



Western Riverside Adaptation and Resiliency Strategy:

Part 2, Adaptation Strategies

KEY ADAPTATION ISSUES AND STRATEGIES

The next century will likely bring more extreme heat days, more wildfires, less potable water, and more extreme weather and flooding (CEC 2019). To understand how these changes could affect the subregion, WRCOG conducted a vulnerability assessment in 2014 and updated the vulnerability assessment in 2019. Through the assessment, WRCOG identified how important structures, populations, and functions in the subregion would be vulnerable to agricultural pests and diseases, air quality, drought, extreme heat, flooding, human health hazards, landslides, severe weather, and wildfire. The vulnerability assessment process is documented in **Part 1, Vulnerability Assessment Technical Appendix**. WRCOG identified nine priority issues through the vulnerability assessment process:

1. Planning and Emergency Response Frameworks
2. Disadvantaged Communities
3. Public Health
4. Transportation Infrastructure and Operations
5. Resilient Development
6. Water and Energy Resources and Reliability
7. Agriculture
8. Biological Resources
9. Plan Maintenance

This section describes a series of strategies to address each issue. The strategies provide recommendations for WRCOG and its member jurisdictions to consider when planning for the future. To assist with implementation, sample work plans are included which identify the potential implementing agency for each strategy (i.e., some strategies would be implemented by WRCOG, while others may be implemented by local governments).

There are numerous strategies in other documents such as the WRCOG subregional Climate Action Plan (CAPtivate), local energy action plans, and state programs, that increase resilience in the subregion. The

strategies in this document are designed to remain consistent and complement existing strategies without duplicating them.

ISSUE 1: PLANNING AND EMERGENCY RESPONSE FRAMEWORKS

Agricultural pests and diseases, poor air quality, drought, extreme heat, flooding, human health hazards, landslides, severe weather, and wildfire conditions are endemic to Riverside County; much of the subregion is prepared for these harsh conditions including local governments and public safety departments (County of Riverside 2018). However, most of these agencies are currently prepared for these hazards as they have occurred historically, not as they are projected to occur. As the climate changes and these hazards increase in frequency and intensity, public safety departments and governments in general will need to adapt in order to adequately provide services to their residents.

WRCOG conducted a policy audit to identify how local governments currently address the nine hazards considered in this document and to determine the extent to which climate change is part of their planning framework. WRCOG obtained General Plan Safety Elements, Local Hazard Mitigation Plans (LHMP), and Emergency Operations Plans (EOP) for each member jurisdiction.¹ In general, flood and wildfire are planned for in all communities within the subregion. Agricultural pests and diseases, drought, extreme heat, human health hazards, landslides, and severe weather, on the other hand, are considered only in the Riverside County Multi-Jurisdictional LHMP, which also considers climate change (County of Riverside 2018).

STRATEGIES FOR PLANNING AND EMERGENCY RESPONSE FRAMEWORKS

Strategy 1.1: Integrate climate change adaptation considerations into general plans, Local Hazard Mitigation Plans, emergency operations plans, and other public safety documents.

Almost all communities maintain plans to help prepare community members and municipal staff for disasters and other hazards, and to guide staff response once a disaster occurs. These plans can include general plans, LHMPs, and EOPs, among others. Adaptation measures can be integrated into several elements of a general plan, including safety, land use, conservation, open space, air quality, and environmental justice. Climate change-related hazards can pose threats to human health and property and should be included in public safety and planning documents. Communities in the WRCOG subregion should strive to ensure that their public safety documents address emergencies that may be created or otherwise affected by climate change, including discussion on how the risks may vary in the future due to a changing climate. Per State requirements, these plans must be updated regularly to include the most recent data and should include the most relevant climate change projections.

- **Implementing Agencies:** Local governments

Strategy 1.2: Incorporate extreme heat and air quality annexes into emergency operations plans.

EOPs describe various emergency events that may threaten a community and how municipal staff should respond when emergencies occur. Extreme heat and air quality are not frequently addressed in EOPs, and existing emergency response protocols may not always be suitable for these types of events. To ensure that EOPs are fully responsive to these threats, communities in the WRCOG subregion should update their EOPs to include annexes on extreme heat and the degraded air quality that results from extreme heat and

¹ Not all documents for all jurisdictions could be identified or obtained.

wildfire events. These annexes should address issues of shelter and information about the hazards (including how they may change in the future), and include any specific, necessary emergency response policies and practices to address these risks.

- **Implementing Agencies:** Local governments, tribal nations, WRCOG

Strategy 1.3: Establish resilience hub locations in communities throughout the WRCOG subregion.

Resilience hubs consist of well-used, existing community-serving facilities that are upgraded to provide local communities with shelter, water, and electricity during extreme heat events, poor air quality, and disasters. These hubs should have other essential resources such as food, ice and refrigeration, charging stations, basic medical supplies, and other emergency supplies. They should have their own renewable energy and energy storage systems that should be able to operate up to 72 hours if a power outage occurs. When not used to provide services during extreme events, resilience hubs act as education centers, where community members can go to learn about hazards, how to prepare and respond to them, and enhance community connections to increase adaptive capacity. Site planning and establishment of resilience hubs, and their importance to emergency preparation and response, should be integrated into General Plan Safety Elements, LHMPs, and EOPs throughout the WRCOG subregion.

- **Implementing Agencies:** Local governments, Riverside County, tribal nations, WRCOG

Strategy 1.4: Collaborate with jurisdictions in the WRCOG subregion to protect existing critical facilities from extreme heat, flooding, landslides, severe weather, and wildfire.

Existing critical facilities, such as emergency operations centers, government facilities, hospitals, and schools should be protected from extreme events. WRCOG can collaborate with the County and cities to harden the critical facilities that cannot be moved to alternative locations. These projects can be integrated into local capital projects or capital improvement plans, to increase resiliency to both critical buildings and infrastructure in the subregion. Benefits of protecting these critical facilities include reducing the costs of building repairs after a disaster and decreasing the cost of water and energy due to efficiency upgrades.

- **Implementing Agencies:** Healthcare providers, local governments, Riverside County, school districts, tribal nations, WRCOG

Strategy 1.5: Increase hazard monitoring to facilitate rapid response and recovery.

Some hazards, such as heavy precipitation, extreme heat, strong winds, and landslides, can be predicted. WRCOG and local communities could monitor hazard forecasts, such as wildfire weather that consists of low humidity, high temperatures, and high winds, and initiate response efforts prior to an event. This is especially important after a wildfire, since the effect of heavy precipitation on burned land may trigger landslides. For example, after a fire, agencies could enhance mapping and monitoring of burned land to improve forecasts of mudslide susceptibility or immediately stabilize burned slopes to minimize future landslides.

- **Implementing Agencies:** CAL FIRE, local governments, Riverside County, tribal nations, WRCOG

ISSUE 2: DISADVANTAGED COMMUNITIES

The diversity in socioeconomic conditions across Western Riverside County creates a disparity among communities' abilities to adapt to the nine hazards identified in this document. For example, communities with older homes that lack modern insulation and air conditioning features are more vulnerable to

increases in extreme heat than communities with newer homes. Similarly, local governments with resources to make significant investments in flood management infrastructure are more resilient than governments that cannot afford to maintain their existing flood management infrastructure.

In addition to discrepancies between jurisdictions, certain areas of the subregion have high levels of social vulnerability to climate change effects. Social vulnerability is the susceptibility of a given population to harm from exposure to a hazard based on its ability to prepare for, respond to, and recover from that hazard (Cooley et al. 2012). Social vulnerability to climate change hazards is exacerbated by other variables including limited mobility, physical disabilities, language barriers, and the lack of a formal social support structure. For example, individuals 65 years of age or older are more susceptible to the adverse effects of heat than younger adults. Similarly, low-income individuals are less able to adapt to increased prices for food, water, and other basic necessities as a result of drought conditions.

STRATEGIES FOR DISADVANTAGED COMMUNITIES

Strategy 2.1: Continue to improve collaboration and information sharing between public agencies, disadvantaged communities, and community-based organizations.

An effective subregional response to climate adaptation requires a collaborative and integrated approach between local and regional agencies, disadvantaged communities, and community-based organizations. WRCOG currently allows communities and other involved organizations to share information, develop partnerships, and craft unified policy responses. These forums should focus on issues identified in the vulnerability assessment and involve specific community-based organizations within disadvantaged communities that can help implement adaptation programs in the subregion.

- **Implementing Agencies:** Local governments, Riverside County, tribal nations, WRCOG

Strategy 2.2: Continue to develop resources and materials that effectively communicate with non-English speakers in emergency and evacuation situations.

It is vital that all residents have access to pertinent information during emergency situations such as updates on the status of the emergency, calls for evacuation, and the location of available shelters. This information should be made available in multiple languages (Spanish, Tagalog, Mandarin, Cantonese, Vietnamese, and Arabic)², as non-English speakers can comprise up to one-third of all residents in some parts of the WRCOG subregion.

- **Implementing Agencies:** CAL FIRE, local governments, Riverside County, WRCOG

Strategy 2.3: Identify and map resilience hubs and cooling centers in locations accessible to vulnerable populations and establish standardized temperature triggers for when they will be opened.

Members of disadvantaged communities, specifically persons on fixed incomes and those living in substandard housing conditions, in addition to pregnant and nursing women and persons with chronic illnesses, are most in need of a cooling center during extreme heat and poor air quality events. However, limited mobility, need for medical assistance, and reduced access to information can make these individuals less aware of available cooling centers or less able to travel to the nearest one. Communities can address this by locating cooling centers as close as possible to where disadvantaged individuals live. By establishing a set temperature for when cooling centers open, communities can help residents know with greater certainty if a center will be open, reducing confusion during times of emergency. WRCOG

² Based on 2017 American Community Survey 1-Year estimates.

should help jurisdictions in the subregion work toward ensuring that a sufficient number of new cooling centers are located in areas with higher concentrations of disadvantaged or chronically ill individuals using the Social Vulnerability Index and other tools.

