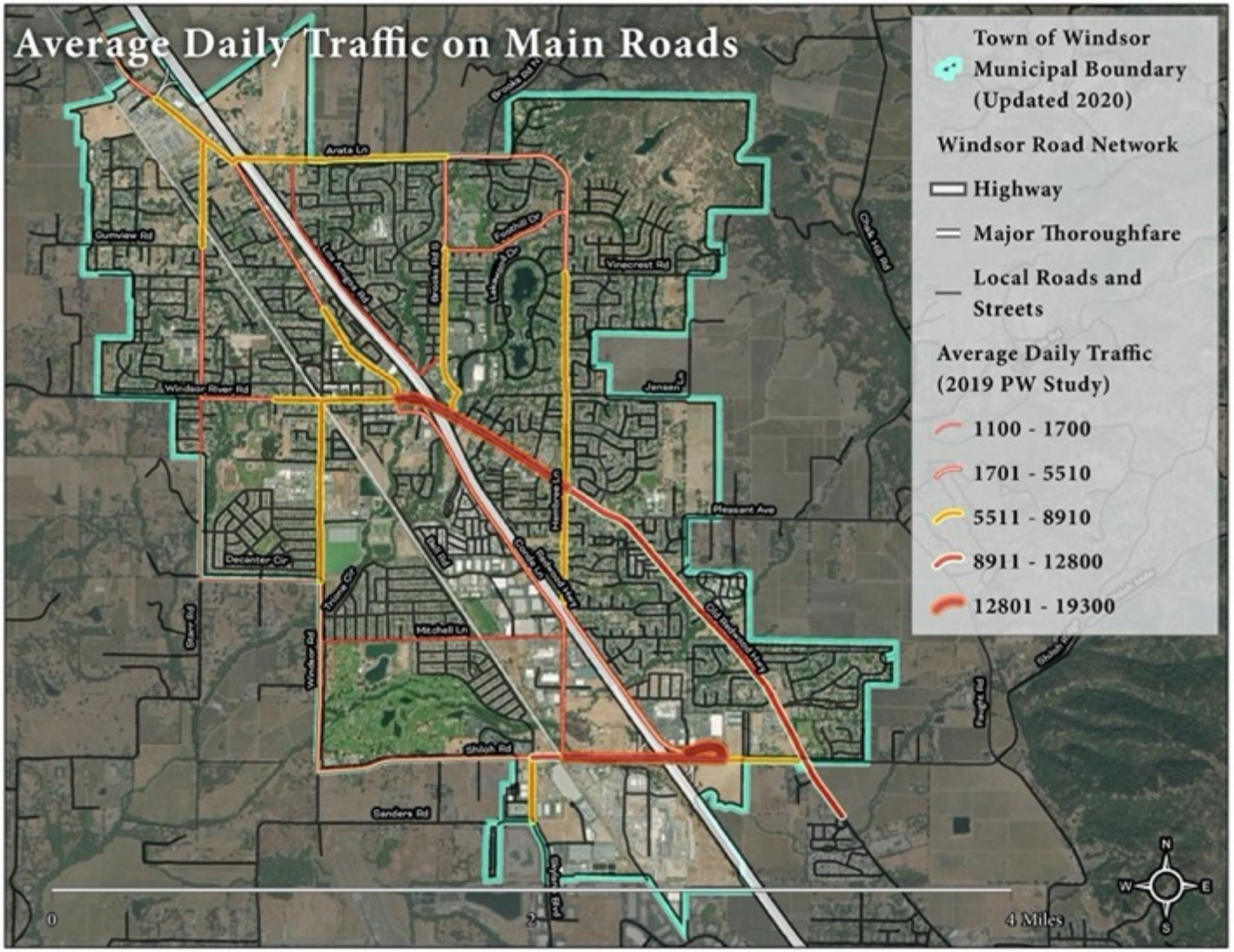


Figure 14. Average daily traffic counts on the main roads through Windsor. Data Source: Windsor Department of Public Works Internal GIS Server.

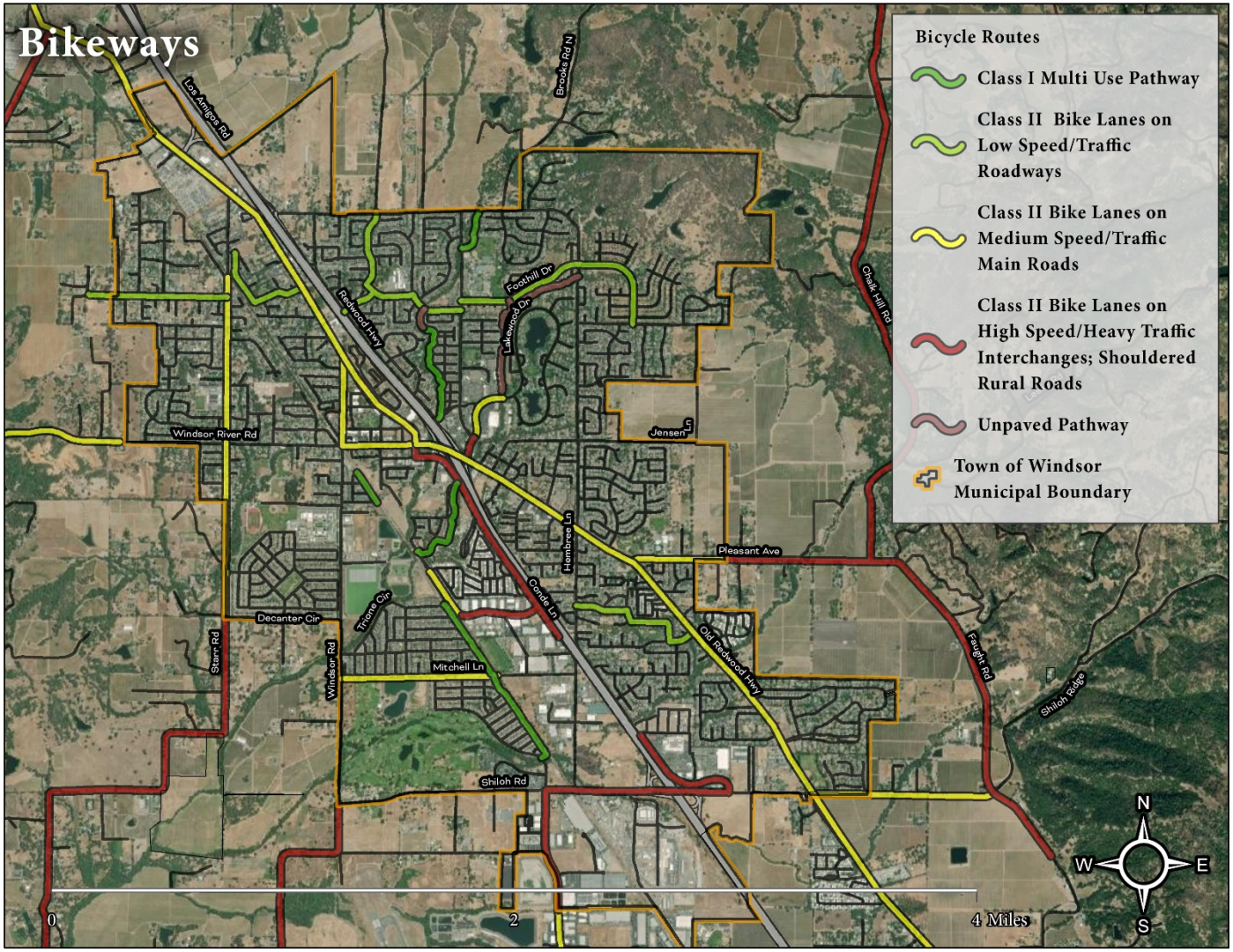


Figure 15. Town of Windsor map of bicycle routes. This map shows the different bicycle routes by type and class within the Windsor Municipal Boundary and connecting routes to the surrounding areas. Class I pathways are separate from automobile traffic and provide the safest options for pedestrians and bikes. Class II bike lanes are alongside automobile traffic and require increased caution depending upon local traffic conditions, especially around interchanges. Rural bikeways may not be distinct bike lanes and may have topography that inhibits visibility or ready maneuverability for less than intermediately skilled riders. Data Source: Windsor Department of Public Works Internal GIS Server.

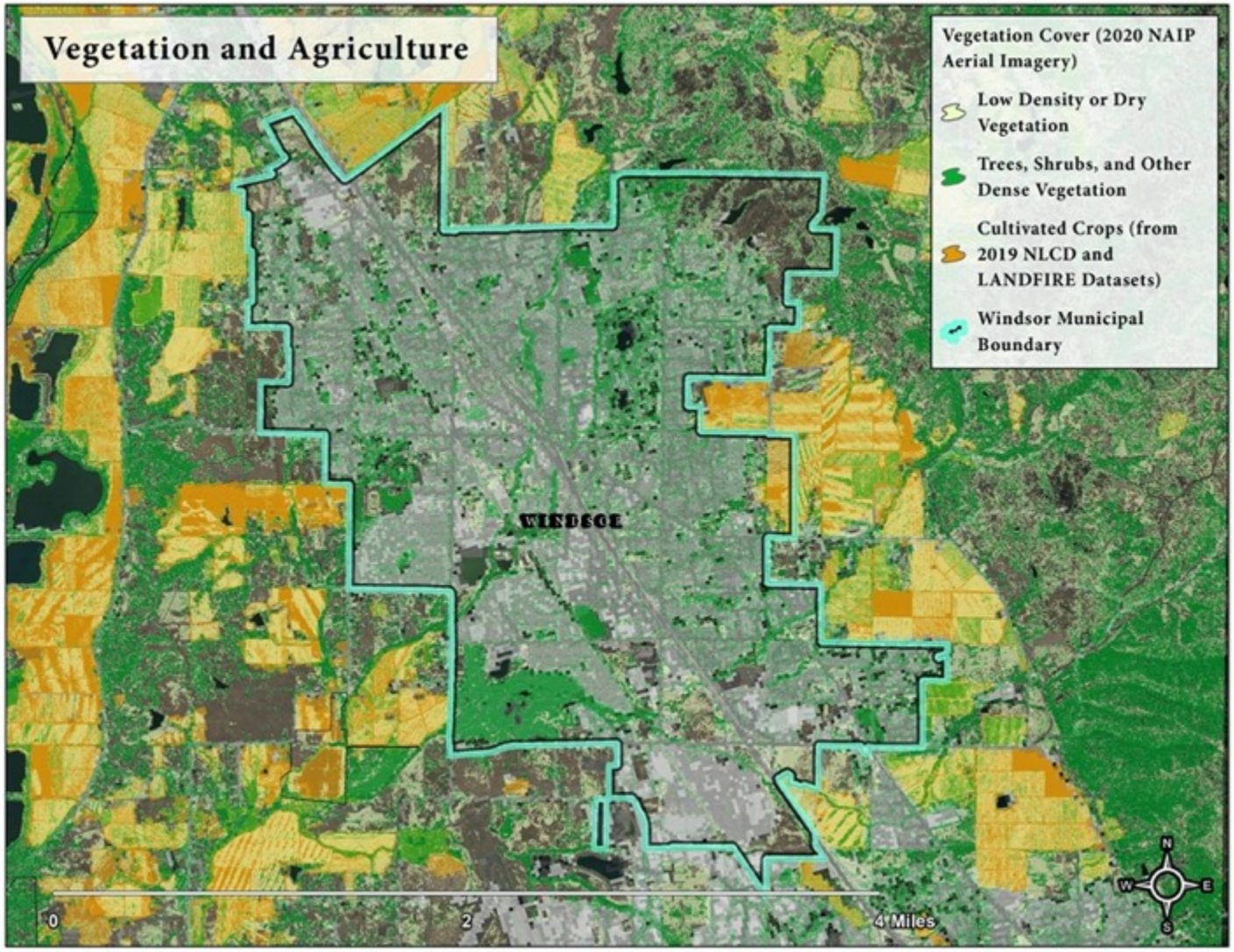


Figure 16. Vegetation cover and agricultural lands for the Town of Windsor and surrounding region. Data Sources: Multi-Resoution Land Characteristics Consortium. 2021. NLCD 2019 Land Cover (CONUS). Accessed at: https://www.mrlc.gov/data/nlcd-2019-land-cover-conus. Vegetation Layer emphasized via USDA NAIP Imagery, accessed for the period of Summer 2020, accessible at the National Map Downloader: https://apps.nationalmap.gov/downloader/#/. LANDFIRE. 2016. Existing Vegetation Cover Dataset.Department of Interior, Geological Survey, and U.S. Department of Agriculture.[Online]. Available:http://landfire.cr.usgs.gov/viewer/

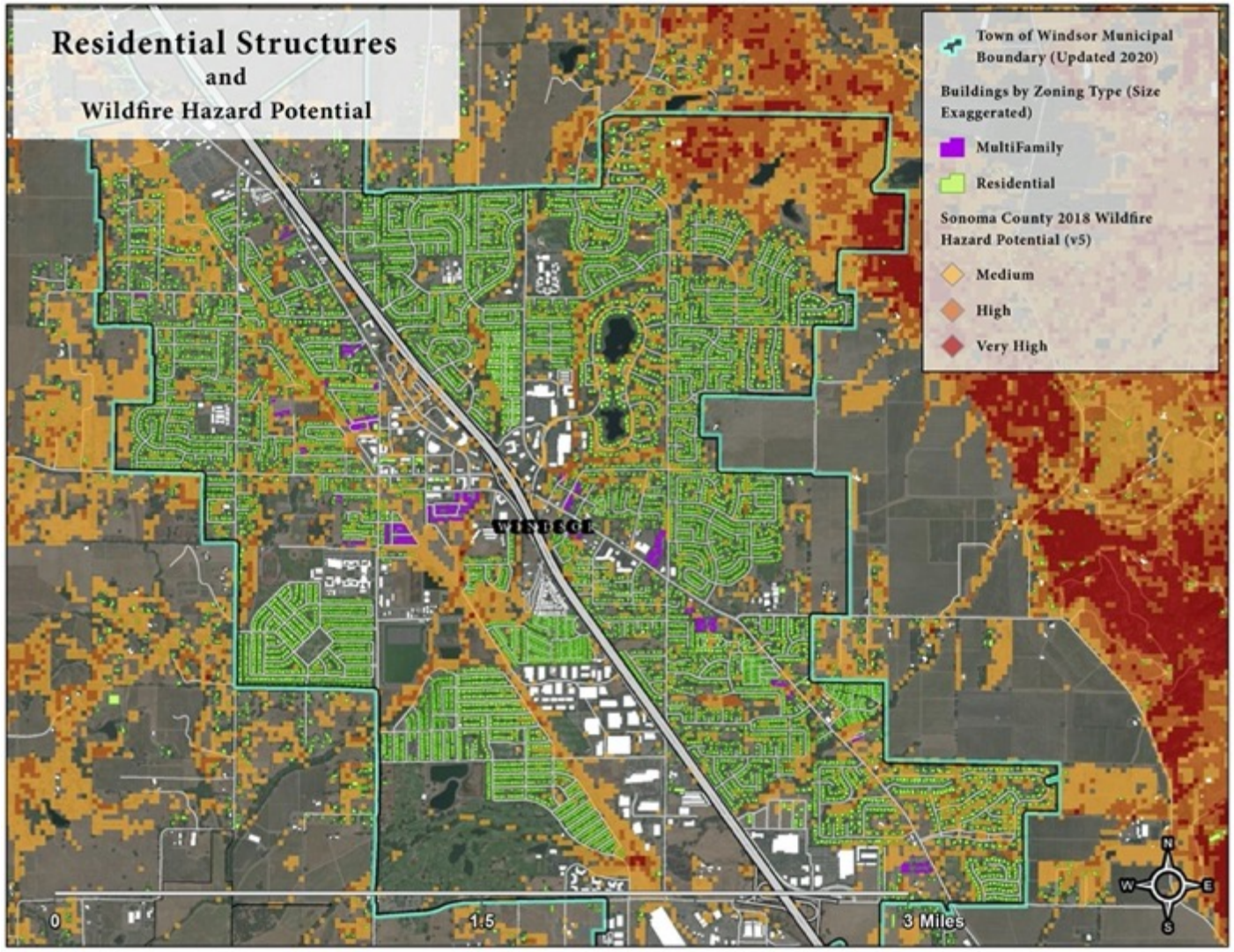


Figure 17. Residential structures and wildfire hazard potential. Data Source: County of Sonoma. 2021. Sonoma County Wildfire Hazard Index. Accessed at: https://storymaps.arcgis.com/stories/a64d596a8be941c8b28263718880e433. Structure and Parcel Data provided by Town of Windsor Public Works and adjusted via imagery examination.

