CLARK COUNTY, NEVADA CLIMATE VULNERABILITY ASSESSMENT

PREPARED BY Kim Lundgren Associates, Inc. and Adaptation International

SEPTEMBER 2022

ACKNOWLEDGMENTS

This summary report is part of the All-In Clark County initiative to create a sustainable community for the well-being and prosperity of all, today and into the future. The Climate Vulnerability Assessment would not have been possible without the time, effort, and dedication of County leadership and staff and engagement from more than 60 stakeholder organizations. The Department of Environment and Sustainability would like to thank the following individuals and organizations for their contributions.

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Inter-Tribal Council of Nevada

Latin Chamber of Commerce

Las Vegas Chamber of Commerce

Las Vegas Convention & Visitor's Authority

Las Vegas Indian Center

Las Vegas NAACP

Las Vegas Paiute Tribe

STAKEHOLDER WORKING GROUP (cont.)

Las Vegas Valley Water District

Living with Fire – University of Nevada, Reno- Extension

Make the Road

Native Voter Alliance of Nevada

Nellis Air Force Base

Nevada Conservation League

Nevada Department of Conservation & Natural Resources

Nevada Division of Environmental Protection

Nevada Division of Forestry

Nevada Governor's Office of Energy

Nevada Housing Coalition

Nevada State Climate Office, University of Nevada Reno

NV Energy

Opportunity Village

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Southern Nevada Building Trades Unions

Southern Nevada Health District

Southern Nevada Water Authority

Southwest Gas

St. Jude's Ranch for Children

The Nature Conservancy

United Way of Southern Nevada

University of Nevada, Las Vegas - School of Public Health

Valley Electric

An additional 15 organizations were invited to participate in the Climate Vulnerability Assessment process.

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BOLD ACTION FOR A
SUSTAINABLE FUTURE

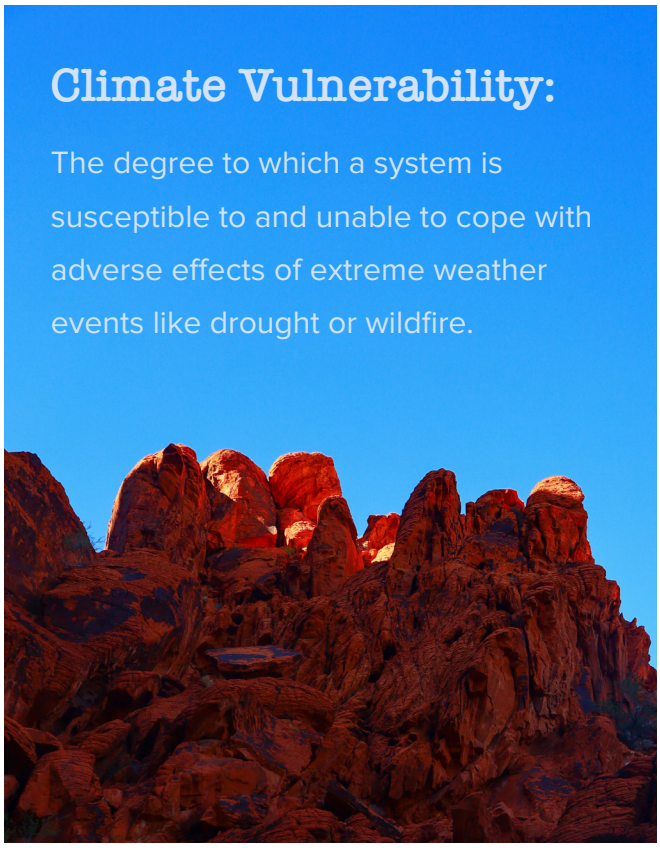
CONTENTS

CLARK COUNTY CLIMATE VULNERABILITY ASSESSMENT

EXECUTIVE SUMMARY

The purpose of the Clark County Climate Vulnerability Assessment (CVA), a project of the All-In Clark County initiative, was to assess the current and future potential impacts of climate change in Clark County, Nevada and to develop strategies that reduce those risks to create a more sustainable and resilient future for all. This report summarizes the process and results of the assessment to understand the vulnerabilities of key systems, services, and people to a changing climate.

What is Climate Vulnerability?



Vulnerability to changing climate conditions and associated extreme events depends on three factors: exposure, sensitivity, and adaptive capacity.

- **Exposure** is the magnitude or rate of change an individual, organization, system, or community experiences due to stressors such as storms, floods, and other extreme weather and climate events or conditions.
- **Sensitivity** indicates the degree to which an actor, organization, or system can be directly or indirectly affected by climate exposure. Sensitivity can range from a system not being affected at all to a system being affected so greatly it loses the ability to function.
- **Adaptive capacity** reflects a system's ability to adjust to and mitigate climate variability or extreme events. Adaptive capacity can range from a system not being able to adjust to climate hazards to a system being able to adjust in a beneficial way.

CVA Process

The CVA consisted of three main phases:

Baseline → **Assess** → **Prioritize**

- Understand existing and projected climate conditions
- Identify critical systems and assets

- Determine system sensitivity to selected climate hazards and capacity to adapt to subsequent climate impacts

- Co-develop and prioritize adaptation strategies

Stakeholder Engagement

Equitable engagement is a core value of the All-In Clark County initiative. The CVA process engaged with a variety of stakeholders through:

Surveys & Interviews

A stakeholder survey and targeted interviews to gain community insight and refine vulnerability rankings.

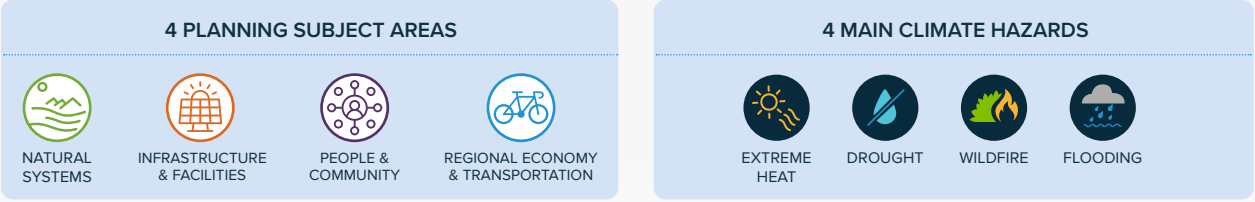
3 workshops

Three workshops with a Stakeholder Working Group (SWG), attended by 48 organizations, to provide guidance and technical expertise.