- **Implementing Agencies:** CAL FIRE, local governments, Riverside County, tribal nations, WRCOG

Strategy 2.4: Coordinate with emergency management services to establish backup power and water resources at emergency shelters, resilience hubs, and cooling centers in case of power outages.

Extreme heat and severe weather can result in power outages or brownouts that can prevent emergency shelters, cooling centers, and resilience hubs from functioning properly. Emergency shelters are centers places that people can live temporarily when they cannot live in their previous residence, which can occur during an evacuation. A resilience hub can provide people with shelter, water, and electricity during power outages and disasters, in addition to other essential resources such as food, ice and refrigeration, charging stations, basic medical supplies, and other emergency supplies. Resilience hubs also provide ongoing and permanent services, benefits, and opportunities to the community, such as education and training. Cooling centers can be made available during extreme heat and poor air quality events as a temporary refuge for households that do not have access to air conditioning. Backup power resources, ideally microgrids with solar energy and battery storage systems, can help these centers remain operational for communities during emergencies. Backup power supplies can help run air conditioning and air purifying systems and can power refrigerators for medical supplies and life support systems. Emergency and cooling centers and resilience hubs should also have a backup water storage, such as water bottles or water cisterns, if water services become stressed due to power outages or constrained supplies.

- **Implementing Agencies:** Tribal nations, water agencies, WRCOG

Strategy 2.5: Coordinate with transit agencies to identify ways for individuals with restricted mobility to reach cooling centers.

Communities and organizations should develop ways to ensure that individuals with mobility challenges, such as low-income residents, senior citizens, physically disabled individuals, and those without access to lifelines, can reach a cooling center. For example, senior citizen housing complexes with their own shuttle services should include cooling centers as a destination during extreme heat events. Similarly, in locations with a large concentration of individuals with limited mobility, it may be effective to establish a temporary shuttle service to and from the nearest cooling center for the duration of the extreme heat event. Standardized temperature triggers and mobility preferences should be created for each community, that would prompt transit agencies servicing those areas to provide shuttle services to cooling centers.

- **Implementing Agencies:** CAL FIRE, local governments, Riverside County, Riverside Transit Agency (RTA)

Strategy 2.6: Coordinate with County of Riverside Continuum of Care and other existing programs to ensure that emergency shelters are available during extreme heat events, poor air quality, severe weather events, and other highly hazardous conditions. Ensure that the local homeless population is made aware of these resources.

Local communities should coordinate with agencies and organizations that provide homeless services to provide shelter during hazardous conditions. These emergency shelters should provide information about hazardous events and basic supplies such as insect repellent and hygiene supplies that can increase the adaptive capacity of individuals experiencing homelessness. Outreach and support efforts to homeless individuals would be essential to disseminate information on how to stay safe during hazardous conditions and where the nearest emergency shelter is located.

- **Implementing Agencies:** Local governments, Riverside County

Strategy 2.7: Expand participation of PACE programs and other support services that provide funding resources for economically disadvantaged households and businesses.

Economically disadvantaged households in the WRCOG subregion may have poor housing conditions that expose residents to greater harm from extreme heat and poor air quality. The homes and businesses of the economically disadvantaged may also not be constructed or retrofitted to withstand projected flooding and severe weather events in the subregion. WRCOG currently administers an array of PACE programs, such as HERO Residential Program and Greenworks Commercial Program, which help residents and business owners obtain financing for building energy upgrades, improvements to HVAC systems, water efficiency upgrades, and roof and window replacements. These programs can provide the necessary financing to help businesses or low-income households prepare for hazardous events. Outreach programs and subregional workshops can help circulate information on the services that these programs provide.

- **Implementing Agency:** WRCOG

Strategy 2.8: Improve the social support systems to increase social capacity within local communities.

Social support systems are essential to improving resiliency in a community, as these systems help ensure that community members know each other and therefore are more likely to check up on their neighbors during an emergency. WRCOG could work with local governments and Riverside County to provide neighborhood emergency preparedness outreach to ensure that communities are prepared and know who lives around them in case individuals need assistance. This can especially increase resiliency for seniors living alone, persons with chronic illnesses, and persons without access to lifelines. Outreach events could also take place at existing community events, religious centers, and schools.

- **Implementing Agencies:** Local governments, Riverside County, WRCOG

ISSUE 3: PUBLIC HEALTH

Climate change could degrade public health by directly affecting residents and employees. The increased health-care needs resulting from these hazards could strain the subregion's public health infrastructure (e.g., health-care facilities, health-care workers, emergency responders), particularly during emergencies or disasters.

Increased temperatures are expected to result in more intense and frequent extreme heat and poor air quality events, which pose health risks. Warmer temperatures may help the subregion support a larger population of disease-carrying organisms such as mosquitoes and ticks, potentially causing increased exposure to vector-borne diseases such as West Nile virus and the bacteria that cause Lyme disease (California Department of Public Health 2012).

Public health infrastructure faces potential direct effects as well. For example, by 2039, five existing hospitals, 13 existing community health agencies, and 10 existing mental health facilities in the subregion will be located in areas of elevated fire risk (WRCOG 2014b). Losing these facilities to fire or losing their services to electricity outages during a fire, would degrade the capacity of health-care organizations to respond to emergencies or disasters. The combination of these effects could reduce access to and effectiveness of public health services, further increasing the vulnerability of the subregion, particularly among disadvantaged populations.

STRATEGIES FOR PUBLIC HEALTH

Strategy 3.1: Augment training of employees and workers in industries with outdoor work, including assurance of adequate water, shade, rest breaks, protection from poor air quality, heat risks, and vector-borne disease avoidance.

Health effects from climate change can be more severe for individuals who work outdoors (e.g. construction workers, landscapers and ground crews, and agricultural workers), who constitute approximately 10% of the employed population in the WRCOG subregion (US Census Bureau 2010a). Extreme heat and poor air quality are the primary health risks for these workers, although increased exposure to potential disease vectors such as ticks and mosquitoes can also pose a hazard. The County and local governments can provide guidance to their employees, as well as work with the private sector, to ensure that outdoor workers are aware of the risks posed by these hazards and how to reduce them.

- **Implementing Agencies:** Local governments, Riverside County

Strategy 3.2: Identify and remedy poor drainage areas to reduce disease risk from stagnant water. Expand outreach programs to educate communities about potential increases in vector-borne diseases from stagnant water.

Stagnant water provides a breeding ground for mosquitoes, which in turn can increase the risk of mosquito-borne pathogens such as West Nile virus. Stagnant water can develop in areas of poor drainage following flood events, creating a health risk in the vicinity. Communities in the WRCOG subregion can identify poorly drained areas and complete infrastructure improvements so that they drain properly. If infrastructure improvements are not feasible, the community can categorize these locations as needing mosquito-control efforts following a flood event. WRCOG should also collaborate with the Riverside County Flood Control and Water Conservation District (RCFC&WCD) and Northwest Mosquito and Vector Control District to expand public education programs regarding preventative actions against vector-borne diseases that have the potential to occur in the future.

- **Implementing Agencies:** Local governments, Northwest Mosquito and Vector Control District, RCFC&WCD

Strategy 3.3: Explore the feasibility of installing microgrids at critical health care facilities, in addition to continuing energy efficiency upgrades.

Energy efficiency programs can help health care facilities function more effectively during periods when the electricity grid may be stressed, such as during an extreme heat event. Microgrids that include battery storage systems along with solar energy systems or other forms of renewable energy generation can provide a consistent power supply if the larger grid has a power outage, improving the resilience of emergency medical response facilities. Even under normal conditions, financial savings from energy efficiency measures can be spent to improve quality of care or benefit other valuable purposes. WRCOG and its member jurisdictions can work with local health care facilities to promote grants and rebates for energy efficiency measures from various public and private organizations. WRCOG can also provide HERO-related outreach directly to eligible facilities.

- **Implementing Agencies:** Local governments, WRCOG

Strategy 3.4: Work with local volunteer emergency response teams to include air quality and extreme heat as a hazard of concern and update core competencies to address the health-related risks of poor air quality and extreme heat events.

Although significant health risks are associated with poor air quality and extreme heat events, extreme heat is not always addressed as part of the training provided to volunteer emergency responders. Poor air quality days and extreme heat events are expected to become more intense and more severe as climate change continues. To help ensure that volunteer emergency responders remain effective in WRCOG subregion communities, all volunteers should receive extreme heat training. This training should include education on the health threats posed by poor air quality and extreme heat, the individuals most at risk, and details on both preventative and curative care. Air quality and extreme heat training should also be included in required recurring training sessions.

- **Implementing Agencies:** CAL FIRE, local governments, Riverside County, South Coast Air Quality Management District (South Coast AQMD), tribal nations

Strategy 3.5: Include public health topics in general plan safety elements, local hazard mitigation plans (LHMP), emergency response plans, and other public safety documents.

Given the important public health implications of climate change, updates to general plan safety elements, LHMPs, emergency response plans, and other public safety documents should include collaboration with staff from agencies and organizations who work on public health issues. Communities in the WRCOG subregion should ensure that their public safety documents address public health emergencies that may be created or worsened by climate change, including discussion of how vector-borne diseases, extreme heat, and poor air quality may become more common in the future due to a changing climate. WRCOG can provide public health information that can adequately inform the policies in public safety documents.