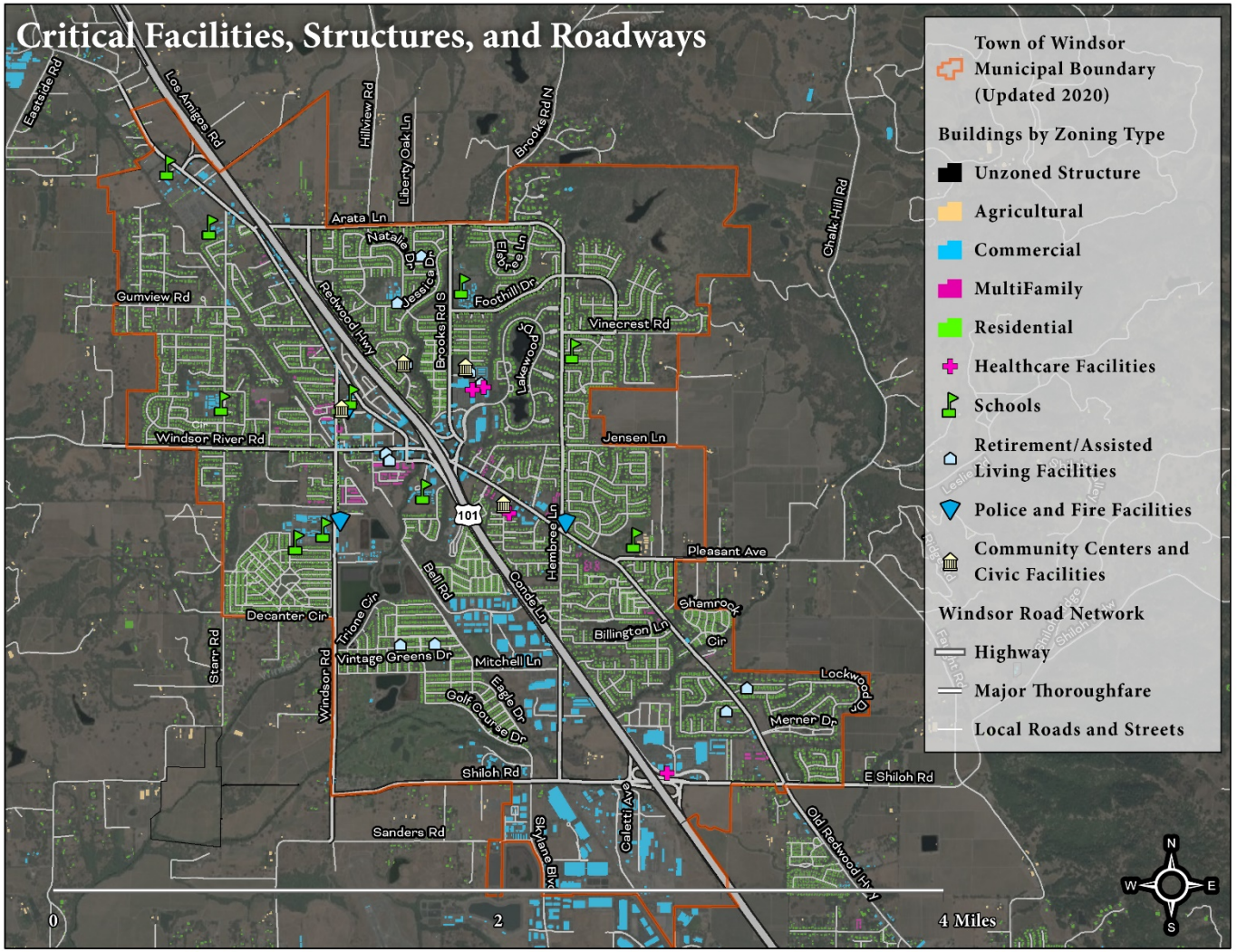


Figure 18. Town of Windsor map of Critical Facilities, Structures, and Roadways. Overview of building location and building type in Windsor. Colors highlight residential, multi-family, commercial, and agricultural buildings by land use zoning type. Symbols identify various critical facilities, such as healthcare facilities, retirement/assisted living facilities, schools, police and fire facilities, and other public facilities and centers. Zoning designations are based on Sonoma County Parcel information as of late 2021, with mobile home parks (zoned commercially) converted where possible to residential visualization for the purposes of clarity for risk evaluation. Data Source:Structure and Parcel Data provided by Town of Windsor Public Works and adjusted via imagery examination.

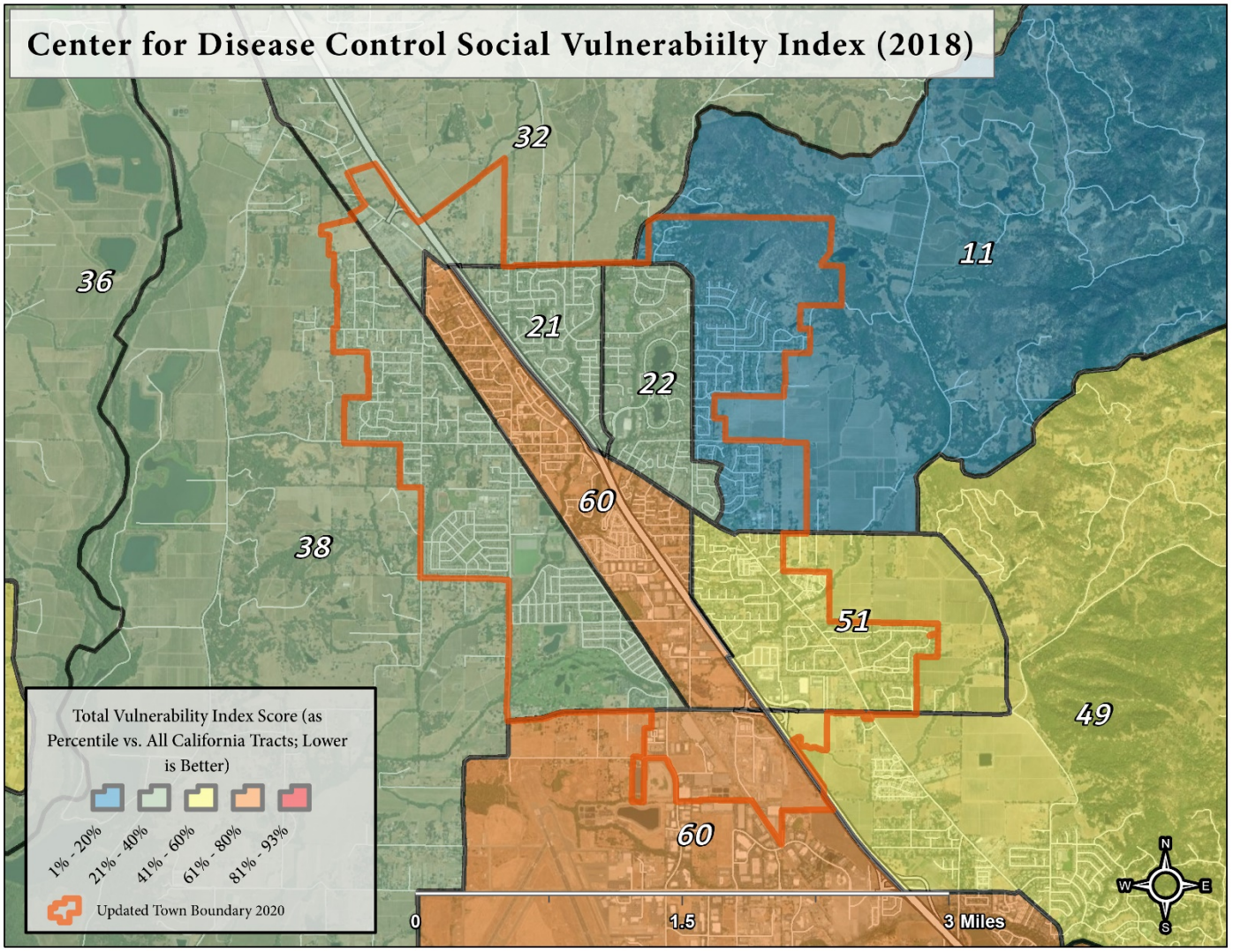


Figure 19. Map of Social Vulnerability Index (SVI) for Windsor. Relative social vulnerability index scores for census tracts in Windsor using data compiled by the Centers for Disease Control and Prevention (CDC). This compilation of 15 factors that are known to affect the ability of households and individuals to prepare for and respond to extreme weather events. Percentile rankings are relative to other census tracts in California where higher numbers (and warmer colors) are more vulnerable, and lower numbers (cooler colors) are less vulnerable to these events. Data Source: CDC/ATSDR. 2018. Social Vulnerability Index. Accessed at: https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

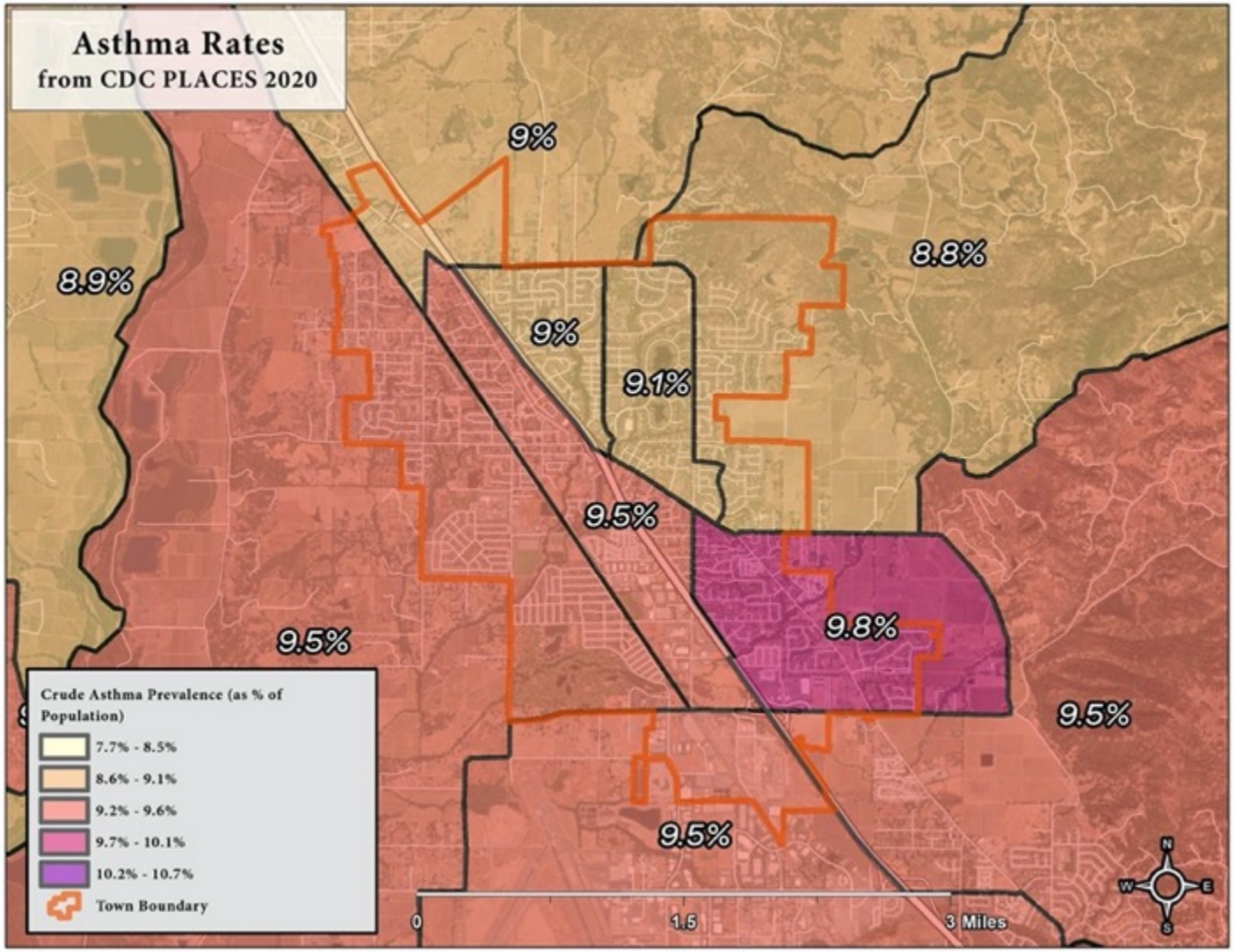


Figure 20. Asthma rates for the Town of Windsor. Data Source: Centers for Disease Control and Prevention. 2020. PLACES. Accessed at: https://www.cdc.gov/places/help/overview/index.html

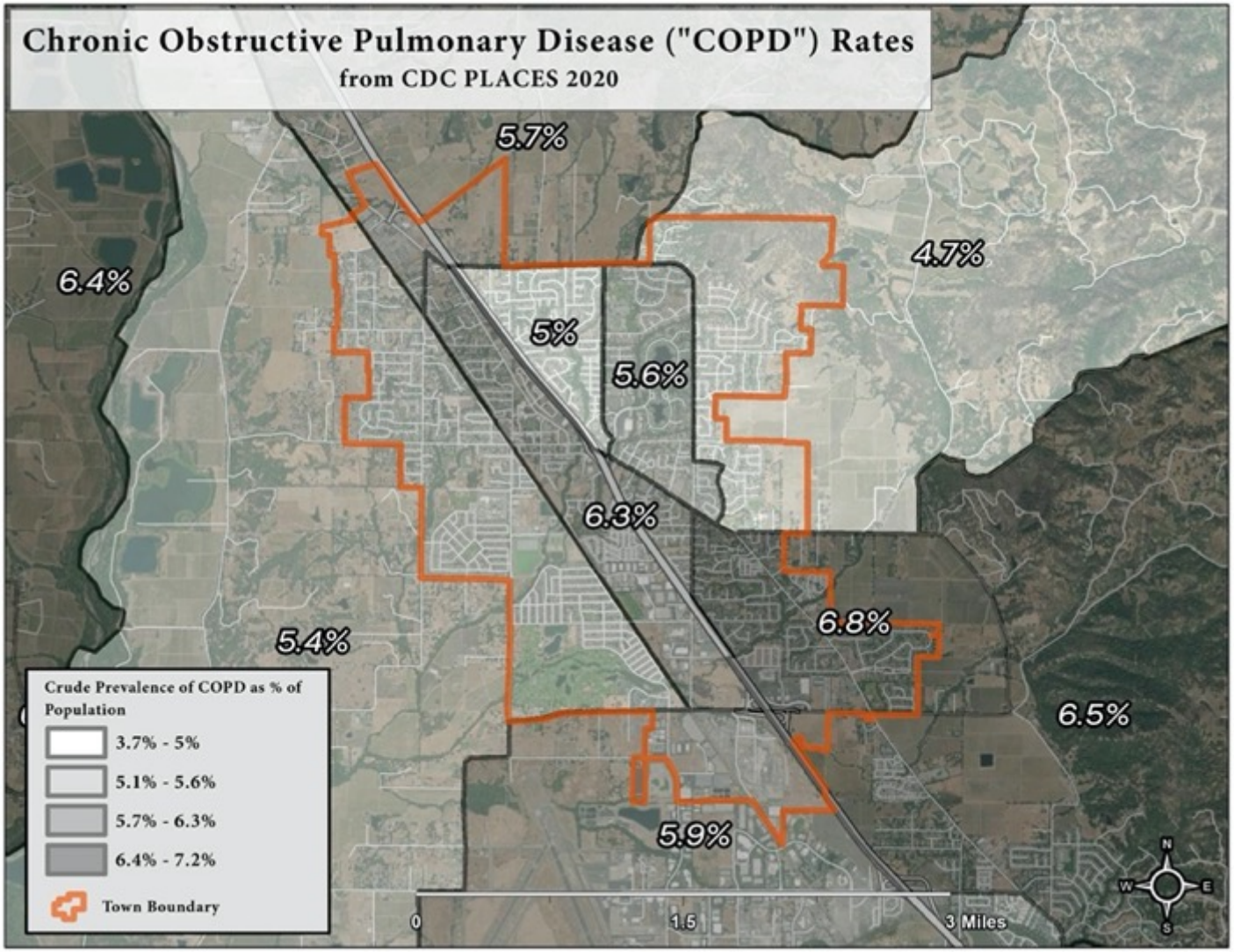


Figure 21. Chronic Obstructive Pulmonary Disease rates for the Town of Windsor. Data Source: Centers for Disease Control and Prevention. 2020. PLACES. Accessed at: https://www.cdc.gov/places/help/overview/index.html