Key Findings

Vulnerability rankings for each system were determined based on reviews of local and regional plans, as well as extensive engagement, through surveys, interviews, and workshops, with regional stakeholders. More detailed information about the vulnerability assessment results can be found in Assess: Vulnerability Assessment Results.

The CVA assessed 4 planning subject areas across 4 main climate hazards:



VULNERABILITY RANKINGS

	Heat	Drought	Wildfire	Flooding
NATURAL SYSTEMS				
Aquatic/Riparian Habitats				
Woodlands/Forest Habitats				
Urban & Community Forests				
Desert Habitats				
Water Supply/Quality				
INFRASTRUCTURE & FACILITIES				
Electricity Infrastructure				
Gas/Oil Infrastructure				
Telecommunications Infrastructure				
Water Treatment & Distribution				
Wastewater Infrastructure				
Stormwater/Flood Protection Infrastructure				
Emergency Management Facilities				
Sanitation/Waste Management				
Government & Administrative Facilities				

Minimally Vulnerable Somewhat Vulnerable Moderately Vulnerable Highly Vulnerable

	Heat	Drought	Wildfire	Flooding
PEOPLE & COMMUNITY				
Housing				
Schools				
Correctional Facilities/Detention Centers				
Public & Community Facilities				
Parks, Open Spaces, & Recreation				
Critical Health Facilities				
Cultural & Spiritual Sites				
Art Centers/Venues				
REGIONAL ECONOMY & TRANSPORTATION				
Small Businesses				
Manufacturing/Industrial				
Food Systems				
Trades				
Professional & Public Service Employment				
Tourism				
Transit & Bike/Pedestrian Infrastructure				
Freight & Passenger Rail				
Roads/bridges				
Aviation				

Minimally Vulnerable Somewhat Vulnerable Moderately Vulnerable Highly Vulnerable

Priorities for Action: Recommended Strategies

The CVA identifies twenty-five priority strategies to address the most significant vulnerabilities and to enhance Clark County's resilience to climate hazards. The recommended strategies that resulted from this process will be further refined and prioritized during the action identification and assessment phase of the All-In Clark County Community Plan planning process.

CROSS-CUTTING STRATEGIES

- Coordinate and maintain inter-agency and multi-organizational working groups to share knowledge, plans, and resources.
- Integrate climate-related risks, including climate projections and impact analyses, into planning processes, including capital improvement and comprehensive plans.

NATURAL SYSTEMS

- Promote conservation and preservation practices to protect and enhance water quality and maintain riparian and aquatic habitat connectivity.
- Ensure adequate protection of permanently protected desert, forest, and woodland and habitats.
- Maintain and expand urban and community tree canopy and support ongoing efforts to expand drought-tolerant trees, focusing on communities that are most vulnerable to high heat.

INFRASTRUCTURE & FACILITIES

- Provide resources to ensure broad participation in utility proceedings and representation in decisions.
- Prioritize demand-side energy management programs.
- Enhance collaboration and transparency between energy utilities and critical agencies whose operations rely on consistent power.
- Continue to advance regional collaboration on water resiliency planning and management.
- Work with local agencies to integrate climate-related risks into wastewater infrastructure design and maintenance plans.
- Expand resources for addressing extreme heat in communities that are most vulnerable to extreme heat.
- Formalize a network of well-resourced mobile crisis intervention services to engage communities of concern during emergency and non-emergency situations and address climate impacts on at-risk residents before or as they occur.
- Coordinate dissemination of information related to climate hazards with community organizations and service providers to ensure all residents have access to information and support networks.
- Encourage installation of solar plus storage, vehicle to grid technology, and microgrids to support system reliability.

PEOPLE & COMMUNITY

- Develop utility assistance and weatherization programs for low- and fixed-income individuals and improve existing programs.
- Provide financial assistance and incentives to implement and maintain cooling and clean air features in affordable housing developments and low- and fixed-income households.
- Invest in resilience hubs and public resources that reduce exposure to multiple climate and health hazards.
- Implement heat reduction strategies, including shade structures, cool pavements, and cool roofs, at parks and recreational sites.
- Enhance coordination and collaboration with Tribal Nations and communities throughout the region to strengthen resilience to climate hazards.

REGIONAL ECONOMY & TRANSPORTATION

- Provide worksite emergency preparedness training for employers and employees to proactively prepare for climate hazards.
- Identify opportunities to make the supply chain more climate resilient.
- Support and promote requirements that protect workers from extreme heat events.
- Prioritize safe and protected (i.e., high-comfort) bicycle and pedestrian infrastructure in locations most vulnerable to the impacts of climate change.
- Invest in projects, programs, and policies that reduce the impacts of climate change on public transit users, infrastructure, and operations.
- Promote strategic investment opportunities to improve and expand high capacity transit, using a climate resilience lens.

INTRODUCTION

This summary report was developed as part of the All-In Clark County initiative to assess the current and future potential impacts of climate change in Clark County and to develop strategies that reduce those risks to create a more sustainable future for all. The focus of this report is to summarize the process and results of the Climate Vulnerability Assessment conducted for Clark County to understand the vulnerabilities of key systems, services, and people to a changing climate.

What is Climate Vulnerability?

Climate vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of extreme weather events like drought or wildfire. Vulnerability to changing climate conditions and associated extreme events are dependent on three factors: exposure, sensitivity, and adaptive capacity. Exposure and sensitivity define potential impact, which may be evaluated against a system's adaptive capacity to define its relative vulnerability).

Exposure is the magnitude or rate of change an individual, organization, system, or community experiences due to stressors such as storms, floods, and other extreme weather and climate events or conditions. Exposure can be direct or indirect.