- **Implementing Agency:** Local governments, Riverside County, WRCOG

ISSUE 4: TRANSPORTATION INFRASTRUCTURE AND OPERATIONS

Transportation infrastructure in the subregion is vulnerable to extreme heat, flooding, landslides, severe weather, and wildfire. The average commute time in most of the WRCOG subregion exceeds 30 minutes each way and is greater than 45 minutes in some locations (US Census Bureau 2017). Extreme events caused by climate change may cause more substantial delays. For example, extreme heat can buckle asphalt and rails, slowing or even halting traffic along these routes. Floodwaters can wash away transportation lines or block transportation networks with debris. For safety reasons, roads and rail lines near active wildfires are often closed and burned areas are more susceptible to landslides which may block roads long after a fire. A closed road or railway line can create congestion throughout the transportation network, causing impacts beyond the directly affected area (DOT 2011).

If major transportation routes are damaged and in need of repair, congestion and delays may continue for months after the event. Public transportation may also be disrupted by damage to transit stops and stations, creating further congestion and mobility problems for individuals lacking access to personal vehicles. Additionally, some emergency events, such as floods, landslides, and fires that affect bus or rail storage facilities, may directly damage transit vehicles. Individuals who maintain and operate transportation networks may also face increased health risks from exposure to extreme events, particularly high temperatures and poor air quality.

Flooding can damage roadways and drainage infrastructure, trigger mudslides, and remove sediment around abutments and piers, which may compromise bridge structures. In the WRCOG subregion, approximately six major bridges, including two across I-15, and dozens of smaller bridges are located

within 100-year flood zones. Most bridges are designed to span the floodplain, but many are in disrepair. Approximately 15 Arizona crossings (also known as fords) are located in 100-year flood zones (WRCOG 2014c). Because more frequent and intense 100-year floods are anticipated, this could extend periods where such crossings are flooded and impassible (Dettinger 2012) or may damage roads. Certain residential communities can only be accessed by roads along Arizona crossings.

Similarly, I-15, I-215, Ramona Expressway, and State Routes 74 and 79 are critical evacuation routes that run through large areas of 100-year flood zones (WRCOG 2014c).

STRATEGIES FOR TRANSPORTATION INFRASTRUCTURE AND OPERATIONS

Strategy 4.1: Use the *Climate Resilient Transportation Infrastructure Guidebook* strategies and design features in transportation infrastructure to improve resiliency to extreme events.

Agencies can take a number of steps to increase transportation resiliency including the use of special sealants and other materials which can help prevent roadways from softening during extreme heat, choosing appropriate roadway materials for wildfire prone areas, treating rail lines to be heat-resistant, and incorporating expansion joints into rails to reduce the risk of damage during high temperatures. Roads and railways can also be built on foundations that are resistant to being washed away during flood events. Specific design standards, such as dynamic shoulder lanes and adaptive signal control systems, can be installed to improve evacuation routes during emergencies. Transportation agencies should integrate these features into all new construction projects throughout the WRCOG subregion.

- **Implementing Agencies:** Caltrans, local governments, Riverside County, Riverside County Transportation Commission (RCTC), WRCOG

Strategy 4.2: Facilitate coordination of traffic signal systems between adjacent communities.

Traffic signal synchronization involves adjusting the timing of traffic signals so that a vehicle traveling on a major roadway reaches each intersection during a green light. This allows vehicles to move rapidly with little or no idling time. In addition to reducing air pollution and GHGs, signal synchronization allows faster movement of emergency response vehicles and can facilitate more effective evacuation during emergency events. Given the expected increase in wildfires and extreme weather events, increasing evacuation effectiveness will become critically important. Within the WRCOG subregion, a major roadway may cross the boundaries of multiple communities, so the transportation agencies in the subregion should coordinate their synchronization efforts to ensure that traffic can continue to flow rapidly across jurisdictional boundaries. RCTC and the California Department of Transportation (Caltrans) would be important partners in the implementation of this strategy.

- **Implementing Agencies:** Caltrans, local governments, Riverside County, RCTC, tribal nations, WRCOG

Strategy 4.3: Use available data and studies to simulate how expanded wildfire, flooding, and landslide impacts might affect the transportation system.

Future projections from Cal-Adapt and FEMA indicate that in the WRCOG region, acreage of area burned during a wildfire and areas where flooding can occur may increase. This detailed information has a wide variety of applications, including the creation and analysis of Resilient IE evacuation maps and enhancement of the information within the Caltrans District 8 Vulnerability Assessment. All of this data can help prioritize preventative maintenance, identify alternative routes, and help in other emergency preparedness work. The transportation agencies in the WRCOG subregion should use these studies and

additional wildfire, flooding, and landslide data to investigate the specific effects of climate change on local transportation infrastructure and implement strategies that reduce risks to the transportation infrastructure.

- **Implementing Agencies:** Riverside County, RCTC, WRCOG

Strategy 4.4: Study changes along designated evacuation routes associated with more frequent and severe wildfire, flood, and landslide events.

As part of the vulnerability assessment update, WRCOG also prepared evacuation route maps and identified potential hazards along those routes. Transportation agencies, such as the County of Riverside Transportation Department and County of Riverside Transportation and Land Management Agency in the WRCOG subregion, can use this evacuation route hazard analysis to identify areas with a higher risk to climate change hazards. Based on this analysis, WRCOG can work with these agencies to harden roads, repair bridges, and replace insufficient culverts to ensure that the roadway infrastructure remains operational during emergencies. The following routes should be considered in this effort: Interstates 10, 15, and 215; and State Routes 60, 74, 79, 91, 243, and 371.

- **Implementing Agencies:** Riverside County, RCTC, WRCOG

Strategy 4.5: Coordinate with regional transit providers to identify alternative routes and stops if normal infrastructure is damaged or closed as a result of extreme events.

Disruptions to transit services can deprive some residents of their only means of travel. To help ensure that transit services can continue to operate during and after extreme events, WRCOG should collaborate with RCTC and other specialized transit service providers to identify alternate routes and stops in the event that they can no longer use normal infrastructure. These alternative routes and stops should be located as close to the normal routes and stops as possible to minimize disruption. The location of alternative routes should also be clearly communicated to riders through signage and flyers, television, radio, print media, and digital services. All communication should occur in relevant languages and be culturally appropriate.

- **Implementing Agencies:** Local governments, Riverside County, RTA, RCTC, WRCOG

Strategy 4.6: Ensure redundancy of critical transportation routes to allow for continued access and movement in the event of an emergency.

Transportation routes are at risk of shutdowns during a climate-driven emergency. If essential transportation and evacuation routes are closed or blocked due to hazardous conditions or major traffic delays, evacuations may not be possible. Critical services, such as healthcare and emergency response, may not be able to properly carry out their functions, and economic activities may slow or be halted. Creating redundancies in the transportation system can lessen the potential severe effects of a shutdown on critical routes. WRCOG's Resilient IE Evacuation Hazard Maps can be used as a tool to identify where redundancies are needed.

- **Implementing Agencies:** Local governments, RCTC, WRCOG

Strategy 4.7: Update maintenance protocols to incorporate climate vulnerabilities.

The increase in intensity and frequency of climate hazards, such as flooding and extreme heat, can affect the day-to-day operations and maintenance of transportation infrastructure. Updating maintenance systems to adapt to climate hazards can involve shifting outdoor physical labor hours to earlier in the morning during extreme heat days. Transportation agencies might also increase stormwater drainage infrastructure maintenance to ensure that when storms occur, there is efficient drainage capacity to convey any surface-level flooding.

- **Implementing Agencies:** Local governments, RCTC, WRCOG

Strategy 4.8: Coordinate with local governments and regional transit providers to increase shading and heat-mitigating materials on pedestrian walkways and transit stops.

Adequate shade on sidewalks and transit stops is essential for individuals who walk or use public transit to get to their destinations. To increase the comfort of pedestrians on hot days, WRCOG can work with local jurisdictions and tribal nations to install pavement with high albedo, which absorbs less heat and contributes less to the urban heat island effect. Heat-reflective pavement can be applied either by replacing existing surfaces or by coating surfaces with a highly reflective coating. WRCOG can also encourage shade structures/shelters at transit stops, and tree planting programs along walkways to provide shade, particularly in communities that have little shade. This could help reduce heat and improve local air quality, as well as incentivize outdoor activity.

- **Implementing Agencies:** Local governments, RCTC, RTA, tribal nations, WRCOG

ISSUE 5: RESILIENT DEVELOPMENT

While drought and extreme heat more or less affect the entire subregion, wildfire, flooding, and landslides have specific spatial bounds. As the climate changes, the amount of area at elevated risk for such spatially limited hazards may increase (CEC 2019). Areas that are currently vulnerable to wildfires, floods, and landslides may face these hazards more frequently, and the hazards themselves may be more severe.

Wildfires, floods, and landslides may begin to affect areas that are not currently vulnerable to these hazards. These risks may be exacerbated by high development pressure, resulting in more buildings and infrastructure built in high-risk areas. Wildfires, floods, and landslides already occur in the WRCOG subregion. The subregion is generally prepared to mitigate and deal with current wildfire, flood, and landslide effects on urban environments (County of Riverside 2018). However, increases in frequency and severity increase the vulnerability in the subregion.

As mentioned above, different communities are especially vulnerable or resilient to climate change effects. This is particularly true for spatial hazards like wildfire and flood, where rapid evacuation may be necessary. For example, there are 20 census tracts in projected 2039 high fire risk areas where 10% or more of the current population do not have access to a vehicle (Krawchuk and Moritz 2012; Cal OEHHA 2014). In these locations, individuals will likely need assistance if evacuation is necessary. The lack of vehicle access may make it difficult for such individuals to move to safer areas during extreme events. **Figures 8 and 9** illustrate how projected flood and wildfire hazards are expected to affect communities.