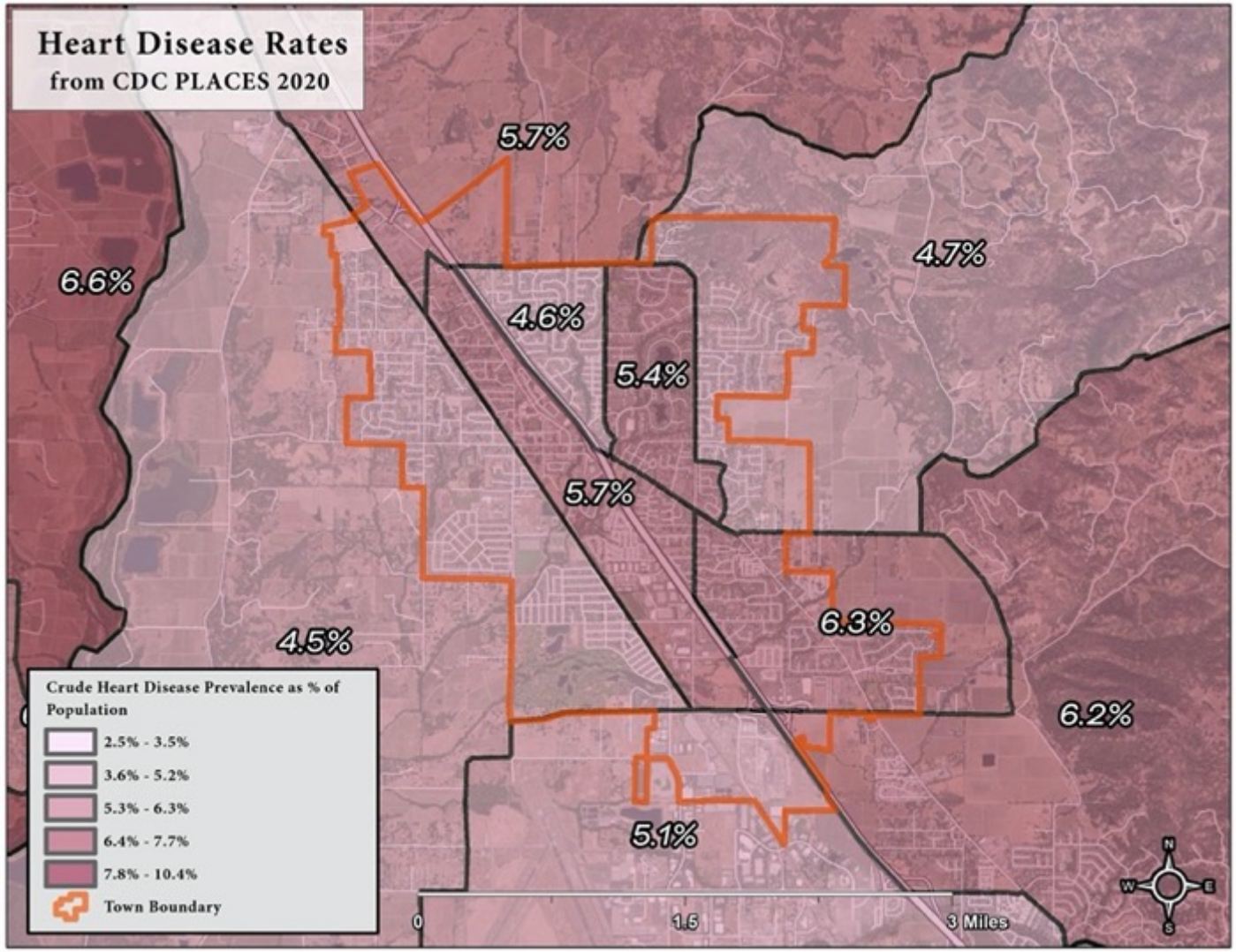


Figure 22. Heart disease rates for the Town of Windsor. Data Source: Centers for Disease Control and Prevention. 2020. PLACES. Accessed at: https://www.cdc.gov/places/help/overview/index.html

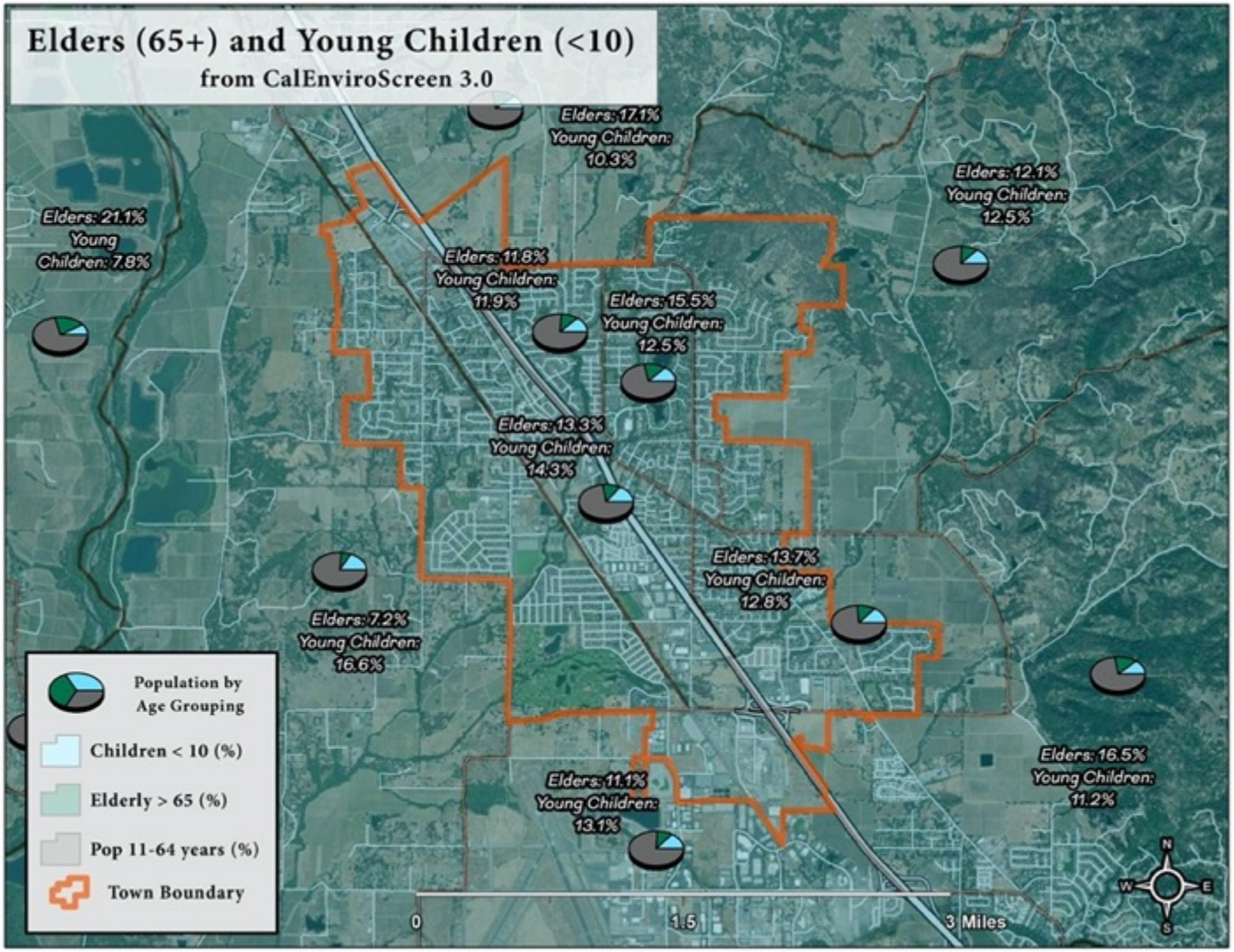


Figure 23. Percentage of elderly (65+ years old) and young children (<10) for the Town of Windsor. Data Source:Centers for Disease Control and Prevention. 2020. PLACES. Accessed at: https://www.cdc.gov/places/help/overview/index.html

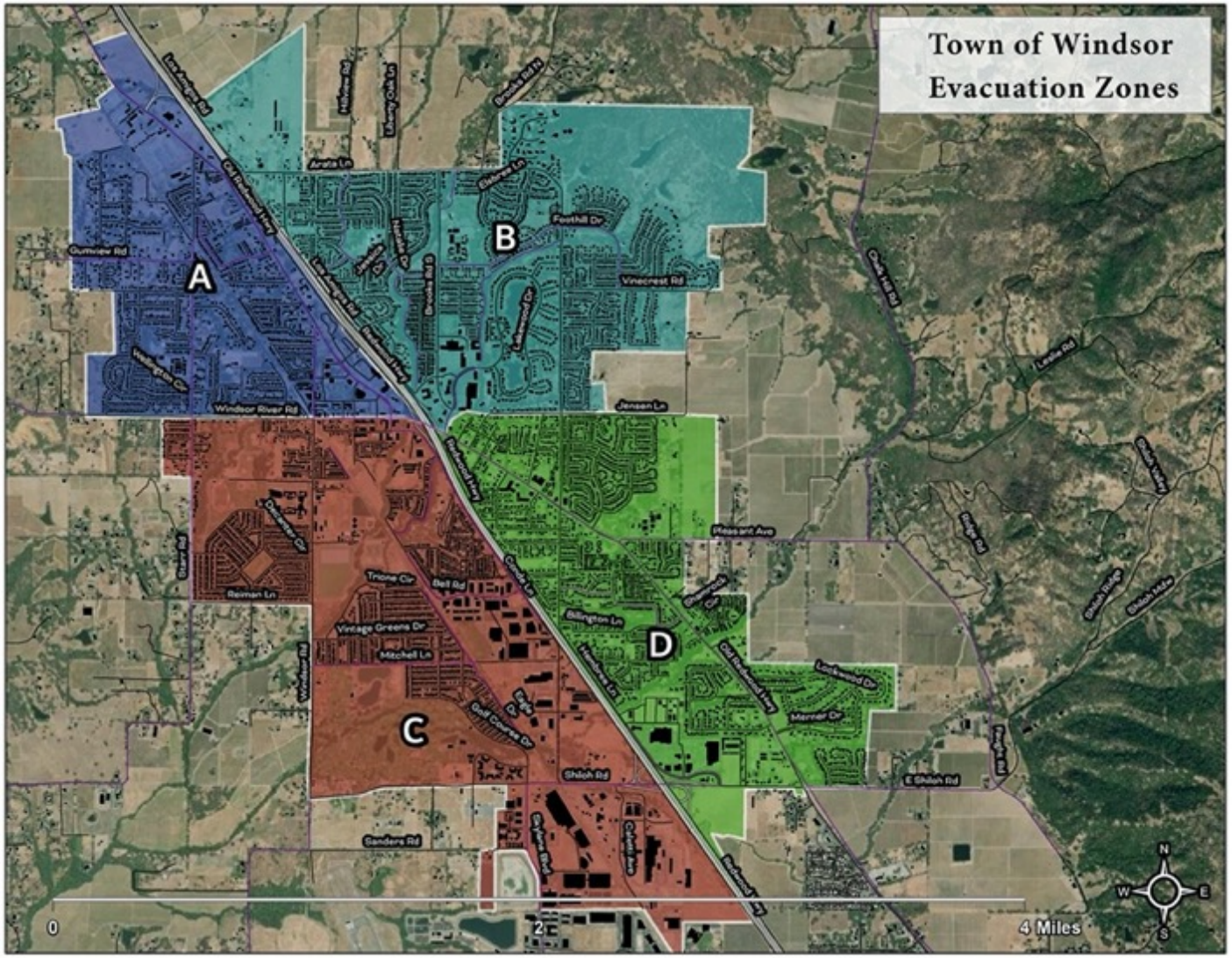


Figure 24. Evacuation zone map for the Town of Windsor published May 2021. Data Source: Town of Windsor.