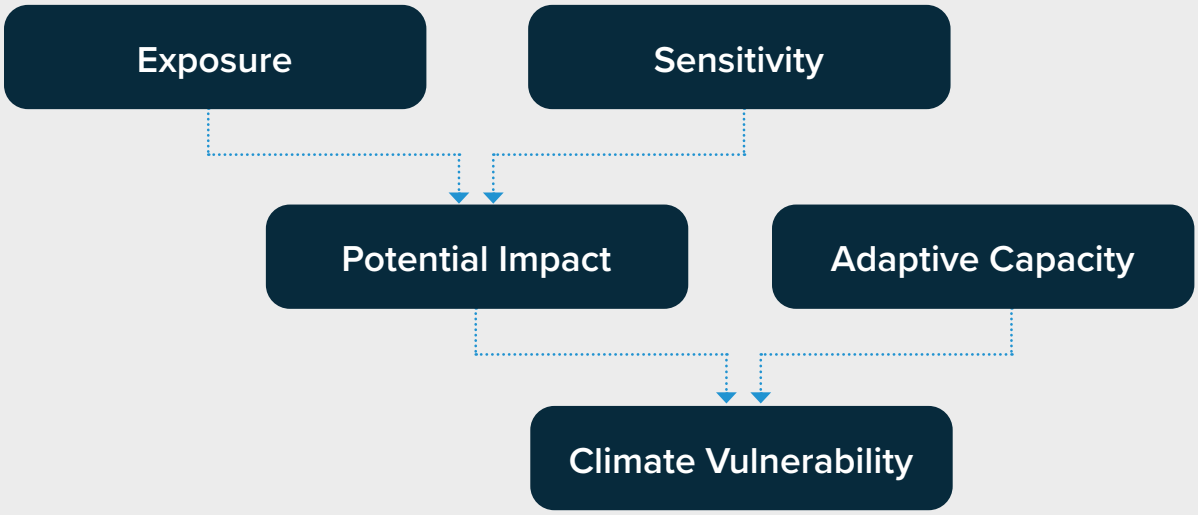
Example
Clark County's water supply is directly exposed to increasing temperatures and drought conditions.

Sensitivity indicates the degree to which an actor, organization, or system can be directly or indirectly affected by climate exposure.

Example
Clark County's outdoor workforce is sensitive to increasing temperatures and extreme heat days because exposure to heat can lead to adverse health impacts.

Adaptive capacity reflects a system's ability to adjust to and mitigate climate variability or extreme events.

Example
Though water supply and distribution are highly sensitive to increasing drought conditions, this system has moderate to high adaptive capacity demonstrated through the many successful water conservation programs initiated across the region.



Adapted from California Adaptation Planning Guide[1]

Conducting the Vulnerability Assessment

The climate vulnerability assessment (CVA) is an adaptation planning tool that identifies high-risk systems, people, and services, as well as opportunities to enhance near- and long-term resilience. Stakeholders identified high-risk systems, peoples, and services, as well as opportunities to enhance their resilience as they participated in the three phases of the CVA.

Baseline

The first phase of the CVA was an assessment of historical climate trends in Southern Nevada, along with the projected climate conditions and subsequent impacts. Clark County is subject to many hazards (including extreme winds), but the assessment addressed four main climate hazards: extreme heat, drought, flooding, and wildfires. To read the results from the baseline assessment, please see the Baseline: Climate Profile section.

Assess

The assessment phase was designed to evaluate the vulnerability of key systems in Clark County. These were determined by reviewing existing plans and reports and communicating with stakeholders to identify the most critical systems and assets throughout the region. Vulnerability–the degree to which a system is susceptible to and unable to cope with adverse effects of climate hazards–was determined for each system by assessing sensitivity and adaptive capacity using existing plans and studies, as well as through extensive engagement with expert stakeholders. Assessing sensitivity and adaptive capacity provides insight into how climate change is affecting (or will affect) critical assets and operations and the ability of people and infrastructure across the region to adapt to a changing climate. To read the results from the assessment phase, please see the Assess: Vulnerability Assessment Results section.

Baseline → **Assess** → **Prioritize**

The baseline phase included an assessment of historical climate trends in Clark County and across the region, along with projected climate conditions and subsequent impacts. It addressed four main climate hazards—driven by changing climate conditions—that will affect the county: **extreme heat, drought, wildfires, and flooding.** For more information, see Clark County Climate Summary Technical Report.

The assess phase was designed to evaluate the vulnerability of key systems in Clark County. Four planning subject areas—**Natural Systems, Infrastructure & Facilities, People & Community, and Regional Economy and Transportation**—were used as the overarching structure. Vulnerability was determined for each system by assessing exposure, sensitivity, and adaptive capacity.

Strategies and actions were developed with the goal of decreasing the sensitivity and/or increasing the adaptive capacity of the most vulnerable systems. These were identified through stakeholder input and evaluation of existing or proposed actions from local and regional plans, as well as best practices in adaptation planning.

Prioritize

The assessment phase provided a detailed analysis of the vulnerabilities of Clark County systems to the impacts of current and future projected extreme weather events. Identifying the most vulnerable systems spotlighted the greatest needs for increased resilience, which initiated the development of resilience strategies. These strategies were identified through stakeholder input and evaluation of existing or proposed actions from local and regional plans, as well as best practices in adaptation planning. These strategies were vetted and prioritized by the Stakeholder Working Group. The recommended strategies that resulted from this process will be further refined and prioritized during the action identification and assessment phase of the All-In Clark County Community Sustainability and Climate Action Plan planning process. To read the results from the prioritization phase, please see the Priorities for Action: Recommended Strategies section.

The assessment phase provided a detailed analysis of the vulnerabilities of Clark County systems to the impacts of current and future projected extreme weather events.

Assessment Framework

Four planning subject areas were used as the overarching structure for assessing vulnerability of key systems across the county: Natural Systems, Infrastructure & Facilities, People & Community, and Regional Economy and Transportation. Within each of these planning subject areas, sectors and systems aim to serve as a comprehensive representation of Clark County's built environment, resources, operations, and services.