Figure 8: 100-Year and 500-Year Flood Zones

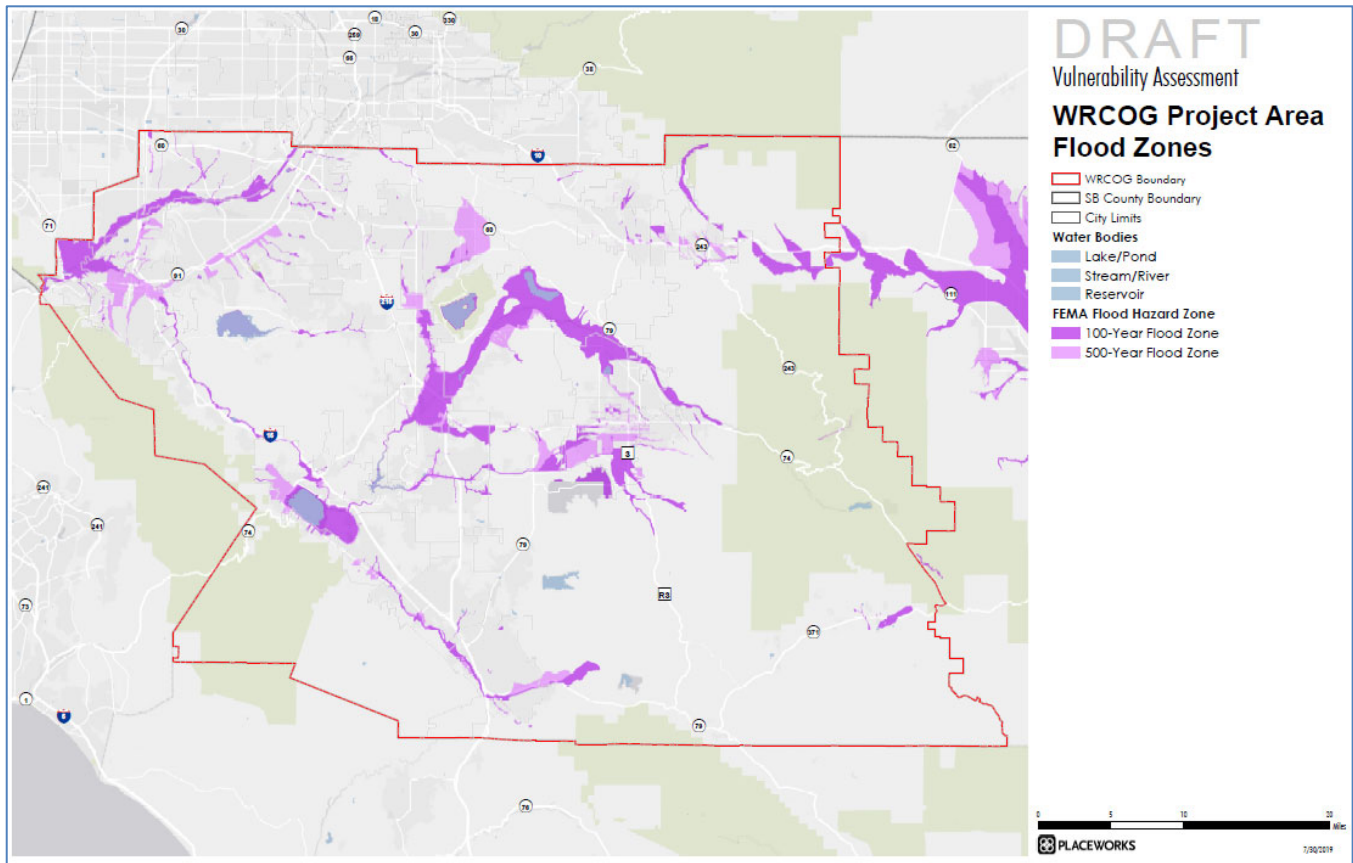
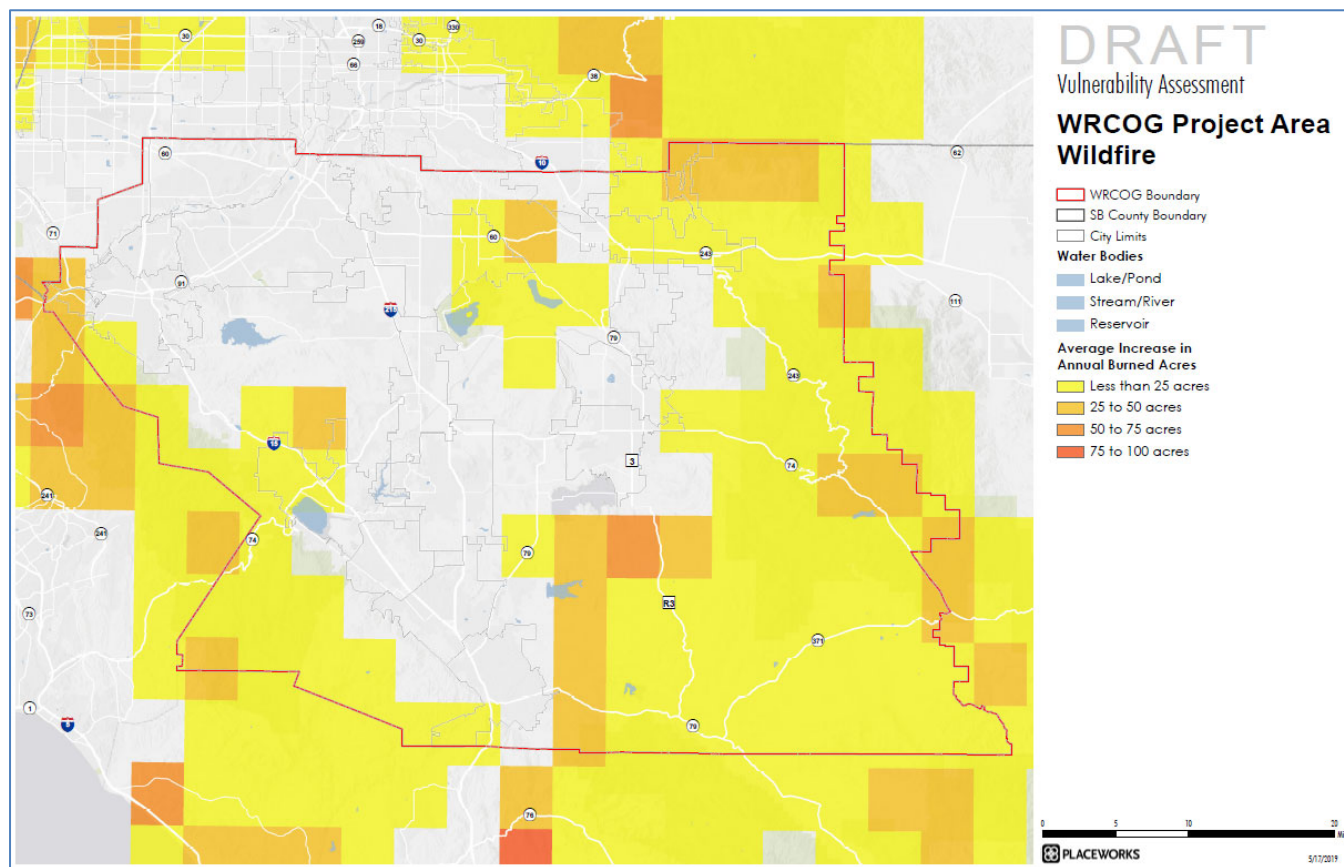


Figure 9: Average Increase Between Historic (1962-1990) and Future (2070-2099) Annual Burned Acres



In addition to vehicle access, a number of additional factors make residents or employees more vulnerable to flooding and wildfire. First, individuals with disabilities could have limited mobility and could be medically dependent on electric devices. Physically disabled individuals may have limited mobility in case of an evacuation, and respiratory problems could be aggravated by smoke. As of 2014, there are six census tracts in projected 2039 high fire risk areas where 20% or more of the current population has some type of disability.

Second, as of 2014, nearly every census tract in projected 2039 high fire risk areas currently has at least 20% of households living at two times below the federal poverty level. Low-income individuals are less likely to have access to high quality housing units, support networks, or other resources that limit exposure to poor air quality or protect against fire. They are also less able to recover and rebuild their quality of life if fire results in destruction of their property or affects their health.

Third, there are 12 census tracts located in projected 2039 high fire risk areas where 20% or more of the current employed population has an outdoor occupation (Krawchuk and Moritz 2012; US Census Bureau 2010a). Outdoor workers are directly impacted by poor air quality caused by wildfire.

Fourth, houses near high fire risk areas are at increased risk of burning. In the WRCOG subregion as of 2014, 51,875 acres of residential land are currently located in an elevated fire risk area. This acreage is expected to increase to 107,749 acres around 2039 (this does not account for new development, which will increase this figure) (Krawchuk and Moritz 2012).

Fifth, as of 2014, at least 20% of owner-occupied households are overpaying for housing in approximately 75% of census tracts located in 100-year floodplain areas (FEMA 2014; Cal OEHHA 2014). At least 20% of renter-occupied households are overpaying for housing in approximately 20% of census tracts located in 100-year floodplain areas (FEMA 2014; Cal OEHHA 2014). Individuals paying a high percentage of their income on housing may have fewer resources available to limit exposure to flooding (FEMA 2014; Cal OEHHA 2014). The higher cost of housing may also result in greater financial losses from a given flood event.