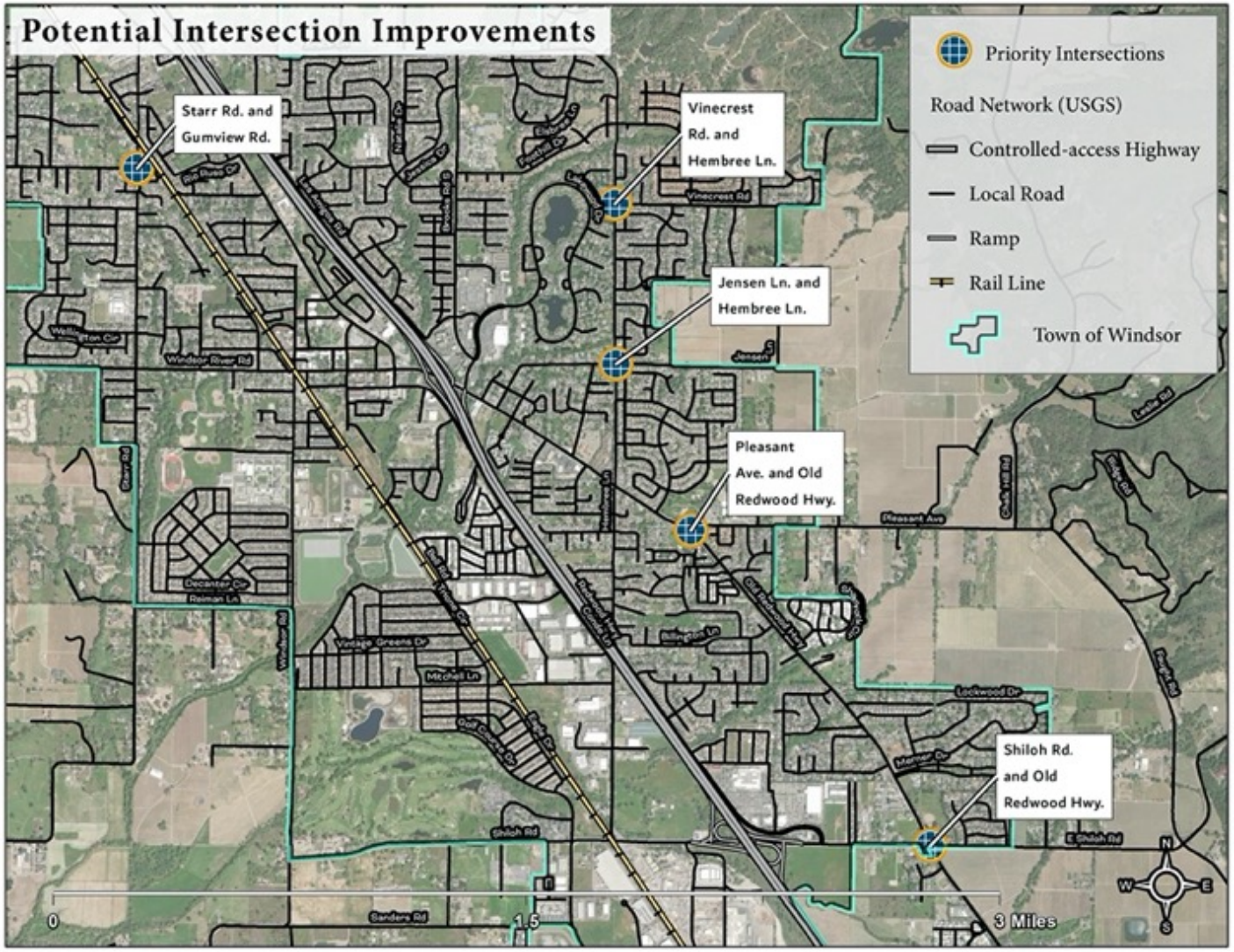


Figure 25. Potential intersection improvement as determined by the Windsor Resilience Planning process. Data Sources: Consultation with Technical Working Group. Town of Windsor Public Works GIS Server. USGS National Map Road Network dataset, accessed at: https://apps.nationalmap.gov/downloader/#/

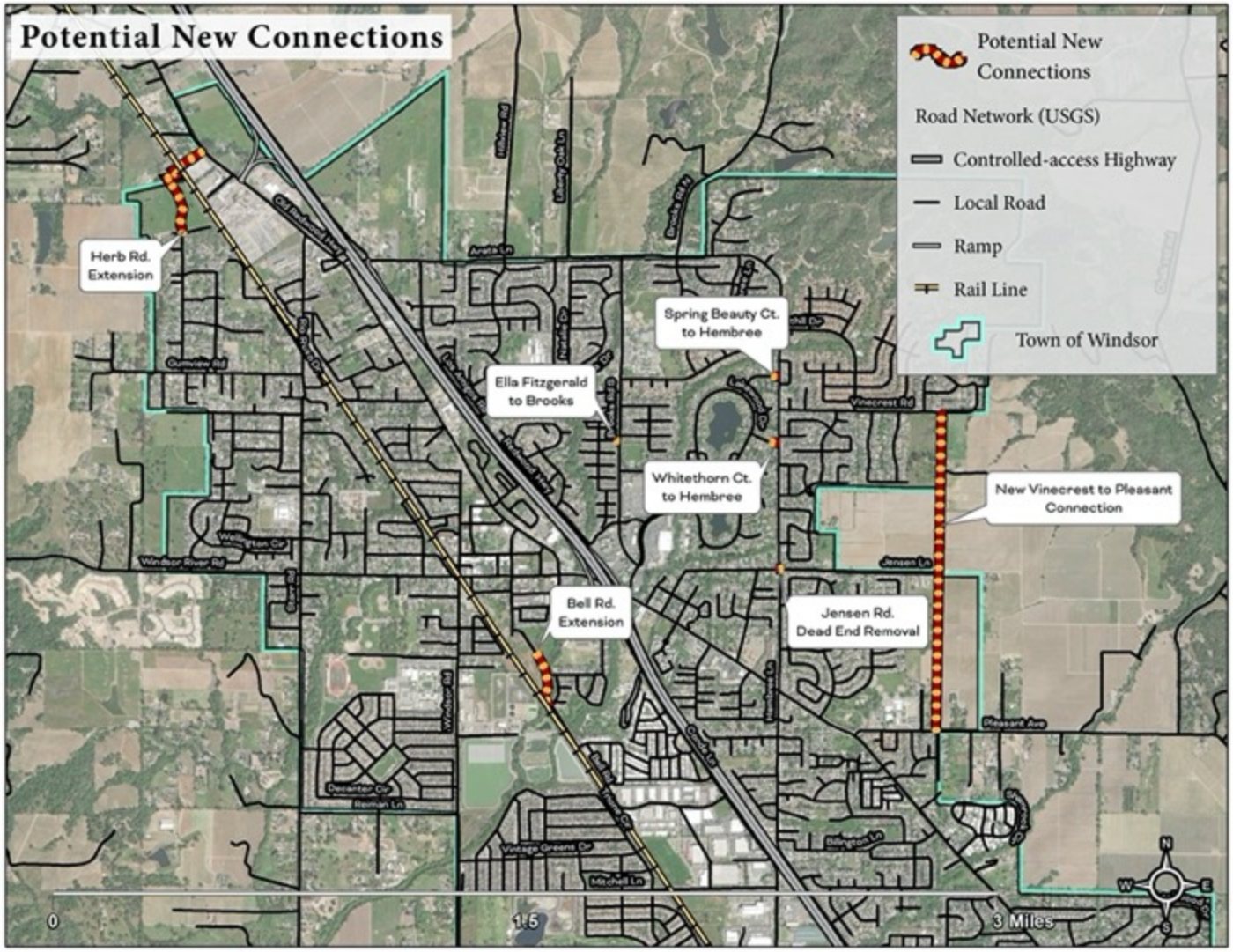


Figure 26. Potential new road connections as determined by the Windsor Resilience Planning process. Data Source: Consultation with Technical Working Group. Town of Windsor Public Works GIS Server. USGS National Map Road Network dataset, accessed at: https://apps.nationalmap.gov/downloader/#/

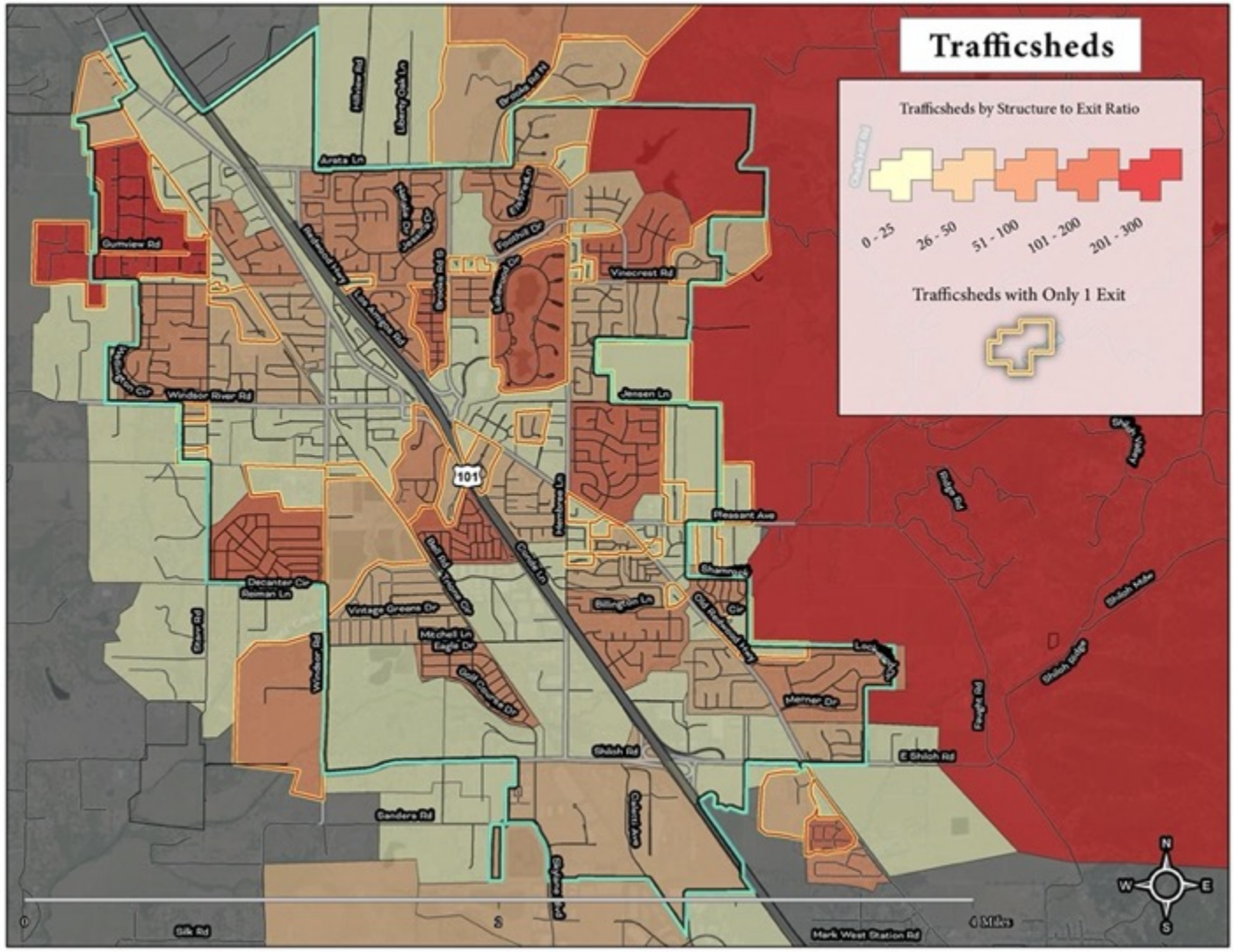


Figure 27. Map of Trafficsheds for the Town of Windsor and surrounding areas. Trafficsheds are areas defined by a shared set of ingress/egress points to major roadways. Areas shown in reds and oranges have fewer ingress/egress points per structure within the trafficshed. Those shown in lighter shades have more access points per structures within the trafficshed. Outlined trafficsheds have only 1 ingress/egress point. The number of access points per residential structure or business can affect or limit the flow of traffic and people during emergencies, especially those that require large numbers of people to evacuate. Data Source: Data created for Trafficsheds by Trevor Even, Adaptation International, LLC., in consultation with Nelson Nygaard, LLC., and Town of Windsor staff. Structure counts provided by Town of Windsor Public Works parcels and building footprint datasets. Road network and connections provided by Town of Windsor Public Works and USGS datasets (modified to reflect recent development).

APPENDIX B

Transportation Funding Opportunities



Introduction

There are a variety of transportation funding opportunities available to support the investments that the Town of Windsor could make to strengthen and expand the multimodal transportation network. This appendix provides a high-level summary of those opportunities and identifies which opportunities apply to the different potential investments (see tables below). Following this summary, the appendix provides a review and description of the different transportation focused funding opportunities that are mentioned in the tables.

Town of Windsor Climate Resilience Plan: Appendix B – Transportation Funding Opportunities

Additional Network Connections for Neighborhoods With Limited Ways In and Out											
Investment Location	**Description**	**Evacuation Zone**	**Neighborhood**	**Co-benefits**	**Structure per Exit** ratio by traffic shed	**Cost Estimate** Low = < 1,000,000 Medium = $1,000,000 and $5,000,000 High = > $5,000,000	**Social Vulnerability Index Score** (% relative to the United States) Low = 30th Percentile Medium = 31st-50th Percentile High = 51st Percentile	**Feasibility within Five Years** Low = not at all feasible or extremely unlikely Medium = more likely than not - potential to obtain or dedicate funding High = funding readily available, high political will or alignment with other efforts	**Co-Benefit Value** Low = little or no utility except for during emergencies Medium = enhancements to safety and easy of travel, aesthetic beauty or other quality of life features. High = significant enhancements to safety, ease of travel, aesthetic beauty on a daily basis	***Public Funding Opportunities*** to Support Implementation	**General comments & additional considerations**
Whitehorn Court to Hembree **Spring Beauty Court to Hembree**	Emergency Exit from Lakewood to Hembree	B	Lakewood	Active transportation plan that increases ped/bike to main roads or other locations at all times and for dispersed evacuation in emergency. Exit near transit stops are optimal.	185:1	Low	Low	High	High	Measure M (Sonoma County sales tax) Transportation Development Act, Article 3 (TDA 3): portion of local match funds for planning or design/construction grant, as long as it include bicycle and pedestrian improvements	These improvements would require coordination with 1 or more private property owners. Funding would likely also need to come from the HOA due to the ownership profile of the infrastructure once completed. - Right of Way or easement required - Portion of existing fence/wall removed for unpaved access to Hembree - Construct driveway apron on both sides of unpaved drive - Add removable bollards along the driveway apron - Hard packed crushed granite path surface: pervious, designed for non-motorized access (ped/bike) but accommodating of emergency vehicle access
Ella Fitzgerald Ct. to Brooks Rd.	Paved Emergency Exit from Ella Fitzgerald to Brooks, w/ Bollards.	B	Glen Miller Way	Secondary egress point for emergency service vehicles allowing more direct access to north end of Glen Miller Way homes.	124:1	Low	Low	High	High	Measure M (Sonoma County sales tax)	Existing bollarded access point would need to be modified or managed differently, likely making this a no cost or extremely low cost option. This is a 55+ community.
West Jensen Ln. and Hembree Ln.	Create connection to Hembree at current dead end on western stretch of Jensen Ln.	B	West Jensen Ln.	Secondary egress point for emergency service vehicles allowing more direct access to Hembree, maintains pedestrian and bicycle access point	Multiple trafficsheds directly affected	Low	Low	Medium	High	Measure M (Sonoma County sales tax)	Existing study of ROW and community concerns about through traffic point to this needing to be a controlled access point at best, and perhaps not a through street connection. Analysis showed not enough ROW to build road through (and no political will). Ask Cindy (Fire Marshall) what they would prefer. Fire dept would drive through the fence if needed in any emergency. Consider Bollards
Herb Rd. to Mildred Wy.	Extend Herb Rd. to provide northern exit route for Gumview Rd. neighborhoods.	A	Gumview		295:1	Medium	Medium	Medium	Low	Measure M (Sonoma County sales tax)	There are possible protected area or other land use restrictions involved in extending Herb rd. north.
North South Route from Jensen to Pleasant	Build out new connection to service future developments on the east side of town, connecting Vinecrest, Jensen, and Pleasant with a through road.	B	Most of Evac Zone B.	Increase accessibility in neighborhood area to disperse daily travel, reducing congestion at intersections	Multiple trafficsheds directly affected	High	Low	Medium	Medium	To be eligible for any of these funds, project should be structured as complete streets and or safety project with positive climate impact (i.e., not inducing more driving). Projects with a direct benefit to a disadvantaged community are typically rated more favorably, especially for STP and ATP funding: Sustainable Transportation Planning Grants (STP: planning stages for multimodal or safety projects with climate impact) Active Transportation Program (ATP): Infrastructure and non-infrastructure projects, plan development for active transportation projects. Highway Safety Improvement Program (HSIP) Local Streets and Roads (LSR) Program Local Partnership Program (LPP) State Highway Operations and Protection Program (SHOPP) Transportation Development Act, Article 3 (TDA 3): portion of local match funds for planning or design/construction grant, as long as it include bicycle and pedestrian improvements	This road project was discussed as part of a package deal with developer(s) looking to build out this area by developing existing farmlands. Funding would likely have to be provided at least in part by the development corporation.
Bell Rd. Extension	Extend Bell Rd. as part of planned development to allow secondary exit points for neighborhoods along Conde Ln., south of closed school.	C	Oakfield Ln. and Windsor Mobile Country Club	Increase accessibility in neighborhood area to disperse daily travel, reducing congestion at intersections	Multiple trafficsheds directly affected	Medium	High	Medium to High	Medium	To be eligible for any of these funds, project should be structured as complete streets and or safety project with positive climate impact (i.e., not inducing more driving). Projects with a direct benefit to a disadvantaged community are typically rated more favorably, especially for STP and ATP funding: Sustainable Transportation Planning Grants (STP: planning stages for multimodal or safety projects with climate impact) Active Transportation Program (ATP): Infrastructure and non-infrastructure projects, plan development for active transportation projects. Highway Safety Improvement Program (HSIP) Local Streets and Roads (LSR) Program Local Partnership Program (LPP) State Highway Operations and Protection Program (SHOPP) Transportation Development Act, Article 3 (TDA 3): portion of local match funds for planning or design/construction grant, as long as it include bicycle and pedestrian improvements	This project is part of a planned development and would be at least partly funded by the developer.