Sector	System	Examples of Key Assets
NATURAL SYSTEMS		
Critical Habitats & Species	Aquatic/Riparian Habitats	• Las Vegas Wash • Aquatic/riparian vegetation and grasses (e.g., desert willow) • Critical and protected species (e.g., Moapa dace fish)
	Woodlands/Forest Habitats	• Mesquite/acacia woodlands • Pinyon-juniper woodland
	Urban & Community Forests	• Street trees and shrubs
	Desert Habitats	• Sagebrush, salt desert scrub, Mojave desert scrub ecosystems • Critical and protected species (e.g., Desert Tortoise)
Water Sources	Water Supply/Quality	• Las Vegas Valley aquifers • Colorado River/Lake Mead
INFRASTRUCTURE & FACILITIES		
Energy & Utilities	Electricity Infrastructure	• Transmission and distribution infrastructure • Solar: NV Energy solar PV arrays • Hydro: Hoover & Davis Dams
	Gas/Oil Infrastructure	• Apex Landfill Gas to Energy Facility • Southwest Gas distribution pipeline • Calnev Pipeline
	Telecommunications Infrastructure	• Emergency response/communication system • Phone, Internet, and Data Centers
Water Infrastructure	Water Treatment & Distribution	• Southern Nevada Water Authority (SNWA) treatment facilities • Clark County Water Reclamation District facilities • Virgin Valley Water facilities
	Wastewater Infrastructure	• Clark County Water Reclamation District facilities
	Stormwater/Flood Protection Infrastructure	• Storm drain system • Dams/flood detention basins
Critical Services	Emergency Management Facilities	• Emergency response facilities • Military facilities (Nellis Air Force Base)
	Sanitation/Waste Management	• Apex Landfill • Southern Nevada Recycling Center • Virgin Valley Disposal
	Government & Administrative Facilities	• County, municipal, and Tribal administrative buildings

Sector	System	Examples of Key Assets
	PEOPLE & COMMUNITY	
Social & Public Services	Housing	• Single-family homes, multi-family apartments, condos • Homeless shelters • Senior centers • Housing developments located on Tribal reservations
	Schools	• K-12 schools • Pre-schools • Colleges and universities
	Correctional Facilities/Detention Centers	• County and municipal detention center/jails
	Public & Community Facilities	• Las Vegas-Clark County Libraries • Community and recreation centers
Health & Wellness	Parks, Open Space, & Recreation	• National and State parks & properties • County and municipal parks and facilities • Recreational sites of cultural significance to Indigenous peoples
	Critical Health Facilities	• Hospitals and emergency rooms • Community health centers and pharmacies
Cultural Resources	Cultural & Spiritual Site	• Place of worship and other spiritual centers • Cultural and Tribal sites of significance
	Art Centers/Venues	• Galleries and museums
	REGIONAL ECONOMY & TRANSPORTATION	
Key Industries & Employers	Small Businesses	• Small restaurants • Local entrepreneurial activities
	Manufacturing/Industrial	• Mineral mining • Metals, chemicals, and plastic manufacturing
	Food Systems	• Food, beverage, and marijuana production • Food banks and pantries • Community and school gardens • Markets and convenience stores
	Trades	• Building/construction and mechanical • Food service/hospitality
	Professional & Public Service Employment	• Government Employees
	Tourism	• Resorts and casinos • Stadiums and arenas
Transportation	Transit & Bike/Pedestrian Infrastructure	• Silver STAR route • Regional Transportation Commission (RTC) South Strip Transfer Terminal • Bike/pedestrian network
	Freight & Passenger Rail	• Union Pacific Railroad • Amtrak Nevada
	Roads/bridges	• Roads and highways (e.g., County routes, Interstate highways) • Bridges (e.g., Mike O'Callaghan-Pat Tillman Memorial Bridge
	Aviation	• Commercial airports

Vulnerability Assessment Process

Sensitivity

The sensitivity of any system in particular can depend on climate (e.g., climate hazards like extreme heat, flooding, wildfire, drought) and non-climate related stressors (e.g., aging infrastructure, cost of repair, population growth). Assessing sensitivity can help identify which components are most and least likely to be affected under changing conditions. For example, the electric grid may be particularly sensitive to the impacts of extreme heat due to aging infrastructure and increased demand due to air conditioner use during extreme heat events resulting in potential power outages and/or grid failure. Sensitivity levels were assessed as follows:

Assessing Adaptive Capacity

Adaptive capacity measures the ability of actors, organizations, or systems to adjust to and mitigate extreme weather events, climate conditions and natural hazards. When assessing adaptive capacity, key factors include assets, constraints, needs, and opportunities. For example, when considering the adaptive capacity of businesses and industries that rely heavily on water use, limited system flexibility, increasing constraints and needs (due to a changing climate), and limited agency (ability or authority to take action) might result in a lower adaptive capacity score.

In contrast to the scale used for sensitivity (S0) means the system has a low sensitivity to a particular climate hazard), a low adaptive capacity score (AC0) means that the system is not readily able to adjust to current and/or future climate hazards. For the purpose of ranking the existing practices or available resources to manage and/or respond to various climate hazards, adaptive capacity levels were assessed as follows:

SENSITIVITY LEVELS

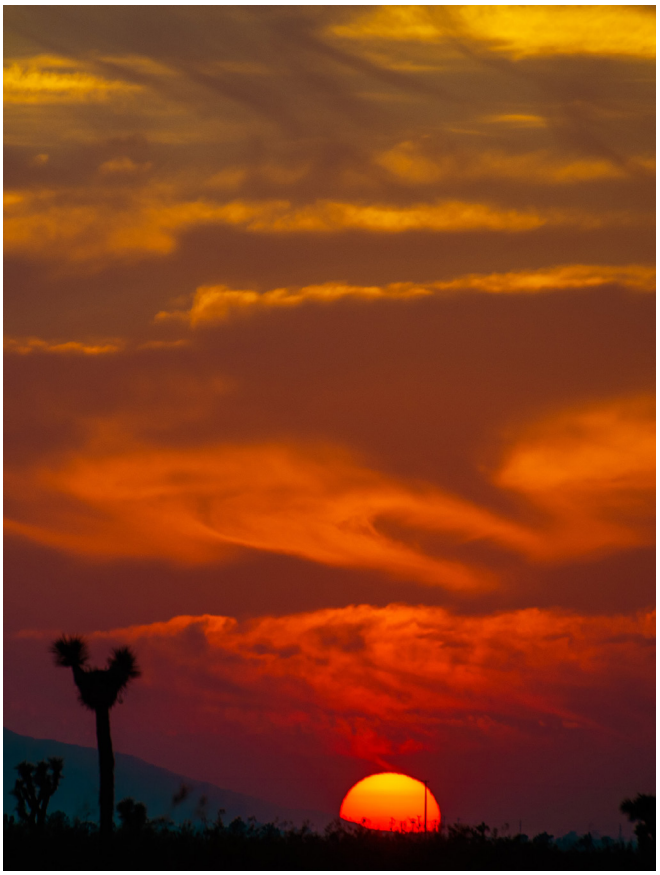
S0	**Low**	System will not be affected
S1	**Low-Moderate**	System may be slightly affected but will retain functionality
S2	**Moderate**	System will be moderately affected but can retain functionality
S3	**Moderate-High**	System will be greatly affected but may be able to retain functionality
S4	**High**	System will be greatly affected and cannot retain functionality