Finally, nearly 75% of census tracts, as of 2014, located in 100-year floodplain areas have at least 20% of households living two times below the federal poverty level (Cal OEHHA 2014). Low-income individuals are less likely to have access to high-quality housing units or access to the necessary resources (e.g., sandbags) to protect their homes from flooding. They are also less able to recover and rebuild if flooding results in destruction of property or degraded health.

STRATEGIES FOR RESILIENT DEVELOPMENT

Strategy 5.1: Continue to provide information to homeowners about statutory vegetation management requirements.

California law requires landowners in areas with flammable groundcover (e.g., forest, brush, grasslands) to maintain defensible space around buildings that can help slow or prevent the spread of wildfire. Local communities and fire protection agencies may require additional vegetation management and other defensible space requirements. While these standards can reduce wildfire risk, not all landowners may be aware of them and may not take appropriate action. Local communities can work with fire protection agencies to provide information to landowners about creating defensible space.

- **Implementing Agencies:** CAL FIRE, local governments, WRCOG

Strategy 5.2: Encourage retrofits of hardscaped areas to use permeable paving.

Permeable surfaces allow water to filter through into the soil below, in contrast to conventional hardscape paving with which water that falls on these surfaces runs off and often ends up in a storm drain. By increasing opportunities for water to soak into the ground instead of running off, permeable paving decreases the amount of water on the surface and can minimize flooding. Additionally, permeable paving can replenish groundwater supplies and may act as a “cool surface” compared to conventional heat-absorbing surfaces such as asphalt, reducing the urban heat island effect. Local communities can encourage landowners to use permeable paving when making retrofits to sidewalks/pedestrian plazas, driveways, parking lots, and other large hardscaped areas where soil conditions and practical applications are cost effective and efficient. Policies encouraging the use of these materials should be integrated into local development codes and communicated to project applicants as part of the ongoing project review process.

- **Implementing Agencies:** Local governments

Strategy 5.3: Establish neighborhood and building design standards that minimize fire and landslide hazards in high wildfire hazard severity zones and high landslide susceptibility areas.

Numerous design strategies can make buildings more resilient to wildfire, including using fire-resistant materials in the walls and roofs of buildings, fire-resistant window shutters and doors, and hardscaped defensive areas (e.g., patios, stone wall) around houses. Design standards (e.g. sizing culverts and drainage accurately and maintaining stability through vegetation management), can make buildings and infrastructure more resistant to landslides. New neighborhoods can also improve resistance to both

wildfires and landslides by using fire-resistant plants and landscaping materials that have stable root systems post-wildfire, and by including multiple ingress and egress routes that facilitate evacuations and emergency vehicle movement as needed. Local communities can adopt these provisions into local building codes and neighborhood design guidelines, then require them through the ongoing development review process and community outreach.

- **Implementing Agencies:** Local governments

Strategy 5.4: Restore riparian corridors, soft-bottomed streambeds, and seasonal flood basins that reduce flood hazards.

Converting natural streams to concrete channels can provide flood management benefits in the immediate area, but these actions can exacerbate downstream flood risks. Concrete banks and streambeds offer little opportunity for water to absorb in the ground and present few barriers to slow the water down, leading to a large volume of fast-moving water that may pose hazards. Local communities can work to restore these streams to their natural state, allowing water to slow down and percolate into the ground, potentially reducing flood risks. Natural riparian areas can act as green infrastructure, providing a cooling benefit during extreme heat events, as well as provide and improve habitat connections between open space areas to enhance the well-being of vegetation communities.

- **Implementing Agencies:** Local governments, RCFC&WCD, Santa Ana Watershed Project Authority (SAWPA)

Strategy 5.5: Encourage the use of low-impact development practices in new development.

Low-impact development (LID) uses natural systems and principles to manage stormwater, rather than relying exclusively on concrete drainage channels and storm drains. In many LID systems, water is channeled into landscaped areas, where plants slow the water and allow it to percolate into the ground, reducing runoff and potentially decreasing flood risk. Communities in the WRCOG subregion should promote use of LID principles where practical and where local conditions are suitable through the ongoing development review process and public outreach.

- **Implementing Agencies:** Local governments

Strategy 5.6: Avoid siting important infrastructure and important facilities in or near hazard prone areas.

Important infrastructure should not be located in areas that are currently recognized as mapped hazard areas or locations that may be vulnerable to flooding, wildfire, or landslides within the infrastructure's expected operational life. Keeping important infrastructure out of hazard zones decreases the risk of damage or destruction by climate change hazards, reducing reconstruction costs and allowing the infrastructure to continue to function during a hazardous event. If there is no feasible alternative location for an important piece of infrastructure, the facility should be designed to reduce the risk of damage or destruction to the extent possible.

- **Implementing Agencies:** Local governments, RCFC&WCD, RCTC, WRCOG

Strategy 5.7: Encourage homeowners and businessowners to retrofit existing structures to increase resiliency to climate change hazards.

Existing homes and commercial structures located in wildfire, flood, landslide, and severe weather prone areas can be damaged or destroyed by these hazards. Older structures and mobile homes are especially vulnerable due to less structural stability in the building materials or foundation. Communities in WRCOG should encourage homeowners to clear gutters that could block stormwater, replace roofs with fire

resistant materials, and add permeable surfaces to properties to reduce runoff. Mobile homes in the WRCOG subregion should also reinforce wall joints and retrofit foundations to resist damages from severe weather and flood events. Local jurisdictions and tribal nations could also establish incentive programs, through existing programs (i.e. PACE) or develop new programs (assessment districts), to help homeowners and business owners complete these retrofits.

- **Implementing Agencies:** Local governments, tribal nations, WRCOG

Strategy 5.8: Develop a fire risk reduction assessment that communities in the WRCOG subregion can use for new development in fire prone areas.

While new development in fire prone areas may be discouraged, some property owners may still want to build structures in these areas. In collaboration with local governments, WRCOG can develop a fire risk reduction assessment to identify existing fire hazards on properties, describe the proposed projects, develop thresholds, and establish guidance to mitigate wildfire risks to these new developments. Local jurisdictions and tribal nations can opt-in to using this assessment, which would increase awareness and ensure that the design of the development considers potential wildfire threats. Based on this assessment, local jurisdictions and tribal nations can recommend development restrictions in very high fire hazard risk areas.

- **Implementing Agencies:** Local governments, tribal nations, WRCOG

ISSUE 6: WATER AND ENERGY RESOURCES AND RELIABILITY

The electrical grid can be less efficient and more prone to breaking down during periods of high temperatures. The US Department of Energy (DoE) estimates that, for a 9-degree increase in temperature, transmission line capacity falls 7% to 8% and substation capacity falls 2% to 4% (DoE 2013). These problems are compounded when electricity demand spikes during a heat wave, primarily due to increased air conditioning loads. This can in turn cause health and safety problems when power losses shut down key pieces of equipment.

Because electricity is more expensive during summer afternoons and early evenings, the increased need for air conditioning may also create economic hardships for low-income households. Approximately 34% of housing units in Riverside County were built before 1980 (US Census Bureau 2010b). These homes are more likely to be energy inefficient, making them less likely to retain cool temperatures in the event of a power outage during warm weather. In the Riverside/San Bernardino/Ontario metropolitan area, which includes the WRCOG subregion, 91% of homes have central or in-room air conditioning (US Census Bureau 2011). Older homes may require air conditioners to be used more often due to the home's inefficiency, which can put stress on the grid and increase the occupants' electricity bill. Residents, businesses, and government operations in the WRCOG subregion can reduce their dependence on the electricity grid by promoting energy efficiency and renewable energy, which decreases stress on the grid and reduces utility bills.

STRATEGIES FOR WATER AND ENERGY RESOURCES AND RELIABILITY

Strategy 6.1: Promote and expand the use of drought-tolerant green infrastructure, including street trees, and landscaped areas, as part of cooling strategies in public and private spaces.

Many of the materials in urbanized areas, such as asphalt and building roofing materials, can radiate heat back to the environment, creating higher temperatures than in rural areas; this is known as the urban heat island effect. By contrast, green infrastructure, such as plants and landscaped areas, can help reduce

temperatures, creating a cooler urban environment. Green infrastructure installations should be designed to be low water use and drought-tolerant in order to survive and continue to provide benefit during times of little or no rainfall.

- **Implementing Agencies:** Local governments, WRCOG

Strategy 6.2: Amend the local development code to require high-reflectivity pavement or increased tree cover in large commercial parking lots.

The dark asphalt surfaces of large parking lots absorb light and radiate large amounts of heat, raising temperatures in the immediate area and increasing the intensity of extreme heat events, which may be particularly problematic for individuals who are highly vulnerable to high temperatures. Communities can address this problem by amending local development codes to require large parking lots to be constructed using materials that radiate less heat, such as high-reflectivity surfaces that do not absorb as much light. Shade trees, which communities can require for parking lots, also block light from being absorbed and create shaded areas that provide additional cooling effects. Development codes requiring shade trees or other green infrastructure should specify that all plants be low water use and drought-resistant in order to provide benefit during times of little or no rainfall. Development codes should also offer flexibility to allow successful implementation under varying local conditions within the subregion.

- **Implementing Agencies:** Local governments

Strategy 6.3: Identify and implement municipal renewable energy projects for daily and emergency operations.