Improvement or Modification of Existing Intersections											
Investment Location	**Description**	**Evacuation Zone**	**Neighborhood**	**Co-benefits**	**Structure per Exit** ratio by traffic shed	**Cost Estimate** Low < 1,000,000 Medium $1,000,000 to $5,000,000 High > $5,000,000	**Social Vulnerability Index Score** (% relative to the United States) Low < 30th Percentile Medium > 31st-69th Percentile High > 51st Percentile	**Feasibility within Five Years** Low = not at all feasible or extremely unlikely Medium = more likely than not - potential to obtain or dedicate funding High = funding readily available, high political will or alignment with other efforts.	**Co-Benefit Value** Low = little or no utility except for during emergencies Medium = enhancements to safety and easy of travel, aesthetic beauty or other quality of life features. High = significant enhancements to safety, ease of travel, aesthetic beauty on a daily basis	***Public Funding Opportunities*** to Support Implementation	**General comments & additional considerations**
Gumview Rd. and Starr Rd.	Modify existing 4-way intersection into a roundabout	A	Multiple	Improves traffic flow overall, reduces accidents, and improves operational capacity during power failures or periods of high traffic.	295:1 (Gumview Neighborhoods)	High	Medium	Low	High	To be eligible for any of these funds, project should be structured as complete streets and or safety project with positive climate impact (i.e., not inducing more driving). Projects with a direct benefit to a disadvantaged community are typically rated more favorably, especially for STP and ATP funding: Sustainable Transportation Planning Grants (STP: planning stages for multimodal or safety projects with climate impact) Active Transportation Program (ATP): Infrastructure and non-infrastructure projects, plan development for active transportation projects. Highway Safety Improvement Program (HSIP) Local Streets and Roads (LSR) Program Local Partnership Program (LPP) State Highway Operations and Protection Program (SHOPP) Transportation Development Act, Article 3 (TDA 3): portion of local match funds for planning or design/construction grant, as long as it include bicycle and pedestrian improvements	This intersection is a critical route for the area and work on it would entail some perhaps complicated planning in terms of how to route people in and out of the neighborhood during the period where the intersection was closed.
Pleasant Ave. and Old Redwood Hwy	Modify existing 4-way intersection into a roundabout	D	Mattie Washburn Elementary School, Hillside Neighborhoods East of Town	Improves traffic flow overall, reduces accidents, and improves operational capacity during power failures or periods of high traffic. Mitigates congestion from school pickup at M. Washburn Elementary.	Multiple trafficsheds directly affected	High	Medium	Medium	High	To be eligible for any of these funds, we recommend project be structured as complete streets and or safety project with positive climate impact (i.e., not inducing more driving). Projects with a direct benefit to a disadvantaged community are typically rated more favorably, especially for STP and ATP funding: Sustainable Transportation Planning Grants (STP: planning stages for multimodal or safety projects with climate impact) Active Transportation Program (ATP): Infrastructure and non-infrastructure projects, plan development for active transportation projects. Highway Safety Improvement Program (HSIP) Local Streets and Roads (LSR) Program Local Partnership Program (LPP) State Highway Operations and Protection Program (SHOPP) Transportation Development Act, Article 3 (TDA 3): portion of local match funds for planning or design/construction grant, as long as it include bicycle and pedestrian improvements	
Shiloh Rd. and Old Redwood Hwy.	Modify existing 4-way intersection into a roundabout	D	Hillside Neighborhoods East of Town; Shiloh Rd. and S Old Redwood Neighborhoods	Improves traffic flow overall, reduces accidents, and improves operational capacity during power failures or periods of high traffic.	Multiple trafficsheds directly affected	High	Medium	Low	High	To be eligible for any of these funds, project should be structured as complete streets and or safety project with positive climate impact (i.e., not inducing more driving). Projects with a direct benefit to a disadvantaged community are typically rated more favorably, especially for STP and ATP funding: Sustainable Transportation Planning Grants (STP: planning stages for multimodal or safety projects with climate impact) Active Transportation Program (ATP): Infrastructure and non-infrastructure projects, plan development for active transportation projects. Highway Safety Improvement Program (HSIP) Local Streets and Roads (LSR) Program Local Partnership Program (LPP) State Highway Operations and Protection Program (SHOPP) Transportation Development Act, Article 3 (TDA 3): portion of local match funds for planning or design/construction grant, as long as it include bicycle and pedestrian improvements	
Vinecrest Rd. and Hembree Ln.	Improve/Upgrade to Controlled Signalling	B	All N Hembree users	Improve traffic flow and multimodal intersection safety through conflict reduction	Multiple trafficsheds directly affected	Low	Low	Medium	Medium	HSIP LSR Measure M LPP	
Jensen Ln. and Hembree Ln.	Improve/Upgrade to Controlled Signalling	B	All N Hembree users	Improve traffic flow and multimodal intersection safety through conflict reduction	Multiple trafficsheds directly affected	Low	Low	Medium	Medium	HSIP LSR Measure M LPP	

Rebuilding American Infrastructure with Sustainability and Equity (RAISE)

Program Type:	Federal
Program Sponsor(s):	U.S. Department of Transportation
Total Program Fund Estimate:	$1 billion (2022-2029)
Typical Award Amount:	Between $5 million and $25 million; max grant award in FY2021 is $25 million, with no more than $100 million awarded to a single state. Up to $30 million (in total) awarded to planning grants in 2021.
Matching Requirements:	20% for projects in urban areas. Match may be lower in rural areas or planning projects in areas of persistent poverty.
Eligible Entities:	State, local and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of State or local governments.
Program Schedule:	Funds are appropriated annually

The Rebuilding American Infrastructure with Sustainability and Equity, or RAISE Discretionary Grant program, provides a unique opportunity for the DOT to invest in road, rail, transit and port projects that promise to achieve national objectives. Previously known as the Better Utilizing Investments to Leverage Development (BUILD) and Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grants, Congress has dedicated nearly $8.9 billion for twelve rounds of National Infrastructure Investments to fund projects that have a significant local or regional impact.

Criterion for the grant include primary and secondary criteria, such as safety, environmental sustainability, quality of life, economic competitiveness, state of good repair, innovation, and partnership are rated qualitatively. In 2021, US DOT stated they will prioritize projects that can demonstrate improvements to racial equity, reduce impacts of climate change and create good-paying jobs.
Each capital project also requires a benefit cost analysis and environmental review. The benefit cost analysis quantifies the expected benefits in the listed categories, using methodology currently being updated by the Department.

RAISE funding is anticipated to increase significantly in 2022.

Transportation Alternatives Set-Aside

Program Type:	Federal
Program Sponsor(s):	U.S. Department of Transportation Federal Highway Administration
Total Program Fund Estimate:	$850 million (2018-2020)
Typical Award Amount:	Awards vary by state.
Matching Requirements:	Federal share is typically 88.5%; however, some safety projects allow for 100% federal share. Local match is about 11.5%.
Eligible Entities:	Local government; regional transportation authority; transit agency; natural resource or public land agency; school district, local education agency or school; tribal government; nonprofit entity responsible for local transportation safety programs; other local or regional governmental entity responsible for, or oversight of, transportation or recreational trails that the State determines to be eligible.
Program Schedule:	Funds are appropriated annually; Funds are available the year appropriated plus three years.

The Transportation Alternatives (TA) Set-Aside in the Fixing America's Surface Transportation (FAST) Act replaced the former Transportation Alternatives Program with a set-aside of funds under the Surface Transportation Block Grant Program. The TA Set-Aside authorizes funding for programs and projects defined as transportation alternatives, such as but not limited to on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility; recreational trail projects; and safe routes to school projects.[4] The TA Set-Aside in California is consolidated into the Active Transportation Program, described in detail in the State Funding Programs section of this document.

4https://www.fhwa.dot.gov/environment/transportation_alternatives/

Congestion Mitigation and Air Quality Improvement Program

Program Type:	Federal
Program Sponsor(s):	U.S. Department of Transportation Federal Highway Administration Federal Transit Administration
Total Program Fund Estimate:	$2.5 billion annually (2016-2020). Total funding increased to $8 billion during the 6-year life of TEA-21.[5]
Typical Award Amount:	N/A
Matching Requirements:	Federal share is typically 80%; however, some safety projects allow for 100% federal share.
Eligible Entities:	MPOs and State in areas without an MPO.
Program Schedule:	CMAQ operates on a reimbursement schedule; funds are not distributed until work is completed.

The Congestion Mitigation and Air Quality (CMAQ) Improvement Program funds transportation projects to improve air quality and reduce traffic congestion in areas that do not meet air quality standards. The program has been a key mechanism for implementing non-motorized projects that reduce greenhouse gas emissions. The CMAQ program is administered jointly by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA).[6] Funds are directed to transportation projects and programs which contribute to the attainment or maintenance of National Ambient Air Quality Standards (NAAQS). Funds may be used for transportation projects or programs that are likely to contribute to the attainment or maintenance of national ambient air quality standard.[7]

About $2.5 Billion was allocated to the program in 2020 under the federal Fixing America's Surface Transportation (FAST) Act. Note: CMAQ operates on a reimbursement schedule; funds are not distributed until work is completed.

5 https://www.nap.edu/read/10350/chapter/5
6 https://www.transportation.gov/sustainability/climate/federal-programs-directory-congestion-mitigation-and-air-quality-cmaq
7https://www.fhwa.dot.gov/fastact/factsheets/cmaqfs.cfm

Highway Safety Improvement Program

Program Type:	Federal
Program Sponsor(s):	U.S. Department of Transportation Federal Highway Administration Caltrans – Division of Local Assistance
Total Program Fund Estimate:	$2.6 billion[8]
Typical Award Amount:	Maximum reimbursement is $10 million for a single HSIP project; Minimum reimbursement for a single project is $100,000.
Matching Requirements:	Federal share is typically 90%.
Eligible Entities:	City, county or tribal government that assumes responsibility and accountability for the use and expenditure of federal-aid highway funds.
Program Schedule:	Call for projects are made every one to two years Cycle 11 Call for Projects anticipated in Spring 2022. *Starting with Cycle 11, agencies must have a Local Road Safety Plan completed by the application deadline to be eligible for funds.*

The Highway Safety Improvement Program (HSIP) funds projects that reduce collisions and vehicular fatalities and improve road safety. Applicable projects include road safety improvements for drivers, bicyclists and pedestrians, safety education, training, and traffic calming. California's Local HSIP focuses on infrastructure projects with nationally recognized crash reduction factors (CRFs). Local HSIP projects must be identified on the basis of crash experience, crash potential, crash rate, or other data-supported means. Like CMAQ funds, HSIP funds are allocated to every state to carry out approved projects and programs. In California, HSIP is managed by the Caltrans Division of Local Assistance. The maximum reimbursement for a single project is $10 million, and the minimum is $100,000. Federal refund is typically 90%, but in some scenarios can be the full project cost. Cycle 11 call for projects is anticipated in Spring 2022.[9]

8 https://www.transportation.gov/sites/dot.gov/files/docs/mission/budget/334296/fy-2020-fhwa.pdf
9 https://dot.ca.gov/programs/local-assistance/fed-and-state-programs/highway-safety-improvement-program/local-roadway-safety-plans

Urbanized Area Formula Grants – 5307

Program Type:	Federal
Program Sponsor(s):	U.S. Department of Transportation Federal Highway Administration
Total Program Fund Estimate:	$5.2 billion[10]
Typical Award Amount:	Funding is apportioned on the basis of legislative formulas, with over 90% of available funds to UZAs apportioned with 200,000 and greater in population.
Matching Requirements:	Federal share is typically 80%.
Eligible Entities:	Public agencies and transit operators in urban areas (more than 50,000 people).
Program Schedule:	Funds are appropriated annually; Funds are available the year appropriated plus five years.[11]

The Federal Transit Administration administers the Urbanized Area Formula Grants (5307) program to fund transportation- related projects in urban areas. Eligible recipients are public agencies and transit operators. Eligible activities include: planning, engineering, design and evaluation of transit projects and other technical transportation-related studies; capital investments in bus and bus-related activities such as replacement, overhaul and rebuilding of buses, crime prevention and security equipment and construction of maintenance and passenger facilities; and capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software. The governor or governor's designee acts as the designated recipient for urbanized areas between 50,000 and 200,000. The federal government will match up to 80% of the net project cost.[12]

10 https://www.transit.dot.gov/funding/grants/urbanized-area-formula-grants-5307

11 Ibid.
12 Ibid

State Funding Programs

In 2017, California passed Senate Bill 1 (SB 1) to support the maintenance and expansion of transportation infrastructure. The program supports several funding opportunities that fund multimodal improvement projects like those recommended for the Town of Windsor that can improve traffic flow during emergencies and mitigate everyday climate risk, including the Sustainable Transportation Grants, Transit and Intercity Rail Capital Program, Solutions for Congested Corridors Program, the Local Partnership Program, and the Active Transportation Program.

Transit and Intercity Rail Capital Program

Program Type:	State
Program Sponsor(s):	California State Transportation Agency (CalSTA)
Total Program Fund Estimate:	$500 million was awarded in the 2020 cycle, bringing total program award over four cycles to $5.9 billion (2015-2020).
Typical Award Amount:	No maximum or minimum.
Matching Requirements:	No minimum match but funding leverage is desirable[13]
Eligible Applicants:	Eligible applicants must be public agencies, including joint powers agencies, that operate or have planning responsibility for existing or planned regularly scheduled intercity or commuter passenger rail service (and associated feeder bus service to intercity rail services), urban rail transit service, or bus or ferry transit service (including commuter bus services and vanpool services).
Program Schedule:	The 2022 TIRCP grant cycle will program projects starting with 2022-2023 fiscal year and ending with 2026-2027. The Call for Projects is scheduled for November 19, 2021, with applications due March 3, 2022.

The Transit and Intercity Rail Capital Program (TIRCP) provides grants from the Greenhouse Gas Reduction Fund (GGRF) to fund transformative capital improvements that will modernize California's intercity, commuter, and urban rail systems, and bus and ferry transit systems, to significantly reduce emissions of

13 https://calsta.ca.gov/subject-areas/transit-intercity-rail-capital-prog

greenhouse gases, vehicle miles traveled, and congestion, and improve safety. In addition, the program seeks to support job and housing growth along transit corridors and expand multimodal transportation access, particularly for priority populations (i.e, disadvantaged low-income communities and low-income households).

Solutions for Congested Corridors Program

Program Type:	State
Program Sponsor(s):	California Transportation Commission
Total Program Fund Estimate:	$250 million will be available upon appropriation to the Congested Corridors Program annually.[14]
Typical Award Amount:	No maximum or minimum.
Matching Requirements:	None; leveraged funds are desirable.[15]
Eligible Entities:	Agencies that implement transportation improvements as part of comprehensive corridor planning.
Program Schedule:	The 2020 program will fund projects for fiscal years 2021-2022 and 2022-2023; Applications were due on July 17, 2020.