CAPACITY LEVELS

AC0	**Low**	System is not able to adjust to climate hazards
AC1	**Low-Moderate**	System is not able to adjust to climate hazards without extensive effort
AC2	**Moderate**	System can adjust to climate hazards with some moderate effort
AC3	**Moderate-High**	System may be able to adjust to climate hazards with minimal effort
AC4	**High**	System can adjust to climate hazards in a beneficial way

Assessing Relative Vulnerability

The figure below demonstrates how each respective sensitivity and adaptive capacity ranking determines a system's relative vulnerability. For example, if a system's sensitivity is high (S4) and adaptive capacity is low (AC1), vulnerability is likely to be high. Because this is a relative vulnerability assessment, by clearly defining the parameters of the scale we are assessing (e.g., at the system scale under each planning subject area like Regional Transportation and Economy), it provides an understanding of how the vulnerability of systems relate and are differentiated from one another. This process can yield a relative vulnerability matrix, which provides an understanding of systems with the highest vulnerability and the greatest need for resilience investments.



RELATIVE VULNERABILITY RANKING SCALE

Adaptive Capacity	Sensitivity				
	S0	S1	S2	S3	S4
AC0					
AC1					
AC2					
AC3					
AC4					

- Minimally Vulnerable
- Somewhat Vulnerable
- Moderately Vulnerable
- Highly Vulnerable

Stakeholder Engagement

A thorough CVA requires input and collaboration with the community members who will be affected by the impacts of changing climate conditions. Engagement with community stakeholders occurred throughout the CVA process and was critical to identifying vulnerabilities and resilience recommendations. Engagement included the following major components:

1. A **survey** to assess existing climate change perceptions,
2. **Interviews** to gain community insight and refine vulnerability rankings, and
3. **Three workshops** with a Stakeholder Working Group to provide guidance and technical expertise throughout all stages of the CVA.

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SURVEY RESPONSES

46
STAKEHOLDER INTERVIEWS

64
REGIONAL STAKEHOLDERS ENGAGED

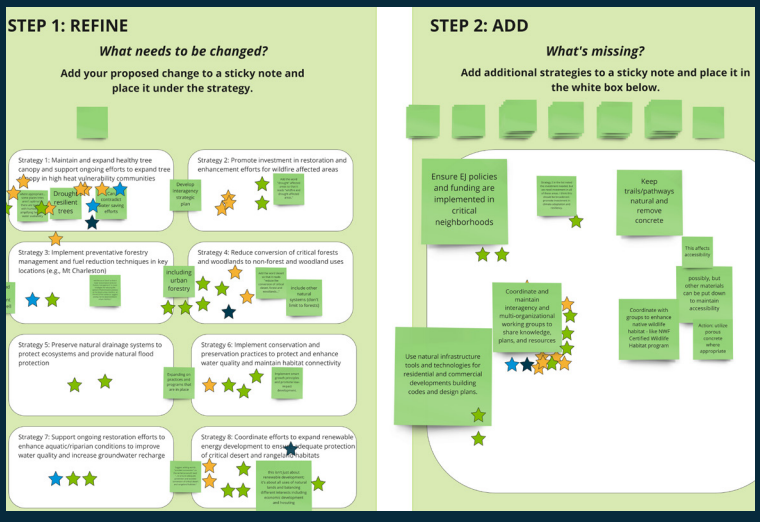
3
WORKSHOPS

Survey

In advance of broader engagement efforts, the project team developed and distributed a survey to a variety of local and regional agencies, partners, and organizations to understand perceptions on the impacts of climate change in Clark County. The survey was sent to 172 individuals and 44 responses were received (a 25% response rate) from representatives of various organizations ranging from local and regional government to non-profits. The survey focused on organizational or individual experiences with, and perception of, changing climate conditions, priorities, and concerns in Clark County. A summary of the key findings from the survey can be found in **Appendix 1: Stakeholder Engagement Materials**.

Targeted Stakeholder Interviews

Throughout the CVA process, **46 interviews were conducted with regional stakeholders, including city officials, County and regional agencies, regional non-profit organizations, utilities and service providers, Tribal organizations, and the business community.** Interviews provided an opportunity to develop a better understanding of climate impacts and concerns and to further refine and identify information relevant to the climate vulnerability of systems throughout the county.



Stakeholder Working Group

The County convened a Stakeholder Working Group in August 2021 composed of technical experts and key stakeholders in the region from 49 organizations. SWG members included representatives of Clark County, regional and state agencies, municipal governments, utilities, Tribal organizations, community-based organizations, business and trade groups, universities and research institutions, and advocacy groups.

Members of the SWG were selected through a comprehensive mapping exercise that consisted of the identification and categorization of stakeholders to offer specific knowledge related to the county's critical assets or services and to represent the county's diverse community members, along with an assessment of stakeholder influence, vulnerability, orientation, capacity, trust, and level of expertise.

The role of the SWG included:

- Actively participating in three workshops;
- Responding to requests for input between workshops; and
- Providing input to assess the vulnerability of key resources to climate change impacts in Clark County.