Municipal renewable energy measures, together with local municipal energy action plans, offer a number of benefits, including saving taxpayer money and providing a platform to demonstrate leadership. Additionally, these actions allow communities to function with improved effectiveness during periods when the electricity grid is stressed, such as during high heat events. Large renewable energy systems in combination with extensive energy efficiency retrofits allow buildings to produce as much energy as they use, resulting in zero net energy. These buildings can be designed to be entirely grid-independent, allowing them to continue to function for long periods during prolonged power failures.

- **Implementing Agencies:** Local governments

Strategy 6.4: Expand participation in PACE programs, identify additional improvements to finance through PACE programs, and consider new approaches to target neighborhoods for focused outreach.

Some residents in the subregion may be unaware of the opportunities PACE programs can offer, particularly opportunities to finance energy efficient upgrades to reduce heating and cooling costs, offsetting PACE repayment costs. Many of these residents may be elderly individuals, people with limited English skills, low-income individuals, or otherwise members of a disadvantaged community. WRCOG communities can expand their PACE outreach efforts to reach locations with a large proportion of disadvantaged individuals as determined by the Social Vulnerability Index.

- **Implementing Agencies:** Local governments, WRCOG

Strategy 6.5: Communicate climate risks to energy utilities and request they ensure that new and upgraded infrastructure is climate resilient.

During infrastructure installation or upgrades, electrical service providers have the opportunity to protect electricity poles and transmission wires from climate hazards such as wildfire, flooding, and severe weather. Strengthened poles may withstand forces like high winds and heavy precipitation events that would otherwise cause them to fall, and covered wires are less exposed to wildfire. Although replacing old infrastructure can be expensive, electrical service providers may find that updating infrastructure and enhancing systems that manage power supply in critical or high-risk areas would be worth the investment to avoid major damage during climate events.

- **Implementing Agencies:** Local governments, WRCOG

Strategy 6.6: Encourage energy and water efficiency in buildings through upgrading appliances and building infrastructure retrofits.

Energy efficiency initiatives that keep buildings cool in extreme heat while using less power can reduce energy demand on the grid. Water efficiency measures can reduce water demand and ensure adequate water supply during drought conditions. Since buildings would need less energy and water to maintain temperature and facilities, stress on the energy infrastructure would be reduced. Local governments and tribal nations can partner with public and private utilities to help finance new, or participate in existing, energy efficiency initiatives through programs such as the California Energy Partnership Program or Statewide Energy Efficiency Program (ACEEE 2019), while building owners could upgrade their appliances and buildings to meet or exceed standards such as Energy Star or the U.S. Green Building Council LEED program.

- **Implementing Agencies:** Local governments, public utilities, Southern California Edison, Southern California Gas, WRCOG

Strategy 6.7: Invest in sustainable backup power sources to provide redundancy and continued services for critical facilities in the event of an outage.

On-site renewable power generation and battery storage systems can allow critical services and equipment, such as healthcare or emergency cooling centers, to remain online in the event of a power outage. Natural hazards can damage power infrastructure that causes service interruptions. Ensuring there are backup supplies can minimize the impact of these events. Local governments can identify the critical service providers in their jurisdictions that would need backup generators the most.

WRCOG and local governments can engage with utility companies to recognize all parties have a stake in community-driven resilience. In turn, utilities can take precautionary measures to ensure that critical infrastructure (e.g., hospitals) have sustaining power during public safety power shutoffs (PSPS) initiated during times of severe wildfire risk. Local governments may also partner with utilities to plan for resiliency hubs (e.g., cooling centers, convenience stores, and mobile charging stations) that provide necessary services during prolonged outages, particularly in disadvantaged communities.

- **Implementing Agencies:** Critical service providers (e.g., hospitals, senior care centers, fire stations, grocery stores), local governments, WRCOG

Strategy 6.8: Increase maintenance of water infrastructure for heavy precipitation events.

WRCOG could coordinate with relevant water agencies (e.g., Eastern and Western Municipal Water Districts) to guide development and maintenance of improved water systems. These systems would increase the reliability of potable water resources by capturing runoff and filtering suspended solids in the water supply during heavy rainfall. This could minimize water quality issues caused during rain events and could also capture and reuse stormwater runoff during extreme precipitation events.

- **Implementing Agencies:** Local governments, water agencies, WRCOG

Strategy 6.9: Encourage water utilities and consumers to implement water conservation programs and policies.

Many local governments and utilities already carry out policies related to water conservation. These include expanding the portfolio of water sources, enacting conservation and efficiency requirements or programs for residents, increasing the use of recycled water, and managing water usage throughout water systems. Expanding the portfolio of water sources could include increasing storage capacity at reservoirs or requesting additional allocations from the State Water Project. These strategies could expand to other areas of the WRCOG subregion that have not yet implemented them to increase resiliency to drought. WRCOG could also coordinate with water utilities to develop mechanisms to decouple water usage rates from revenue, in order to counteract potential revenue losses in support of more aggressive conservation practices.

Decoupling Water

In 2008, the California Public Utilities Commission (CPUC) attempted this decoupling by adopting a Water Revenue Adjustment Mechanisms (WRAM) policy. The WRAM policy allowed excess-use charges to make up for revenue deficiencies that resulted from conservation practices of the majority of customers. Furthermore, customer bills were not as strictly tied to their water usage, so while usage rates declined, customer savings did not change significantly (CPUC 2019).

- **Implementing Agencies:** Local governments, water agencies, WRCOG

Strategy 6.10: Increase the resiliency of water and wastewater systems to flooding and severe weather.

Water and wastewater systems are at risk of damage and overflow from flooding and severe weather events. Flood waters can overwhelm wastewater treatment facilities, and cause overflows that can lead to contaminated water supplies. WRCOG should collaborate with the County, tribal nations, and water agencies to harden water and wastewater treatment facilities, as well as collection and distribution systems, to prevent damage to these critical facilities.

- **Implementing Agencies:** Riverside County, water agencies, tribal nations, WRCOG

ISSUE 7: AGRICULTURE

Agriculture is a major activity in Riverside County, and from 2017 to 2018 the Western Riverside subregion contributed approximately \$300 million to the \$3.61 billion agricultural economy and 27,442 agricultural jobs in Riverside County (County of Riverside 2017, Hall 2018). Agricultural activities can be highly vulnerable to the impacts of climate change, including agricultural pests and diseases, drought conditions, extreme heat, and severe weather. In 2014, drought conditions cost agriculture in California approximately \$2.2 billion, and costs may be substantially higher in the future if droughts further deplete groundwater supplies (Howitt et al. 2014). Additionally, changes to temperatures and precipitation patterns may increase the prevalence of weeds, pest insects, and other organisms that damage agricultural products. Although agriculture is slowly declining in some parts of the subregion with

urbanization, local agriculture (mainly nurseries, cattle farms, and dairy operations) still plays an important role in the local economy and culture. Other predicted effects of increased warming on agriculture include yield changes, alteration of viable crop types, new/increased diseases and pest invasions, pollination changes, and increased stress on crops and animals resulting in losses of crop quality and yield and increasing the risk of livestock morbidity and mortality (CEC 2006).

In addition to temperature changes, wildfire may also become an elevated issue for agricultural resources. There are 84,392 acres of agricultural land in areas of elevated fire risk in the WRCOG subregion. This number is expected to rise to 154,376 acres by 2039 (Krawchuk and Moritz 2012).

STRATEGIES FOR AGRICULTURE

Strategy 7.1: Work with regional education and farming organizations (e.g., University of California, Riverside (UCR) and University of California Cooperative Extension) to develop and distribute best practices for responding to anticipated changes such as increases of hardier pests, new weeds, reduced water availability, and altered growing seasons.

Farmers and ranchers can increase resiliency to climate change through more efficient irrigation practices, the use of biological control agents to target new pest organisms, changes to planting and land management techniques, and expanding into crops that are better suited for a warmer and drier climate. Regional farming organizations, in collaboration with the County Agricultural Commissioner's Office and educational institutions such as the University of California, Riverside (UCR) and UC Cooperative Extension, can help distribute information about these ways to reduce risks.

- **Implementing Agencies:** Local governments, Riverside County, UCR, WRCOG

Strategy 7.2: Encourage efficient irrigation techniques and identify financial resources to support installation.

High-efficiency irrigation techniques (e.g., drip irrigation) can meet the water needs of crops using substantially less water than conventional irrigation systems. They are highly suitable for areas under increased drought pressure such as the WRCOG subregion. However, high-efficiency irrigation systems often have a high upfront cost that may exceed the financial resources of some farmers. PACE programs should target agricultural users in future outreach programs.

- **Implementing Agency:** WRCOG

Strategy 7.3: Promote secondary revenue streams that support a strong, sustained agricultural sector.

Farmers and ranchers face many financial pressures, even without the added stresses caused by climate change. To help agriculture remain viable, communities in the WRCOG subregion can support secondary activities that allow farmers and ranchers to generate additional revenue. For example, farmers and ranchers could devote part of their land to agritourism operations such as direct marketing (e.g., farm stalls, self-pick operations), small-scale processing, retail sales of commodities, and picnic and event space. Other potential sources of revenue include setting aside land for habitat conservation, carbon sequestration and carbon offsets, biomass energy generation, or small-scale renewable energy systems. Communities should alter local development codes to allow these types of operations with minimal permitting and financial barriers for landowners and promote these operations through tourism and other marketing opportunities.

- **Implementing Agency:** Local governments

ISSUE 8: BIOLOGICAL AND NATURAL RESOURCES

Biological communities in the WRCOG subregion are highly variable and include desert scrubs, riparian areas and vernal pools, meadows and marshes, and mountain forests (Western Riverside County Regional Conservation Authority 2003). Many of these communities are highly vulnerable to the effects of climate change, such as wildfire, extreme heat, and drought (CEPA and OEHHA 2013). These communities may not be adapted to extreme events and may have a difficult time reestablishing following a disaster, particularly if these events occur more frequently. Climate change may also indirectly threaten existing biological communities in the WRCOG subregion by making the climate in the area more suitable for invasive species, which may out-compete native species for food and other resources.