The purpose of the Solutions for Congested Corridors Program (SCCP) is to provide funding to achieve a balanced set of transportation, environmental, and community access improvements to reduce congestion throughout the state. This statewide, competitive program makes $250 million available annually for projects that implement specific transportation performance improvements and are part of a comprehensive corridor plan by providing more transportation choices while preserving the character of local communities and creating opportunities for neighborhood enhancement.

14 The 2018 Program exceeded the programming amount by $6 Million. Therefore, available funds have been reduced to $494 Million.

15 https://catc.ca.gov/-/media/ctc-media/documents/programs/sccp/adopted-2020-sccp-guidelines-combined-file-march-20-a11y.pdf

Local Partnership Program (LPP)

Program Type:	State
Program Sponsor(s):	California Transportation Commission
Total Program Fund Estimate:	$216 million for FY 2020-21 through 2022-23
Typical Award Amount:	N/A
Matching Requirements:	1-to-1 match for both Formulaic and Competitive Program.[16]
Eligible Applicants:	Agencies that have passed a sales tax measure, developer fee, or other transportation free for the purposes of improving mobility.
Program Schedule:	2020 Applications were due June 2020; new Cycles will be programmed every two years.

California Senate Bill 1 (SB 1) includes the Local Partnership Program (LPP), which is a funding source for local and regional transportation agencies that have passed a sales tax measure, developer fee, or other transportation fee for the purpose of improving transportation and mobility. $200 million of SB 1 funds are allocated to LLP annually and provides funding opportunities to improve aging infrastructure, road conditions, active transportation, transit and rail, and health and safety benefits. The program is two pronged– 40% is through a statewide competitive process and 60% is through a formulaic program. 2020 applications were due June 2020; new funding cycles will be programmed every two years.

16 https://catc.ca.gov/-/media/ctc-media/documents/programs/local-partnership-program/adopted-resolution/final-2020-lpp-guidelines-and-adopting- resolution-g-20-33-v3-a11y.pdf

Active Transportation Program

Program Type:	State
Program Sponsor(s):	California Transportation Commission
Total Program Fund Estimate:	$440 million were available for 2021 ATP Cycle 5
Typical Award Amount:	The minimum award is $250,000. There is no maximum amount.[17]
Matching Requirements:	The Commission does not require a funding match for ATP.
Eligible Applicants:	Local, regional, or state agencies, as well as transit agencies, tribal governments, public land agencies, and private non- profit organizations. Eligible projects include infrastructure projects, plans, and non-infrastructure projects related to active transportation.
Program Schedule:	Cycle 6 application cycle begins in spring 2022

In 2013, Governor Brown created the Active Transportation Program (ATP), which consolidated other existing federal and state active transportation funding programs to support infrastructure and non-infrastructure projects. The purpose of the ATP is to increase biking and walking trips, increase safety and mobility for non-motorized users, enhance air quality and public health, and ensure disadvantaged communities fully share the benefits of the program. Each year, the program allocates 50% of its funds to projects competitively awarded on a statewide basis, 40% to MPOs in urban areas with populations greater than 200,000, and 10% to small urban and rural areas with populations of 200,000 or less. Exact funding amounts fluctuate from cycle to cycle.

ATP Quick Build Grants

Launched for the Cycle 5 ATP, applicants can now submit Quick-Build projects – relatively inexpensive changes to existing rights-of-way to improve safety issues and pilot concepts. The Quick Build Grant Pilot received 22 project applications in July 2020 and staff recommended eight projects (collectively valued at about $4.5 million) to be funded. These projects included protected bikeways, pedestrian safety improvements, and intersection redesigns.[18]

17 https://catc.ca.gov/-/media/ctc-media/documents/programs/atp/workshops/cycle-5/2020325-adopted-2021-atp-guidelines-a11y.pdf
18 https://catc.ca.gov/programs/active-transportation-program

Clean Mobility Options Pilot Program

Program Type:	State
Program Sponsor(s):	California Air Resources Board (CARB)
Total Program Fund Estimate:	$20 million
Typical Award Amount:	Up to $1 million
Matching Requirements:	CARB Contribution: $20,000,000 (first round) Matching Funds: $820,000 Project Total: $20,820,000[19]
Eligible Applicants:	Applicants must operate projects for four years; Eligible applicants are public agencies, non-profit organizations, and tribal authorities.
Program Schedule:	First round applications were approved in early 2020; second round yet to be determined.

The Clean Mobility Options Pilot distributes cap-and-trade dollars (up to $20 million) for shared mobility projects including car share, bike share, and on-demand programs to disadvantaged, low-income communities. Public agencies, tribal governments, and non- profit organizations are eligible. Each new mobility project can receive up to $1,000,000, a project expanding an existing mobility service can receive up to $600,000, and community Transportation Needs Assessment projects could receive up to $50,000.[20]

19 https://www.cleanmobilityoptions.org/about/
20 https://ww3.arb.ca.gov/msprog/lct/pdfs/cmo-voucher.pdf

Sustainable Transportation Planning Grants

Program Type:	State
Program Sponsor(s):	California Department of Transportation
Total Program Fund	$34 Million
Typical Award Amount:	Awards range from $50,000 minimum to $700,000 maximum depends on the fund source.[21]
Matching Requirements:	11.47% for Competitive, Formula, and SP – Transit; 20% for Strategic Partnerships
Eligible Entities:	Competitive: MPOs, RTPAs, transit agencies, cities and counties, Native American Tribal Govts, etc. Formula: MPOs only Strategic Partnerships: MPOs and RTPAs, with transit, cities, counties, universities, CBOs eligible as sub applicants Strategic Partnerships – Transit: MPOs, RTPAs as leads, with transit, cities, counties, universities, CBOs eligible as sub applicants
Program Schedule:	Caltrans released the Sustainable Transportation Planning Grant Application for the FY2022-23 cycle on September 7, 2021. Applications are due on October 27, 2021.

Caltrans' Sustainable Transportation Grants provide funding to support regional sustainable community strategies that can help to achieve the State's greenhouse gas reduction targets of 40 and 80 percent below 1990 levels by 2030 and 2050, respectively. The Sustainable Transportation Planning Grant Program is composed of two broad grant programs within which there are multiple award and eligibility categories:

- Sustainable Communities Grants ($29.5 million) to encourage local and regional planning that furthers state goals, including, but not limited to, the goals and best practices cited in the Regional Transportation Plan Guidelines adopted by the California Transportation Commission.
- Strategic Partnerships Grants ($4.5 million) to identify and address statewide, interregional, or regional transportation deficiencies on the State highway system in partnership with Caltrans. A sub-category funds transit-focused planning projects that

21 Caltrans Sustainable Transportation Planning Grant Program Fiscal Year 2021-2022

address multimodal transportation deficiencies.[22] Transit project examples include but are not limited to strategies to increase transit ridership, studies or plans that evaluate commuter rail or multimodal connectivity, and studies or plans that evaluate first and last mile transit connectivity.

Eligible projects include land use and transportation planning documents, climate adaptation plans, feasibility studies for active transportation, complete streets and safe routes to school plans, and active transportation master plans.

22 https://dot.ca.gov/programs/transportation-planning/regional-planning/sustainable-transportation-planning-grants

Local Streets and Roads (LSR) Program

Program Type:	State
Program Sponsor(s):	California Transportation Commission (CTC)
Total Program Fund	$1.5 billion per year
Typical Award Amount:	Awards vary, formula apportionments of Road Maintenance and Rehabilitation Account, Local Streets and Roads Funding
Matching Requirements:	None
Eligible Entities:	Eligible recipients of RMRA funding apportionments include cities and counties that have prepared and submitted a project list to the Commission each fiscal year pursuant to SHC Section 2034(a)(1) and that have been included in a list of eligible entities submitted by the Commission to the State Controller pursuant to SHC Section 2034(a)(2).
Program Schedule:	Project lists due to CTC July 1st each year. CTC adopts initial list of eligible cities and counties at August meeting. Initial list goes to State Controller by August 31st each year. Subsequent List due, adopted and submitted in September and October, if needed. [23]

SB1 dedicated approximately $1.5 billion per year via the Local Streets and Roads Program (LSR) in new formula revenues apportioned by the State Controller (Controller) to cities and counties for basic road maintenance, rehabilitation, and critical safety projects on the local streets and roads system.

To be eligible to receive funding from the Controller, each year, cities and counties must submit a proposed project list adopted at a regular meeting by their board or council tha To be eligible to receive funding from the Controller, each year, cities and counties must submit a proposed project list adopted at a regular meeting by their board or council that is then submitted to the CTC. Once reviewed and adopted by the CTC, the list of eligible cities and counties to receive funding is sent to the Controller to begin the apportionment process for that fiscal year.

23 https://catc.ca.gov/-/media/ctc-media/documents/programs/local-streets-and-roads/2021/2021-local-streets-and-roads-program-guidelines-a11y.pdf

Example projects and uses for RMRA funding include, but are not limited to: road maintenance and rehabilitation, safety projects, railroad grade separations, complete street components, including active transportation purposes, pedestrian and bicycle safety projects, transit facilities, and drainage and stormwater capture projects in conjunction with any other allowable project, and traffic control devices. Funds made available by the program may also be used to satisfy a match requirement to obtain state or federal funds for projects authorized by this subdivision.

Affordable Housing Sustainable Communities

Program Type:	State
Program Sponsor(s):	California Strategic Growth Council
Total Program Fund **Typical Award Amount:**	$400 million[24] Between $1 million and $30 million.
Matching Requirements:	Project must have enough committed additional funding at time of application that is 90% of the following formula: (AHSC funds requested + Enforceable Funding Commitments (EFCs) – Deferred Costs) / (Total Development Cost – Deferred Costs)
Eligible Entities:	City, county, transit agency, RTPA, JPA, school district, developer, university, or Native American Tribe.
Program Schedule:	Applications for Round 6 were due February 2021.

The Affordable Housing Sustainable Communities (AHSC) Program gives grants and loans to affordable housing developers and transportation agencies to increase access between housing, employment centers, and essential services. Funded by auction proceeds from California's Cap-and-Trade emissions reduction program, AHSC is administered by the Strategic Growth Council and implemented by the California Department of Housing and Community Development. There are three project types: Transit-Oriented Development Project Areas, Integrated Connectivity Project Areas, and Rural Innovation Project Areas.

The AHSC program has invested more than $1 Billion in projects across the state, 70% of which have been allocated to disadvantaged communities.[25]

24 https://www.grants.ca.gov/grants/ahsc-round-6/
25 Ibid.

Low Carbon Transit Operations Program

Program Type:	State
Program Sponsor(s):	Caltrans
Total Program Fund Estimate:	Total Fiscal Year 2018-2019 Eligible Allocation was $359,092 for SMART, $47,833 for County of Sonoma and $54 million for MTC in prior year
Typical Award Amount:	None
Matching Requirements:	50%
Eligible Entities:	Transportation planning agencies and transit operators looking to fund transit-related greenhouse gas emissions reductions that improve mobility; includes funding for construction, operations, and maintenance.
Program Schedule:	Annual calls; start project within 6 months

The Low Carbon Transit Operations Program (LCTOP) is one of several programs that are part of the Transit, Affordable Housing, and Sustainable Communities Program established by the California Legislature in 2014 by Senate Bill 862. The LCTOP was created to provide operating and capital assistance for transit agencies to reduce greenhouse gas emission and improve mobility, with a priority on serving disadvantaged communities. Approved projects in LCTOP will support new or expanded bus or rail services, expand intermodal transit facilities, and may include equipment acquisition, fueling, maintenance and other costs to operate those services or facilities, with each project reducing greenhouse gas emissions. For agencies whose service area includes disadvantaged communities, at least 50 percent of the total moneys received shall be expended on projects that will benefit disadvantaged communities. Senate Bill 862 continuously appropriates five percent of the annual auction proceeds in the Greenhouse Gas Reduction Fund (Fund) for LCTOP, beginning in 2015-16. This program will be administered by the California Department of Transportation (Caltrans) in coordination with Air Resource Board (ARB) and the State Controller's Office (SCO). Caltrans is responsible to ensure that the statutory requirements of the program are met in terms of project eligibility, greenhouse reduction, disadvantaged community benefit, and other requirements of the law.

State Rail Assistance

Program Type:	State
Program Sponsor(s):	California State Transportation Agency
Total Program Fund Estimate:	About $6 million per year
Typical Award Amount:	None
Matching Requirements:	None
Eligible Entities:	Intercity and commuter rail operators looking to fund rail network improvements to existing or aspiring corridors; will fund projects in planning, environmental, design, ROW, construction, operations, and maintenance
Program Schedule:	Intermittent calls; next cycle is 2025/26 – 2029/30; project must start within 6 months and complete within 4 years

Senate Bill 1 created the State Rail Assistance (SRA) Program by directing a portion of new revenue specifically to intercity rail and commuter rail.

- SB 1 directs a 0.5% portion of new diesel sales tax revenue for allocation: half to the 5 commuter rail providers and half to intercity rail corridors
- Half of revenue is allocated in equal shares to commuter operators through 2019-20, and via guidelines thereafter (about $10.5M to each total over 3 years)
- Half of revenue is allocated to intercity rail corridors such that each of the existing three corridors receives at least 25% of the intercity rail share (about $13.1M to each over 3 years)
- Funding is available for capital and operations

This revenue is estimated to be $25 million in 2017-18, $39 million in 2018-19, and $41 million in 2019-20. The majority of program funding is directed by statutory formula to rail operators, with guidelines defining process and timeline for agencies to obtain funding.

MPO Active Transportation Program distributed funds

Program Type:	Regional
Program Sponsor(s):	Metropolitan Transportation Commission (MTC)
Total Program Fund Estimate:	About $37 million available in Cycle 5
Typical Award Amount:	Between $400,000 and $13 million (average: $6.5 million)
Matching Requirements:	11.47% with match waivers for projects benefiting Disadvantaged Communities, stand-alone non-infrastructure projects, and safe routes to schools projects.
Eligible Entities:	Public agencies looking to fund infrastructure projects that improve biking and walking; includes projects in planning, environmental, design, ROW, and construction.
Program Schedule:	Every 2 years; the call for proposals for Cycle 6 is anticipated in Spring 2022.

Forty percent of the State ATP funding is distributed to MPOs by population. MTC is responsible for the management of the Bay Area MPO distribution of funds, the development of the region's guidelines for the Regional ATP, and the administration, review and award of regional projects, with approval by the California Transportation Commission.

One Bay Area Grant Program

Program Type:	Regional
Program Sponsor(s):	Metropolitan Transportation Commission
Total Program Fund Estimate:	About $500 million
Typical Award Amount:	Dependent on subprogram
Matching Requirements:	Dependent on subprogram
Eligible Entities:	Public agencies looking to fund improvements to Bay Area transportation; includes projects in planning, environmental, design, ROW, construction, operations, and maintenance.
Program Schedule:	Every 5 years; next cycle is 2022/23-2026/27; complete project within 2 years

OBAG 1 integrated the region's federal transportation program with California's climate laws and the Sustainable Communities Strategy by targeting funding to Priority Development Areas, Priority Conservation Areas, and Climate Initiatives, while maintaining commitments to existing transportation priorities. The second round of One Bay Area Grant funding (OBAG 2), adopted in November 2015, includes more than $900 million in federal funding for projects from 2018 to 2022.
The OBAG 2 program is divided into a Regional Program, managed by MTC, and a County Program, managed by the nine Bay Area County Transportation Agencies (CTAs).