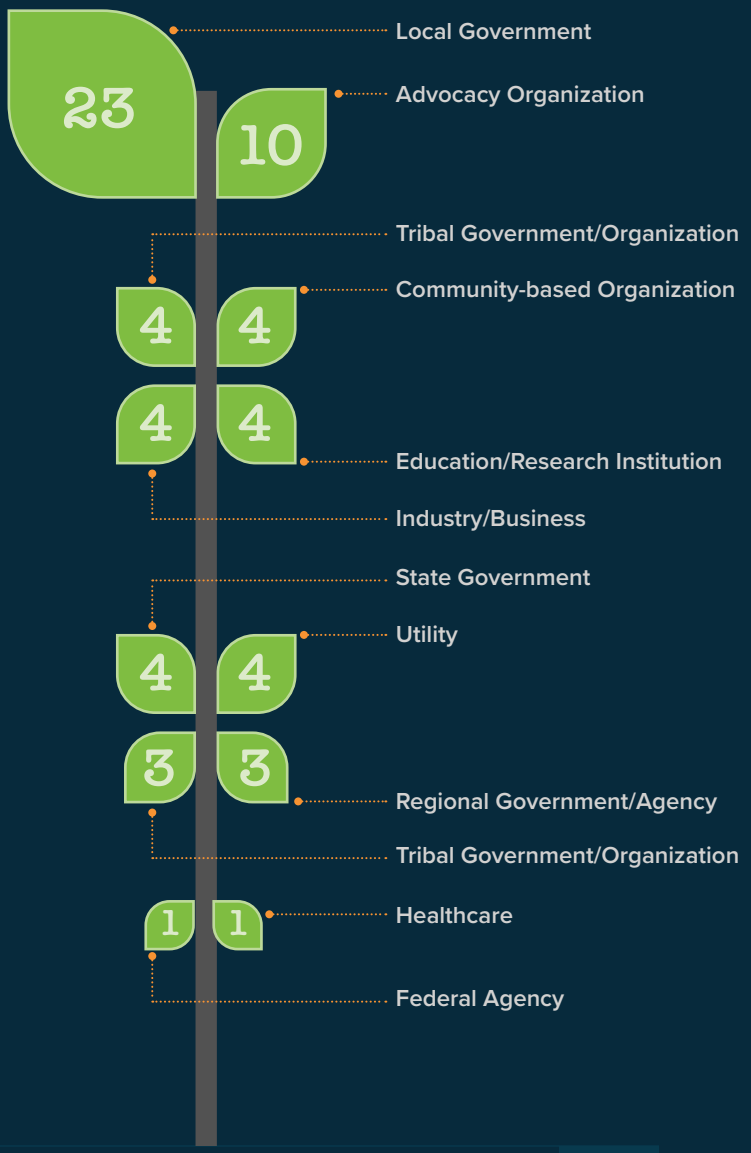
Stakeholder Workshops

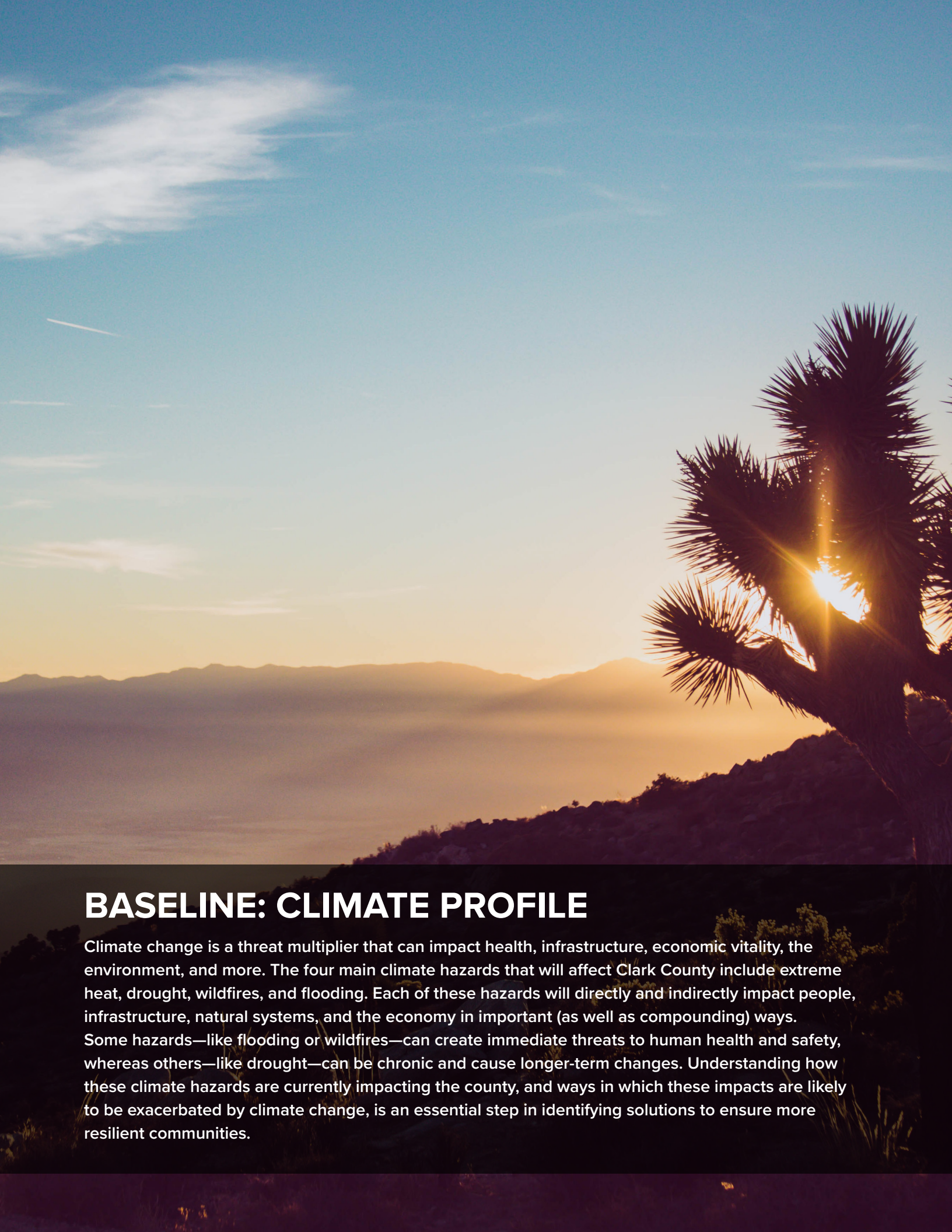
The SWG gathered for three virtual workshops over the course of five months, using digital collaboration tools to co-develop and refine the assessment:

- Workshop 1 (held September 2021): Participants identified critical systems and assets that are likely to be impacted by climate change.
- Workshop 2 (held November 2021): Participants evaluated systems' sensitivity and capacity to adapt to climate impacts.
- Workshop 3 (held January 2022): Participants co-developed, refined, and prioritized resilience strategies intended to feed into the All-In Community Plan.