STRATEGIES FOR BIOLOGICAL AND NATURAL RESOURCES

Strategy 8.1: Incorporate climate change projections in future conservation and land use plans, including research and monitoring plans.

Threats posed by climate change to biological communities are varied and may not be fully accounted for in the existing Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP), administered by the Western Riverside County Regional Conservation Authority (RCA), or the Stephens' Kangaroo Rat Habitat Conservation Plan, administered by the Riverside County Habitat Conservation Agency (RCHCA). In order to help ensure the long-term success of the biological communities in the WRCOG subregion, local governments and advocacy groups should work with State and regional agencies to include detailed analyses of how climate change may threaten native habitats and species, in addition to their habitats. These analyses should be used to develop and implement strategies to protect biological communities in the future.

- **Implementing Agencies:** Local governments, RCA, RCHCA, WRCOG

Strategy 8.2: Continue to monitor and research the potential impacts of climate change on local habitat and wildlife.

While conservation plans are often developed by state and regional agencies, local communities can also protect habitat and wildlife through planning, updating conservation and/or open space elements of local general plans. Integrating climate change into the management of local habitat and wildlife can include habitat restoration efforts that not only enhance habitat for wildlife, but also provide natural infrastructure as a means for communities to adapt to climate change. For example, tree planting and tree maintenance activities can provide habitat for bird species, while also reducing the heat island effect in urban areas. As with state and regional conservation plans, any local conservation planning effort should address the risk of climate change on biological communities.

- **Implementing Agency:** Local governments

Strategy 8.3: Consider the ecosystem shift when updating conservation and land use plans.

As temperatures warm and precipitation patterns change, ecosystems may shift or migrate to better suited locations. For some plant and wildlife species, this means shifting to higher elevations, where the temperatures remain cooler throughout the year. Updates to the MSHCP should consider this ecological species migration to ensure that both plants and wildlife have suitable habitat in the future. WRCOG should also ensure that there is adequate connectivity between protected lands and ecosystems.

- **Implementing Agencies:** Local governments, RCA, RCHCA, tribal nations, WRCOG

Strategy 8.4: Collaborate with local governments to establish fire fuel management practices in local and regional parks and open spaces.

The WRCOG subregion has a variety of open space and park areas in both urban and wildland areas. The open space areas in the eastern and western mountainous areas are not only in wildland area, but also within the high fire zones due to vegetation and topographical features. WRCOG should collaborate with park and open space managing agencies (e.g. RCA, RCHCA, tribal nations) to establish consistent fuel management practices, such as vegetation removal or prescribed burns, which can reduce the potential for a wildfire disaster. Fuel management can also save local governments costs by preventing damage or destruction of park facilities.

- **Implementing Agencies:** Local governments, RCA, RCHCA, Riverside County, tribal nations, WRCOG

ISSUE 9: PLAN MAINTENANCE

Climate change is a dynamic topic, with projections and research updated and released regularly. The adaptive needs of residents and businesses in the WRCOG subregion may change with new climate conditions and demographic shifts. Efficacy of local, regional, and other planning documents which account for climate adaptation will diminish if not revised to incorporate the latest data on a regular basis. WRCOG will regularly update this document to ensure measures are adjusted based on ongoing performance and to incorporate best available climate change data.

STRATEGIES FOR PLAN MAINTENANCE

Strategy 9.1: Monitor and refresh climate change projections.

This document recommends several strategies to incorporate climate change projections in local planning documents. These projections can change as new science emerges, GHG emission levels deviate from forecasted paths, or as forecasting tools improve.

As the policies in these plans depend upon assessments of future climate change effects, any changes to projections may alter the effectiveness or prioritization of individual strategies. To address this, WRCOG should regularly update the Adaptation and Resiliency Strategy. Local plans that include a discussion of climate change effects should be updated concurrently with WRCOG's update to incorporate the most current information.

- **Implementing Agencies:** Local governments, WRCOG

Strategy 9.2: Continue to update the Adaptation and Resiliency Strategy when the Subregional CAP is updated and encourage local governments to update their own local adaptation plans concurrent with the local hazard mitigation plan update cycle.

WRCOG may update the Subregional CAP as needed to include a new GHG inventory, modify existing GHG reduction measures, or make other changes to the document. When this happens, WRCOG should also update this Adaptation and Resiliency Strategy to ensure it includes the most recent science and descriptions of climate change-related hazards and to revise the adaptation measures as needed. WRCOG should also encourage individual communities and tribal nations to develop local climate adaptation plans, and to update them along with their own local hazard mitigation plans to keep the documents current and fully integrated.

- **Implementing Agencies:** Local governments, tribal nations, WRCOG

Strategy 9.3: Assess the implementation status and effectiveness of adaptation strategies.

WRCOG and local communities should closely monitor implementation of policies in this Adaptation and Resiliency Strategy and determine if the strategies are working as intended. If not, WRCOG and local communities should alter implementation to improve effectiveness.

- **Implementing Agencies:** Local governments, WRCOG

Strategy 9.4: Assign an overseeing climate committee.

The State of California has a Climate Action Team whose members coordinate statewide efforts on reducing greenhouse gases and implementing adaptation strategies. Several local governments throughout California (e.g. City and County of San Francisco, City of Los Angeles) also have their own climate teams, often coupled with a sustainability or resilience office. The WRCOG subregion can likewise assign a climate committee responsible for coordinating tasks related to adaptation strategies.

This committee may take charge of updating subregional climate-related documents and identifying places in the local government planning and emergency response processes to recommend integrating adaptation measures. This committee can coordinate its efforts not just with other local governments, but also State and federal agencies, as well as tribal nations. This will integrate land within the WRCOG subregion and elsewhere in Riverside County that lies outside of local control, such as Mt. San Jacinto State Park and Soboba Reservation, as well as harmonize the region's adaptation actions with broader efforts. As part of this strategy, WRCOG is working to establish a Regional Climate Collaborative for inland southern California, as a new node of the statewide Alliance of Regional Collaboratives for Climate Adaptation (ARCCA). The Collaborative will help WRCOG coordinate with its neighbors and to ensure that the region's voice is heard in state-level climate adaptation efforts.

- **Implementing Agency:** WRCOG

WORK PLANS

This section organizes the adaptation strategies into a work plan for WRCOG and a work plan for local governments.

WRCOG

WRCOG should implement the following strategies to increase subregional resilience.

WRCOG Strategy		Key Issue
1.2	Incorporate extreme heat and air quality annexes into emergency operations plans.	Planning and Emergency Response Framework
1.3	Establish resiliency hub locations in communities throughout the WRCOG subregion.	Planning and Emergency Response Framework
1.4	Collaborate with jurisdictions in the WRCOG subregion to protect existing critical facilities from extreme heat, flooding, landslides, severe weather, and wildfire.	Planning and Emergency Response Framework
1.5	Increase hazard monitoring to facilitate rapid response and recovery.	Planning and Emergency Response Framework
2.1	Continue to improve collaboration and information sharing between public agencies, disadvantaged communities, and community-based organizations.	Disadvantaged Communities
2.2	Continue to develop resources and materials that effectively communicate with non-English speakers in emergency and evacuation situations.	Disadvantaged Communities
2.3	Identify and map cooling centers in locations accessible to vulnerable populations and establish standardized temperature triggers for when they will be opened.	Disadvantaged Communities
2.4	Coordinate with emergency management services to establish backup power and water resources at emergency centers, resilience hubs, and cooling centers in case of power outages.	Disadvantaged Communities
2.7	Expand participation of PACE programs and other support services that provide funding resources for economically disadvantaged households and businesses.	Disadvantaged Communities
2.8	Improve the social support systems to increase social capacity within local communities.	Disadvantaged Communities
3.1	Augment training of employees and workers training in industries with outdoor work, including assurance of adequate water, shade, rest breaks, protection from poor air quality, training on heat risks, and vector-borne disease avoidance.	Public Health
3.3	Explore the feasibility of installing microgrids at critical health care facilities, in addition to continuing energy efficiency upgrades.	Public Health

WRCOG Strategy		Key Issue
3.5	Include public health topics in general plan safety elements, local hazard mitigation plans (LHMP), emergency response plans, and other public safety documents.	Public Health
4.1	Use the <i>Climate Resilient Transportation Infrastructure Guidebook</i> strategies and design features in transportation infrastructure to improve resiliency to extreme events.	Transportation Infrastructure and Operations
4.2	Facilitate coordination of traffic signal systems between adjacent communities.	Transportation Infrastructure and Operations
4.3	Use available data and studies to simulate how expanded wildfire, flooding, and landslide impacts might affect the transportation system.	Transportation Infrastructure and Operations
4.4	Study changes along designated evacuation routes associated with more frequent and severe wildfire, flood, and landslide events.	Transportation Infrastructure and Operations
4.5	Coordinate with regional transit providers to identify alternative routes and stops if normal infrastructure is damaged or closed as a result of extreme events.	Transportation Infrastructure and Operations
4.6	Ensure redundancy of critical transportation routes to allow for continued access and movement in the event of an emergency.	Transportation Infrastructure and Operations
4.7	Update maintenance protocols to incorporate climate vulnerabilities.	Transportation Infrastructure and Operations
4.8	Coordinate with local governments and regional transit providers to increase shading and heat-mitigating materials on pedestrian walkways and transit stops.	Transportation Infrastructure and Operations
5.1	Continue to provide information to homeowners about statutory vegetation management requirements.	Resilient Development
5.6	Avoid siting important infrastructure and important facilities in or near hazard prone areas.	Resilient Development
5.7	Encourage homeowners and businessowners to retrofit existing structures to increase resiliency to climate change hazards.	Resilient Development
5.8	Develop a fire risk reduction assessment that communities in the WRCOG subregion can use for new development in fire prone areas.	Resilient Development
6.1	Promote and expand the use of drought-tolerant green infrastructure, including street trees, and landscaped areas as part of cooling strategies in public and private spaces.	Water and Energy Resources and Reliability