Transit Capital Priorities

Program Type:	Regional
Program Sponsor(s):	Metropolitan Transportation Commission (via Federal Transit Administration)
Total Program Fund Estimate:	About $1.6 billion
Typical Award Amount:	Not applicable
Matching Requirements:	20%
Eligible Entities:	Public agencies looking to fund transit network improvements; includes projects in construction.
Program Schedule:	Calls every 5 years; next cycle is 2025; must use funds within 5 years

There are more than 20 different transit agencies in the Bay Area. MTC's Transit Capital Priorities process makes sure that available federal funding has the biggest impact on Bay Area residents. There are three main goals:

- Fund basic capital requirements
- Maintain reasonable fairness to all transit agencies
- Complement other MTC transit funding programs

Transit agencies use the Transit Capital Priorities process to compete for funds used for a wide range of investments, including:

- Vehicle replacement or rehabilitation
- Rail system equipment replacement or rehabilitation
- Replacement or rehabilitation of ferry propulsion systems or other major ferry components
- Purchase or replacement of vehicle communications equipment
- Replacement of Clipper® fare collection equipment or other fare boxes
- Purchase and installation of emissions-reduction systems for diesel buses
- Safety projects
- Station and parking lot rehabilitation

Transportation Fund for Clean Air

Program Type:	Regional
Program Sponsor(s):	Bay Area Air Quality Management District
Total Program Fund Estimate:	About $13 million
Typical Award Amount:	Between $10,000 and $5.5 million
Matching Requirements:	10%
Eligible Entities:	Public agencies and non-public entities looking to fund projects that result in the reduction of motor vehicle emissions; includes projects in planning, environmental, design, ROW, and construction.
Program Schedule:	Annual calls; must complete project within 2 years. Applications for the FYE 2022 Call for Projects were due on March 5, 2021

In 1991, the California State Legislature authorized the Air District to impose a $4 surcharge on cars and trucks registered within the Air District's jurisdiction to provide grant funding to eligible projects that reduce on-road motor vehicle emissions. The statutory authority for the Transportation Fund for Clean Air, or TFCA, and requirements of the program are set forth in California Health and Safety Code Sections 44241 and 44242.

Sixty percent of TFCA funds are awarded by the Air District through the TFCA Regional Fund, and to eligible programs implemented directly by the Air District, referred as Air District-sponsored programs. Each year, the Air District's Board of Directors considers the allocation of new TFCA funds and the proposed updates to the policies. Solicitations and Call for Projects are issued following the Board's approval.

The remaining forty percent of this funding is passed through to the designated agencies of the nine Bay Area counties through the County Program Manager Fund and is awarded by these agencies to TFCA-eligible projects located within those counties.

The Sonoma County Transportation Authority administers the TFCA County Program Manager Funds. The TFCA County Program Manager Funds comprise 40% of the total funds created in Sonoma County. SCTA is responsible for programming these funds annually. Funding is used for transportation projects that demonstrate a positive effect on local air quality. Projects include transit, traffic control, and facilities and amenities for bicyclists and pedestrians.

Transportation Development Act, Article 3 (TDA 3)

Program Type:	Regional
Program Sponsor(s): Transportation Authority	Metropolitan Transportation Commission, Sonoma County
Total Program Fund	Two percent of Transit Development Act (TDA) funds collected by each Bay
Estimate:	Area County
Typical Award Amount:	Funding estimates based on the MTC fund estimate of new revenues, population and any funds banked or rescinded from previous years. FY2021-2022 Estimated Funding available for Windsor was $51,472
Matching Requirements:	None
Eligible Entities:	Bay Area cities/towns and counties.
Program Schedule:	FY 2021-2022 TDA3 Call for Projects were due on April 12, 2021

TDA 3 funds are generated from a statewide ¼ cent sales tax. Article 3 of TDA is a set-aside of approximately 2% of those monies. MTC administers TDA3, which is distributed based on population. Each year, an annual fund estimate or "entitlement" is developed for each jurisdiction. Unused entitlement is accumulated as credit. A jurisdiction's claim in any given year cannot exceed the sum of their accumulated credit plus their projected entitlement for the following two years.

Sonoma County's cities/towns and the County of Sonoma are eligible to apply. TDA3 funds may be used for bicycle lanes, bicycle and pedestrian paths, and related planning and marketing efforts. There are no matching requirements with this funding source. TDA3 projects are required to meet Caltrans safety design criteria and CEQA requirements, be completed within three years, be maintained, be consistent with adopted bicycle plans, and be authorized by a governing council or board.

Measure M (Traffic Relief Act for Sonoma County)

Program Type:	Local
Program Sponsor(s):	Sonoma County Transportation Authority
Total Program Fund Estimate:	Dependent on subprogram
Typical Award Amount:	Dependent on subprogram
Matching Requirements:	Dependent on subprogram
Eligible Entities:	Sonoma County public agencies.
Program Schedule:	Biennial calls

Passed by more than two-thirds of voters in November 2004, the Traffic Relief Act for Sonoma County (Measure M) continues to deliver multi-modal transportation improvements throughout the county. Measure M provides for a ¼ cent sales tax to be used to maintain local streets, fix potholes, accelerate the widening of Highway 101 for High Occupancy Vehicle (HOV) lanes, improve local street operations, restore and enhance transit services, support the development of passenger rail service, and build safe bicycle and pedestrian routes. The funds are dedicated towards specific programs and projects specified in the voter approved Expenditure Plan. The funding will sunset in 2024 unless renewed via voter approval.

Developer Impact Fees

Program Type: Regional and Local

Program Sponsor(s): Regional and Local Governments

Local revenue sources to fund multimodal improvements include development impact fees. Development impact fees collect funds from new development to offset its construction. Fees are requested by local government agencies. Fees often improve bicycle and pedestrian facilities, lighting and safety, and educational programs for residents, employees, and community members.

APPENDIX C

Community Engagement Summary



Summary of Key Themes

The following were the most salient themes and ideas that surfaced throughout all three phases of community outreach and engagement.

- The Town must **engage regionally** as well as locally to **increase resilience**
- **Effective communication for individuals, neighborhoods, and businesses and an evacuation plan** for climate emergencies must be developed
- Support the development of more **neighborhood groups and networks to increase overall resilience and self-reliance**
- Identify and help to protect and support the most **vulnerable communities, particularly seniors**
- **Increase climate and resilience education** to ensure Plan buy in and trust from the community
- Expand **home hardening** and retrofit efforts for homes, buildings, and critical facilities
- Prioritize **active transportation infrastructure,** particularly east-west connections to make evacuation easier for all, especially those without access to a car, and to provide overall long-term residential benefits
- Ensure the Town **addresses climate issues** including drought, water quality, smoke, extreme weather events, flooding, and public safety power shutoff events in current and future Town plans
- **Change our relationship with fire** and landscape to work with it not against it, using science-based information for vegetation management and defensible space
- Ensure we **climate proof** key **town services** and **facilities**
- Identify opportunities to enhance the capacity of Town and school facilities to become **Resilience Hubs**

Phase I Engagement Efforts

To guide the creation of the vision and goals for the Plan, BluePoint Planning in collaboration with Adaptation International and the town, conducted a range of engagement activities, including five one-on-one interviews with community leaders, five small group meetings with stakeholders, a virtual community workshop, and an online survey. The small group sessions included members representing interests related to the environment, critical services, businesses and visitor services, youth, and general community. The workshop included 80 participants and an opportunity to share concerns and opportunities for the resilience plan. Overall, over 100 stakeholders were involved in the process.

Small Group Meetings

The small group meetings allowed the team to engage with special interest groups in an intimate setting. The hour-long meetings were hosted in February and March of 2021 for five groups, including: critical services, environmental, community, business and visitors, and youth. A brief presentation related to climate issues was shared, participants were then asked to discuss their concerns and ideas. A total of 26 participants attended these sessions. A summary of the main takeaways from each session and a list of meeting attendees can be found below.

Critical Services Session
The critical services session included three participants from multiple organizations, including Bell Ambulance, Windsor Water District, and Sonoma County Water Agency. Their concerns and ideas are outlined below.

- **Evacuation** of **older adults** is a major concern
    - Mobile home park off of Conde and residential care facilities need evacuation assistance
    - Need alternative transportation options
- There is a need for a clear **evacuation plan and designated routes**
    - WUI areas are most vulnerable areas, and routes near this area need to be flexible and agile in an emergency
    - Flooding is a major concern; how does this affect evacuation routes?
    - Can a route east of Lakewood Hills go southward?
- Need to **coordinate** the **plan** with Emergency Services and the County
- Variability and intensity of **Russian River** water flow is unknown, and **flooding** is a concern
    - Floods have become more frequent - How will this unknown impact evacuation routes?
    - Fire House #2 is impacted by floods
    - Work with the US Army Corp of Engineers to create a science-based forecast of wet and dry times to manage flow of river

        - Can we pump water into the ground and bank it for future use?
    - WELO is trying to improve storm drains and bank water through green infrastructure solutions
- **Weed abatement programs** are needed in undeveloped and private lots to improve **defensible space management**
    - Need enforcement
    - Working on federal grant to clean up creek areas
- **Water quality** is a concern with fires, smoke, and rain
- The Town needs to **manage** the **treatment plant during evacuations**
    - A large solar array was designed to manage the plant, but it needs enhancements to improve safety
- **Prepare** for **PSPS emergencies** with solar arrays that follow the parking lot systems (High School) and get microgrids
- Add **generators** outside of service area
- Design functional and reliable **cooling centers** for days of extreme heat and smoke

Environmental Session

The environmental session included seven participants from different organizations such as the Center for Social & Environmental Stewardship (Circuit Rider), Daily Acts, Sonoma Clean Power, Climate Corps Bay Area, Windsor Bicycle and Pedestrian Advisory Committee, Downtown Merchants Association, and the Windsor Historical Society. Their concerns and ideas are outlined below.

- **Good air quality** and **environmental health** should be **top priority**
    - Particularly related to smoke and urban heat island effect
- Create **firesafe landscape**
    - Balance fire risk, water management, and ecological impacts
    - Improve tree canopy; trees are being taken down because of the threat from wildfires
- **Water quality** is being impacted as **temperatures rise**
    - Watersheds above the reservoir have issues related to run off
    - Wastewater treatment is also a health issue
- Windsor **lacks good exit routes** and lots of areas are cut off which is a major **evacuation concern**
- Need to improve **building resilience** against smoke and air quality.
    - Provide incentives to homeowners and businesses
- **Better community engagement efforts** are needed to educate and prepare the community
- **Hear from voices** that **protect the land**, particularly native and indigenous communities

- Better **active transportation**
    - Improve connectivity for biking and walking paths
    - Good active transportation will improve sense of community
    - These paths could be used as evacuation paths
- Avoid sprawl to create a Town that is better connected
    - Too many dead-end streets
    - Fill in around key transportation areas
- Protect **critical facilities** that need to **operate during an emergency**
    - Work with town to establish microgrids at critical sites such as grocery stores, fueling stations, evacuation centers
- Provide more **education** to everyone about what can be done during emergencies
    - This is an issue as it has been hard to build community with strong networks
- Need to be **less reliant on power grid**, and have more availability of **solar/battery; microgrids; Decarbonize buildings** and **housing**
- Provide **affordable housing**

Community Session

The community session included five participants from local organizations as well as town residents. The organizations represented in the session include the Sonoma County Bicycle Coalition, Foothills Homeowners Association, and the Town of Windsor. Their concerns and ideas are outlined below.

- Need to provide **coordinated evacuation efforts** in all communities
    - Some communities are more prepared than others
    - Partnerships with outside organizations are crucial for effective evacuation
    - Need neighborhood groups and community champions for efforts to be effective
- **Improve active transportation** to also improve alternative evacuation routes
    - Bike lanes are currently unsafe
    - Provide bike parking and bike lanes that are well designed and provided at convenient locations
    - Implement bike programs like Safe Routes to School

- Reduce **congestion** during evacuation
    - Share cars; during the last evacuation, multiple cars from single households were taken
    - Use electric bikes and understand how to use bike lanes during evacuation events
    - Ensure roads are usable during evacuation, for example, need to ensure access to the freeway underpass

- **Education is critical** for community buy-in on evacuation preparedness
    - Leverage social networks to improve this
    - Make it interesting
    - Ensure that they know how to prepare their homes
- How do you **balance homeowners concerns** with what makes sense?
    - People are concerned about Vernal pool grasses, but we can't mow it for the management of the habitat
    - Consider wildlands and how we can help mitigate the potential impact of fires; create wine land buffer zones?
- Develop a **comprehensive tree policy**
    - It needs to take sun, insulation, heat, and fire safety into account

Business and Visitor's Session

The business and visitor's session included four total participants from the Sonoma County Agricultural Preservation and Open Space District, the Windsor Chamber of Commerce, the Sonoma County Vintners, and SMART. Their concerns and ideas are outlined below.

- The Town has had **12 natural disasters declarations** over 3 years; haven't moved to Emergency Response programs yet.
- Improve **alternative transit to cars**
    - Improve access to safe biking
    - Achieve goals of reducing greenhouse gas emissions
- Improve direct connection to **train services** to aid in evacuation
    - Crucial for those who do not have access to a car and those who might be more vulnerable
    - Bus system did not work during Kincade fire because buses got stuck in traffic on the 101
    - Work with SMART to improve railway line
- **Work with partners** to communicate a consistent message
    - Potential partners include People 4 Parks and the Chamber of Commerce
- **Concerns with PSPS**, and ongoing electrification with stress on grid
- **Implement new building codes** and **adapt to State requirements**
- **Communicating** with **older populatio**n is a concern, particularly if they do not have computers/phones
    - How do we get them out?
    - Communication during Kincade fire was good because there was very clear messaging
- Prepare for an emergency with **consistency**
    - This is a challenge during COVID because we are opening and closing constantly

Youth Session

The youth session included seven participants from the Girl Scouts, Sonoma State University, and Windsor High School - Leadership and Committee for Change. Their concerns and ideas are outlined below.

- **Need better education**, especially for parents and Spanish speaking communities
    - Evacuation maps are confusing and need to be clearer
    - Provide more resources to inform the public about evacuation
    - Provide information on climate change and needs
- Prioritize **reducing emissions** from **transportation** sector
    - Need more bikeways and walking paths not roads
    - Pedestrian bridge from east to west used often but is unsafe
    - Make sustainable transportation options lucrative so people use them to scale
    - New on ramp to 101 near Arrata is useful but how will it impact the community and green space, ag?
- Need to **keep** and **improve** on the **green space** of the community
    - New civic center will take away some green space, need to offset that with adding green space elsewhere
    - New on ramp to 101 near Arrata is useful but how will it impact the community and green space, ag?
    - Encourage drought-resistant and fire-safe gardens
    - Work with property owners to green the town and harvest rainwater
- Bring more **youth** into this process and **civics** in general
    - Teach people and youth how to "Tend the Forest"
    - Similar to the Vineyard Academy
- We need **action right now**! 15- 20 years is not soon enough
- **Reform education**
    - Add Advanced Placement (AP) Environmental Science! Need more detailed classes for students
- Need a **digital survey** to align priorities on what we love and must protect
    - Post on Tiktok, Instagram, Facebook, Windsor High School Updates, Radio Stations

One-on-One Interviews

Community leaders were asked to participate in one-on-one interviews to share their insights on their areas of expertise. The interviews followed a general set of questions. A summary of the interviews can be found below:

How do you characterize Windsor's risks for various climate impacts? A major issue? Minor issue? What are the risks? What about smoke from wildfires?

- **Fire, drought, and earthquakes** are the biggest climate risks
  - Loss of communication creates safety issues
  - Need to understand where we should build and where we shouldn't (look into historic fire patterns)
- We need to have a **relationship** with fires and other **local climate impacts**
  - Change accountability and responsibility
  - Need to build community ability to support first responders
  - Need to know how to prepare for multiple events at once
- Need **coordination of the multiple resilience** efforts going on to improve community buy-in
  - Countywide mitigation plan efforts weren't very successful (80-85 people responded to survey from the entire county)
  - How do we improve on these efforts? How do we align them?
- People are **focused on other prominent issues**
  - Mayor re-election
  - Vaccination efforts
  - Must align efforts with these issues

What do you think are Windsor's greatest assets that need to be protected?