For a more detailed summary of the three workshops, including related workshop materials, please see **Appendix 1: Stakeholder Engagement Materials**.

PARTICIPANTS IN CVA WORKSHOPS AND INTERVIEWS BY ORGANIZATION TYPE



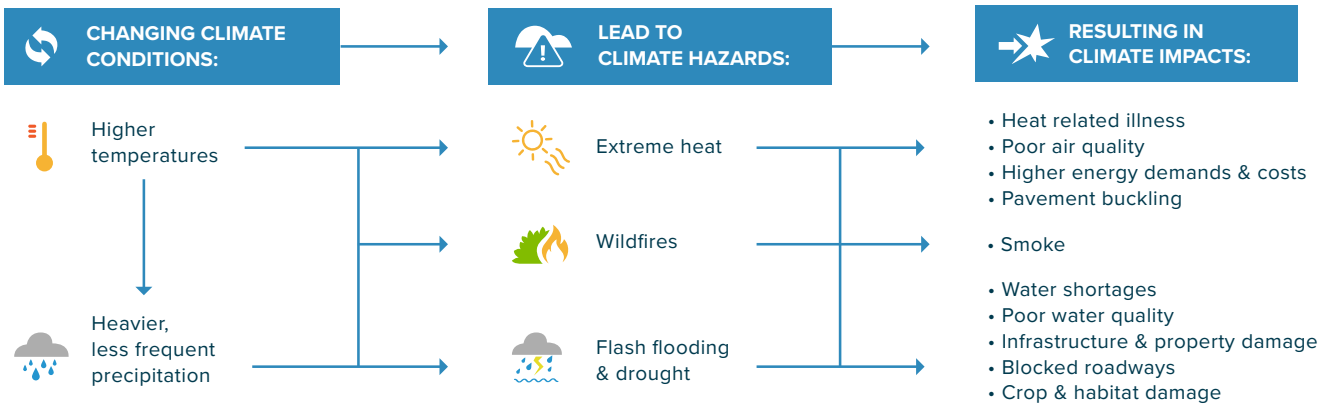


BASELINE: CLIMATE PROFILE

Climate change is a threat multiplier that can impact health, infrastructure, economic vitality, the environment, and more. The four main climate hazards that will affect Clark County include extreme heat, drought, wildfires, and flooding. Each of these hazards will directly and indirectly impact people, infrastructure, natural systems, and the economy in important (as well as compounding) ways. Some hazards—like flooding or wildfires—can create immediate threats to human health and safety, whereas others—like drought—can be chronic and cause longer-term changes. Understanding how these climate hazards are currently impacting the county, and ways in which these impacts are likely to be exacerbated by climate change, is an essential step in identifying solutions to ensure more resilient communities.

Four main climate hazards will affect Clark County: extreme heat, drought, wildfires, and flooding. Each of these hazards will directly and indirectly impact people, infrastructure, natural systems, and the economy in important (as well as compounding) ways.

For more information on the climate models used, the relationship between climate drivers and hazards, and a detailed look at historical and projected changes, see Clark County Climate Summary Technical Report.



Number of people who get drinking water from Lake Mead, which is fed by the Colorado River

2.3 million
Nevada residents

45.6 million
Nevada visitors

Snowpack and the Colorado River Basin

Clark County and its largest water source—Lake Mead, which is fed by the Colorado River—provides drinking water for more than 2.3 million residents (over 74% of Nevada's total population) and over 45.6 million visitors per year.[2,3] Lake Mead receives the majority of its water from snowmelt in the Colorado, Wyoming, and Utah Rocky Mountains. Due to projected reductions in snowpack and runoff, as more precipitation in the region falls as rain instead of snow.[4,5] Clark County is projected to experience more extreme, long-term drought conditions **(aridification)**. This has significant implications for the current and future residents and visitors of Clark County.

Climate Drivers

Two different climate scenarios that model climate outcomes based on varying degrees of global greenhouse gas (GHG) emissions were used to assess climate projections: a lower emissions scenario, representative concentration pathway (RCP) 4.5, and a higher emissions scenario, RCP 8.5. Two different time periods were used to assess future temperature and precipitation projections: mid-century (2035-2064) to provide a near-term timeframe useful for planning, and late-century (2070-2099) to better understand the magnitude of challenges facing the county.

Temperature

Temperatures in Clark County are increasing. Average annual temperatures in the State of Nevada have increased ~2 °F since the early 20th century and are projected to continue to increase 3.2 °F to 7.3 °F by mid-century and 8 °F to 12.8 °F by late century.[6,7] Across the Southwest region, the coldest recorded day of the year has increased by 4.1 °F. The number of extreme heat days (days over 106 °F) in a year is also projected to increase from a current average of 4 days a year to up to 30 days per year by mid-century and 64 days per year by the late century.

Table 1: Average historical and projected changes in average annual maximum temperature and average number of extreme heat days a year (above 106 °F) for Clark County. Source: Cal-Adapt.

	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 Maximum Temperature	76.5 °F	79.7 – 82.7 °F (+ 3.2 to 6.2 °F)	81.1 – 83.8 °F (+ 4.6 to 7.3 °F)	81.3 – 84.4 °F (+ 4.8 to 7.9 °F)	84.2 – 89.3 °F (+ 7.7 to 12.8 °F)
Extreme Heat Days (at least 106 °F)	4 days / year	23 days / year	30 days / year	31 days / year	64 days / year

Precipitation

Clark County experiences relatively low amounts of annual precipitation and frequent drought conditions. While total annual precipitation is not likely to increase significantly, extreme precipitation events (total amount of precipitation falling during one event) are likely to increase.[8] In addition, climate projections show more variability in the amount of precipitation from year to year. Dry spells, the maximum number of consecutive days with precipitation less than 0.04 inches, are expected to increase by around 9 days by 2050 and 17 days by 2100. As a result, Clark County can expect to see more rain in shorter bursts, with longer dry periods in between.