WRCOG Strategy		Key Issue
6.4	Expand participation in PACE programs, identify additional improvements to finance through PACE, and consider new approaches to target neighborhoods for focused outreach.	Water and Energy Resources and Reliability
6.5	Communicate climate risks to energy utilities and request they ensure that new and upgraded infrastructure is climate resilient.	Water and Energy Resources and Reliability
6.6	Encourage energy and water efficiency in buildings through upgrading appliances and building infrastructure retrofits.	Water and Energy Resources and Reliability
6.7	Invest in sustainable backup power sources to provide redundancy and continued services for critical facilities in the event of an outage.	Water and Energy Resources and Reliability
6.8	Increase maintenance of water infrastructure for heavy precipitation events.	Water and Energy Resources and Reliability
6.9	Encourage water utilities and consumers to implement water conservation programs and policies.	Water and Energy Resources and Reliability
6.10	Increase the resiliency of water and wastewater systems to flooding and severe weather.	Water and Energy Resources and Reliability
7.1	Work with regional education and farming organizations (e.g. University of California, Riverside & University of California Cooperative Extension) to develop and distribute best practices for responding to anticipated changes such as increases of hardier pests, new weeds, reduced water availability, and altered growing seasons.	Agriculture
7.2	Encourage efficient irrigation techniques and identify financial resources to support installation.	Agriculture
8.1	Incorporate climate change projections in future conservation plans and land use plans, including research and monitoring plans.	Biological and Natural Resources
8.3	Consider the ecosystem shift when updating conservation and land use plans.	Biological and Natural Resources
8.4	Collaborate with local governments to establish fuel management practices in local and regional parks and open spaces.	Biological and Natural Resources
9.1	Monitor and refresh climate change projections.	Plan Maintenance
9.2	Continue to update the Adaptation and Resiliency Strategy when the Subregional CAP is updated and encourage local governments to update their own local adaptation plans concurrent with the local hazard mitigation plan update cycle.	Plan Maintenance
9.3	Assess the implementation status and effectiveness of adaptation strategies.	Plan Maintenance
9.4	Assign an overseeing climate committee.	Plan Maintenance

LOCAL GOVERNMENTS

Local governments should implement the following strategies to increase local and subregional resilience.

Local Government Strategy		Key Issue
1.1	Integrate climate change adaptation considerations into general plans, Local Hazard Mitigation Plans, emergency operations plans, and other public safety documents.	Planning and Emergency Response Frameworks
1.2	Incorporate extreme heat and air quality annexes into emergency operations plans.	Planning and Emergency Response Frameworks
1.3	Establish resiliency hub locations in communities throughout the WRCOG subregion.	Planning and Emergency Response Frameworks
1.4	Collaborate with jurisdictions in the WRCOG subregion to protect existing critical facilities from extreme heat, flooding, landslides, severe weather, and wildfire.	Planning and Emergency Response Frameworks
1.5	Increase hazard monitoring to facilitate rapid response and recovery.	Planning and Emergency Response Frameworks
2.1	Continue to improve collaboration and information sharing between public agencies, disadvantaged communities, and community-based organizations.	Disadvantaged Communities
2.2	Continue to develop resources and materials that effectively communicate with non-English speakers in emergency and evacuation situations.	Disadvantaged Communities
2.3	Identify and map cooling centers in locations accessible to vulnerable populations and establish standardized temperature triggers for when they will be opened.	Disadvantaged Communities
2.5	Coordinate with transit agencies to identify ways for individuals with restricted mobility to reach cooling centers.	Disadvantaged Communities
2.6	Coordinate with County of Riverside Continuum of Care and other existing programs to ensure that emergency shelters are available during extreme heat events, poor air quality, severe weather events, and other highly hazardous conditions. Ensure that the local homeless population is made aware of these resources.	Disadvantaged Communities
2.8	Improve the social support systems to increase social capacity within local communities.	Disadvantaged Communities
3.1	Augment training of employees and workers in industries with outdoor work, including assurance of adequate water, shade, rest breaks, heat risks, and vector-borne disease avoidance.	Public Health
3.2	Identify and remedy poor drainage areas to reduce disease risk from stagnant water. Expand outreach programs to educate communities about potential increases in vector-borne diseases from stagnant water.	Public Health

Local Government Strategy		Key Issue
3.3	Explore the feasibility of installing microgrids at critical health care facilities, in addition to continuing energy efficiency upgrades.	Public Health
3.4	Work with local volunteer emergency response teams to include air quality and extreme heat as a hazard of concern and update core competencies to address the health-related risks of poor air quality and extreme heat events.	Public Health
3.5	Include public health topics in general plan safety elements, local hazard mitigation plans (LHMP), emergency response plans, and other public safety documents.	Public Health
4.1	Use the <i>Climate Resilient Transportation Infrastructure Guidebook</i> strategies and design features in transportation infrastructure to improve resiliency to extreme events.	Transportation Infrastructure and Operations
4.2	Facilitate coordination of traffic signal systems between adjacent communities.	Transportation Infrastructure and Operations
4.5	Coordinate with regional transit providers to identify alternative routes and stops if normal infrastructure is damaged or closed as a result of extreme events.	Transportation Infrastructure and Operations
4.6	Ensure redundancy of critical transportation routes to allow for continued access and movement in the event of an emergency.	Transportation Infrastructure and Operations
4.7	Update maintenance protocols to incorporate climate vulnerabilities.	Transportation Infrastructure and Operations
4.8	Coordinate with local governments and regional transit providers to increase shading and heat-mitigating materials on pedestrian walkways and transit stops.	Transportation Infrastructure and Operations
5.1	Continue to provide information to homeowners about statutory vegetation management requirements.	Resilient Development
5.2	Encourage retrofits of hardscaped areas to use permeable paving.	Resilient Development
5.3	Establish neighborhood and building design standards that minimize fire and landslide hazards in high wildfire hazard severity zones and high landslide susceptibility areas.	Resilient Development
5.4	Restore riparian corridors, soft-bottomed streambeds, and seasonal flood basins that reduce flood hazards.	Resilient Development
5.5	Encourage the use of low-impact development practices in new development.	Resilient Development
5.6	Avoid siting important infrastructure and important facilities in or near hazard prone areas.	Resilient Development

Local Government Strategy		Key Issue
5.7	Encourage homeowners and businessowners to retrofit existing structures to increase resiliency to climate change hazards.	Resilient Development
5.8	Develop a fire risk reduction assessment that communities in the WRCOG subregion can use for new development in fire prone areas.	Resilient Development
6.1	Promote and expand the use of drought-tolerant green infrastructure, including street trees and landscaped areas, as part of cooling strategies in public and private spaces.	Water and Energy Resources and Reliability
6.2	Amend the local development code to require high-reflectivity pavement or increased tree cover for large commercial parking lots.	Water and Energy Resources and Reliability
6.3	Identify and implement municipal renewable energy projects for daily and emergency operations.	Water and Energy Resources and Reliability
6.4	Work with WRCOG to expand participation in PACE programs, identify additional improvements to finance through PACE, and consider new approaches to target neighborhoods for focused outreach.	Water and Energy Resources and Reliability
6.5	Communicate climate risks to energy utilities and request they ensure that new and upgraded infrastructure is climate resilient.	Water and Energy Resources and Reliability
6.6	Encourage energy and water efficiency in buildings through upgrading appliances and building infrastructure retrofits.	Water and Energy Resources and Reliability
6.7	Invest in sustainable backup power sources to provide redundancy and continued services for critical facilities in the event of an outage.	Water and Energy Resources and Reliability
6.8	Increase maintenance of water infrastructure for heavy precipitation events.	Water and Energy Resources and Reliability
6.9	Encourage water utilities and consumers to implement water conservation programs and policies.	Water and Energy Resources and Reliability
7.1	Work with regional education and farming organizations (e.g. University of California, Riverside & University of California Cooperative Extension) to develop and distribute best practices for responding to anticipated changes such as increases of hardier pests, new weeds, reduced water availability, and altered growing seasons.	Agriculture
7.3	Promote secondary revenue streams that support a strong, sustained agricultural sector.	Agriculture
8.1	Incorporate climate change projections in future conservation plans and land use plans, including research and monitoring plans.	Biological and Natural Resources
8.2	Continue to monitor and research the potential impacts of climate change on local habitat and wildlife.	Biological and Natural Resources
8.3	Consider the ecosystem shift when updating conservation and land use plans.	Biological and Natural Resources

Local Government Strategy		Key Issue
8.4	Collaborate with local governments to establish fuel management practices in local and regional parks and open spaces.	Biological and Natural Resources
9.1	Monitor and refresh climate change projections.	Plan Maintenance
9.2	When the Adaptation and Resiliency Strategy and Subregional CAP is updated, work with WRCOG to update local adaptation plans concurrent with the local hazard mitigation plan update cycle.	Plan Maintenance
9.3	Assess the implementation status and effectiveness of adaptation strategies.	Plan Maintenance

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