- **Critical infrastructure**
  - Cell towers, water delivery, medical facilities, schools, emergency response facilities, transportation routes (Old Redwood Hwy, Windsor River Road, Shiloh)
- Need to have **battery backup support**
- Need to be **fire safe**
  - Greenbelt and other open space around Windsor, create a buffer zone that helps with resilience

Similarly, what are Windsor's greatest strengths that should be enhanced and supported?

- **Community**
  - Windsor is built in subdivisions, we need neighborhood captains in all communities, including mobile home parks
  - Some neighborhoods don't have a good sense of community – how can we strengthen that?
  - Grateful for the firefighters, town manager and council
  - It has been harder to come together now that the Town has closed down
- **Nonprofits**
  - COPE and other local groups work to bring education about emergency response to the community

- **Nixle Alerts** and **communication** are paramount for effective evacuation
    - Cannot alert people through social media- not helpful
    - While communication was good during the last evacuations, there needs to be a clearer communication plan

How do you think the Town, overall considers its risks related to climate change and its need to make changes for adaptation?

- Town needs to be more **proactive** about the climate change and implement real change
- Need an evacuation plan that works for all community members
- Should **prioritize new active transport builds** over car-centric roads to improve transportation
- Protect our **critical infrastructure** that needs to operate during emergencies

What do you think are the Town's greatest priorities overall?

- **Not focusing enough on climate impacts,** instead focus on new development, tourism, and hotels.
- **Not enough focus on community involvement**
    - Need to provide community meeting times that can actually be attended by locals
    - What are other things we can do to improve involvement?

Talk a bit about recent experience with evacuation… How effective is Windsor in moving people out in an emergency?

- The town needs to be **more effective**
    - 2019 evacuation had a lot of **traffic,** from 2-4 pm everyone was leaving at the same time, need to move as fast as possible
    - Need to model the best approach and prepare for it
    - Need better **communication**, especially for Spanish speaking community
- Need to better prepare **emergency evacuation sites** for earthquakes
    - Need volunteers and supplies

We are looking at the transportation infrastructure as well and its ability to support the Town. Are there critical points of failure in the physical transportation system during extreme events (flood, wind, evacuation due to wildfire)?

- Need **real infrastructure for active transportation**
    - Old Redwood Hwy is very car-oriented and could benefit from sidewalks for daily trips but also emergency pick ups and meeting points, especially from mobile home parks
    - Conde road and other roads need more walkability, especially for seniors
    - Figure out how to move over the freeway, the North Bound Ramp is very tight and difficult for bikes to navigate
- **Encourage less driving**
    - Improve **bike infrastructure** and connectivity, especially around the downtown areas

- **Safety** in **active transit**
    - Poorly paved roads are dangerous
    - Major roads are not maintained as well as neighborhood roads
    - Around Old Redwood Highway has no bike lanes, which makes biking scary at the interchanges

Are there policies or programs in the Town, County or region that may contribute to these issues (e.g., zoning, unimproved roadways, lack of multimodal planning)? Or are there activities, programs or projects that are planned or in the works that should be considered in this effort?

- As a suburban and rural ag community, most people **need cars** but there are a lot of people with **different needs**
- **Active transportation** policies can improve transportation for people without access to cars

What do you see as the Town's role verses other county and regional agencies?

- **Coordinate** with the **Local Hazard Mitigation Plan** for the County of Sonoma for a holistic approach

What do you see as the best methods for connecting with the community? What organizations, stakeholder groups and/or individuals should be involved/consulted in this process?

- Provide information through…
    - **Entertainment channels**, especially in the nighttime
    - Community **celebrations** with food
    - **Bulletin Boards!**
        - Dog Park, Town hall, grocery stores, public gathering places

- Connect with **audiences** in the **periphery of downtown** and underrepresented communities
- **Involve youth**
    - Title VI in schools- cultural engagement, Academy at High School
    - Schools, Scouts
- **Reach the Spanish speaking community**
    - Spanish radio is an effective way to connect with the Spanish speaking community
    - In person events that are COVID safe, drive through or walk event like a food drive, short and simple surveys

Community Workshop

The evening workshop held on March 30th on Zoom was attended by approximately 40 people and incorporated a presentation by the consultant team with several input opportunities for the community to provide their ideas regarding the Resilience Plan. Specifically, the team presented on the current conditions of the Town and the primary drivers for climate-related disasters and need for adaptation and resilience.

Insights from workshop informed the overall vision for the Town and goals for the Plan. It should be noted that community workshop attendees skewed to represent, for the most part, active participants in emergency planning efforts.

Closed Captioning in Spanish was offered, but no attendees requested the service. The recorded session was posted on the windsorready.com website and Spanish Closed Captions have been added to the video.

Summary Workshop Agenda:

I. Welcome, Introduction, Orientation
II. What does it mean for the Town of Windsor to be Resilient?
III. Climate Challenges for the Community
IV. Key Resilience Values and Goals
V. Wrap-up and next steps

The main takeaways from the workshop include:

- **Resilience** means being able to **bounce back after an emergency** by being well prepared, connected as a community, and educated
- **Fire** and **drought** risk are the biggest climate emergency concerns
- The biggest evacuation safety concern is **congestion** on **roadways**
- The **environment** and **natural areas** need to be prioritized in this effort
    - **Buffers** between Park and North and East Windsor borders must be designed and implemented before this fire season
- The Town needs to learn how to live **symbiotically** with the environment
- **Community** is very important for building resilience
- **Communication** during **evacuations** needs to be improved to be reliable and comprehensive
    - **Connections** between **leaders** and **residents** need to be strengthened
- It is **unclear** to the Town **where to go** to when **evacuating**
- While natural disasters are a concern, it is equally important to **ensure access** to **electricity** and **water** after **repopulation**, especially for homes that are the most vulnerable

Throughout the workshop, participants were asked to answer 10 questions about resilience planning in Windsor. Answers to key questions can be found below:

- **In a word of two, what does it mean for the Town of Windsor to be Resilient?**

  This question was asked both at the beginning and end of the workshop. Overall, the answers stayed consistent. For the Town of Windsor to be resilient, participants generally believe that we need to have good communication, preparedness, and education.



Responses during the beginning of the workshop.



Final responses

- **Briefly, share what aspirations or goals you have for Windsor?** Participants expressed many aspirations for Windsor. In general, there is a sentiment of wanting to be safe, prepared for natural disasters, healthy, inclusive, balanced with the natural environment, and connected as a community.



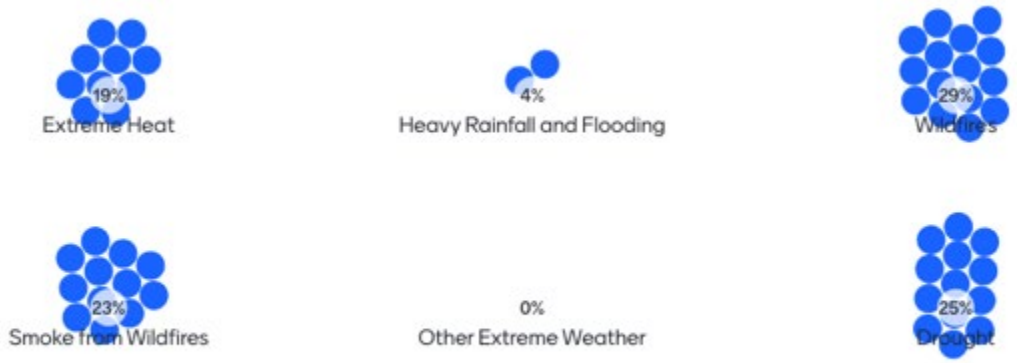


- **What do you see as the major priorities for this effort?**

Overall, attendees believed that the Resilience Plan should prioritize the environment and natural areas in its efforts. However, the additional emphasis placed on equity and community health and wellbeing echoes the previously mentioned aspirations.

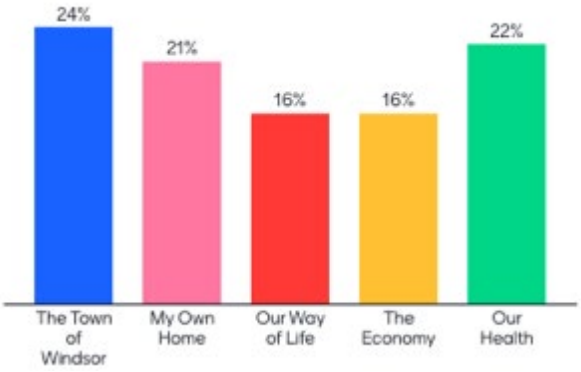


- **What are the biggest climate related challenges facing the Town of Windsor?**

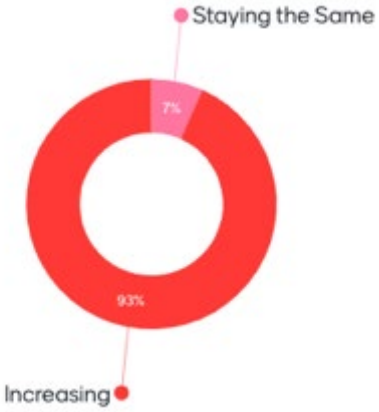


Wildfires: 29%, Drought: 25%, Smoke from Wildfires: 23%, Extreme Heat: 19%, Heavy Rainfall and Flooding: 4%, Other Extreme Weather: 0%

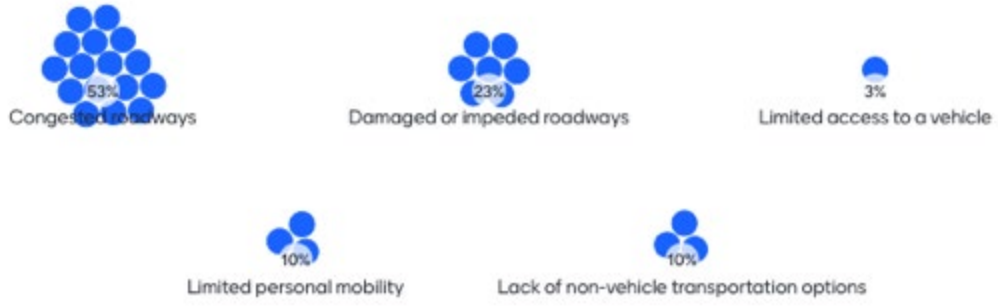
- **I believe that wildfires are a threat to (choose all that apply:**



- **Wildfire risk in Windsor is…**



- **Which of these transportation vulnerabilities pose the greatest challenge for you during a climate emergency? (Select all that apply):**



- **What other transportation vulnerabilities have you experienced or expect to experience in the future?**



- **Which of the following have you done to prepare yourself or your family to evacuate in an emergency (check all that apply):**



Resilience Plan Survey

The Town of Windsor Resilience Plan survey was hosted from March 7 – May 24, 2021 and was advertised via social media, the Town's email list, and through project champions. 124 people responded to the 13-question survey. Most (90%) of respondents live in single family detached homes, and most (85%) survey takers were between the ages of 35-74 years old. The survey summarized that over 50% of the respondents are extremely concerned about the impacts of climate change on the future of the Town and 98% express some level of concern. The following is a list of the key takeaways of the survey:

- **Wildfires** and **smoke** from wildfires are the most concerning extreme weather events to survey takers
- **Utilities**, **First Responders**, and **Open Spaces** are the top three assets that should be prioritized in the Windsor Ready Plan
- Survey takers feel that the following are the top three tactics to enhance our resilience:
    - ensuring reliable **communications**,
    - establishing **wildfire buffer zones**,

    - and **investing in emergency response and disaster management**
- **HOAs, Facebook groups, Nextdoor, COPE, and NIXEL Alerts** are all trusted communications streams used by the community that can be leveraged for the Windsor Ready Plan
- Many (over 30%) **households have special considerations** for emergencies, including children under 12, elderly family members, and pets that make their evacuation plans more challenging
- Many survey takers have an evacuation route in case of an emergency, yet **12% do not know their evacuation route**

The summary of the responses to the survey can be found here.

Phase II Engagement Efforts

Phase II helped to develop, refine, and finalize adaptation strategies based on the findings of the vulnerability assessment. The TWG helped to advise the initial priority strategy creation. Then, the community at-large had the opportunity to engage with and respond to the strategies through community engagement materials and events, including an open house event at the farmers market, the project website, an online survey through Consider.it, and social media pushes. Priority strategies were identified, leading to phase III.

The priority strategies that were identified include the following:

- Prepare businesses, and business-dependent services, for climate related disruptions
- Enhance community evacuation planning and execution
- Expand home hardening and retrofit efforts for all homes, buildings, and critical facilities
- Support neighborhood connections to enhance self-reliance and support during extreme weather events, particularly for residents in communities of concern.
- Identify opportunities to reduce the negative effects of poor air quality caused by wildfire smoke on human health.
- Ensure all current and future Town plan updates include climate change considerations.
- Enhance the Multimodal Transportation Network
- Enhance vegetation management and defensible space efforts for all homes, buildings, and critical facilities.
- Enhance local water conservation efforts to improve drought preparedness.
- Cultivate and support wildfire adapted landscape practices on Town and regional properties.
- Identify opportunities to enhance the capacity of Town and school facilities to become Resilience Hubs.

Open House/ Farmers Market Event

On Sunday, September 19th, 2021 the Town hosted an in-person Open House event during the weekly Farmers Market from 10am – 1pm. The goal of the event was to receive feedback from the community on the strategies that should be included in the final Windsor Resilience Plan. Strategies were grouped into five categories: People, Buildings, Natural Systems, Infrastructure, and Economy. Five poster boards showed the strategies and attendees were able to vote on their priority strategies with sticky dots. Those that preferred to vote on strategies online were directed to Consider.it, an online polling platform. To incentivize participation, attendees could share additional in the comment card and add their email for a chance to win a resilience-related raffle prize. Prizes includes go-bags and emergency radios. The event provided English and Spanish language materials. Roughly 150 people visited the booth. It should be noted that the Town planned to have a similar in-person booth event at the El Mercadito market but was unable to due to the event being canceled.

To bring awareness about the event, the Town of Windsor conducted several outreach pushes, including:

- Posts on Instagram and Facebook and an outreach toolkit to share with partners
- A blurb on the Town Newsletter
- Information for Town Counselors to spread

- Contact with organizations that cater to the Spanish speaking community, including: El Mercadito and Lady of Guadalupe Church

Consider.it Strategies Survey

The Consider.it is an online polling platform used in tandem with the farmers market event. Site visitors could vote on strategies for all 5 resilience categories mentioned above. The poll was open from the September 1st to October 31st, 2021. A Spanish-language poll was also created to enhance participation from the Spanish-speaking community. 48 people participated. The online survey was promoted through posts on Instagram and Facebook. The results from the Consider.it can be found here.

Phase III Engagement Efforts

After the priority strategies were identified, the draft Resilience Plan was created. On November 17th, 2021 the TWG hosted a meeting to review the draft plan and provide feedback. The final draft of the plan incorporated the edits made by the TWG and was sent to the Town.

The TWG meeting agenda can be found below:

I. Welcome
II. Priority Resilience Strategies
III. Deep Dive into Implementation Details
    a. Mural Activity
IV. Large Group Discussion and Additional Input
V. Wrap-up and Next Steps

The Draft Climate Resilience Plan was available for public review from December 17, 2021 through January 10, 2022 with feedback opportunities via the project website. Public comments were incorporated before the Plan was presented to the Town Council on February 2, 2022. Council member comments were incorporated and summarized for review by Town Council before the Plan was accepted on February 16, 2022.