Table 2: Changes in average annual precipitation for Clark County based on modeled historical observations and future projections by mid-century (2035-2064) and late century (2070-2099). Source: Cal-Adapt.

	Observed Historical (1961-1990)	Mid-Century (2035-2064)		Late Century (2070-2099)	
		RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Annual Average Precipitation	6.1[9] - 7.6 inches	5.7 - 8.3 inches	5.3 - 8.3 inches	5.8 - 8.3 inches	5.2 - 10.4 inches
Extreme Rainfall (Max 1-day Precipitation)	0.68 - 0.88 inches	↓1% - ↑19%	↓1% - ↑22%	↑1% - ↑24%	↓3% - ↑26%
Average length of dry spell	71 - 99 days	76 - 111 days	75 - 114 days	74 - 114 days	76 - 141 days

Climate Scenarios:
Pathways that scientists use to model possible climate outcomes. The severity of these outcomes depends on global reduction in heat-trapping greenhouse gas (GHG) emissions.

Representative Concentration Pathway:
Pathways to model and describe different climate scenarios that are considered possible depending on the volume of GHG emissions emitted.

Climate Hazards

Extreme Heat

While Clark County residents are familiar with warm and hot temperatures, extreme heat events have continued to increase in frequency and severity over the last century due to climate change.

Trends

According to an analysis completed by Southern Nevada's Metropolitan Planning Organization, there were 437 heat-related deaths in Southern Nevada between 2007-2016.[10] In addition, the National Weather Service issued 23 excessive heat warnings in Southern Nevada between 2015 and 2019. The average daytime high during the summer months between that same period was 104 °F, and in 2019 alone, 84 days exceeded 100 °F. Across the US, July 2021 became the hottest month on record in 142 years of record-keeping, a record that has been broken in July every year for the last seven years.[11]

Throughout the summer of 2021, Clark County experienced several extreme heat events and record-breaking temperatures. On July 11, 2021, nearby Death Valley reached highs of 130 °F, tying records for the hottest temperature ever recorded globally.[12] This was the third heatwave to hit the region that summer alone. Across the West, more than 31 million people were under excessive heat warnings or heat advisories in July 2021.

Projections

Between 1970 and 2018, Las Vegas was the fastest warming city in the country,[13] and extreme heat events are projected to continue worsening.[14]

The people and environment of Clark County have adapted to higher temperatures, yet the projected increase in annual and seasonal average temperatures can cause significant health stress on organisms at the top of their temperature thresholds. The number of excessively warm days in Clark County is expected to increase as are the frequency and duration of extreme heat events (back-to-back days of extreme heat). Some regional projections indicate that the number of days over 115 °F in Clark County could increase by 10 times by the end of the century.[15]

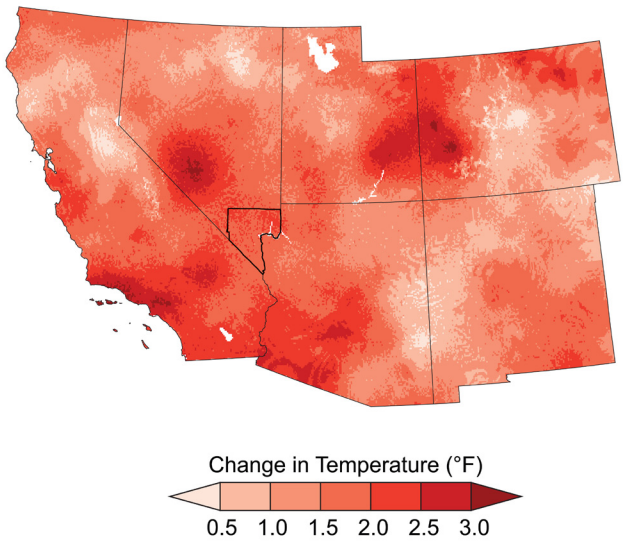


FIGURE 1.

Change in Temperature Across the Southwest US, 1901-2016. Adapted from USGCRP, Climate Science Special Report: Fourth National Climate Assessment, 2017. https://science2017.globalchange.gov/chapter/6/.

Drought

Nevada is the driest state in the country with some of the most variable precipitation from year to year. While Southern Nevadans are no strangers to drought, droughts have increased in duration and intensity since the start of the 21st century. Not only does drought directly impact people, infrastructure, and natural resources, it also exacerbates other climate hazards including wildfires.

Trends

Clark County is one of the driest counties in the U.S., generally only receiving between 4-8 inches of annual rainfall.[16] Throughout much of 2021, the majority of Clark County experienced "exceptional" drought conditions,[17] as did much of the West **(Figure 2)** due to increasing temperatures and decreasing runoff in the Colorado River Basin driven by climate change.[18] Future climate projections show similar amounts of annual average precipitation, but more pervasive long-term drought conditions (leading to megadrought) and a reduction in snowpack in the Colorado River due to earlier runoff and more precipitation falling as rain instead of snow. Some studies indicate that the current long-term drought, which started in 2000 and is fueled by climate change, is the worst drought in 1,200 years.[19]

Clark County's largest water source—Lake Mead, which is fed by the Colorado River—provides drinking water for more than 2.3 million Nevada residents (over 74% of Nevada's total population) and over 45.6 million visitors per year.[20] Clark County shares access to this critical resource with neighboring states, as dictated through the Colorado River Compact. The agreement sets annual allotments for each state. Southern Nevada comprises just 1.8 percent of the Colorado River allotments. Lake Mead is the largest reservoir in the United States, but its water levels have been in steady decline since the 2000s.[21] In 2022 (as of June 27), water levels were at 28% of total reservoir capacity, the lowest since it was filled in the 1930s.[22] This is a stark decline from its capacity exactly one year prior, at 36%. The water source is less than 150 feet away from reaching "dead pool" status, when the reservoir cannot flow downstream from the Hoover Dam.

FIGURE 2.

Much of Clark County experienced an Exceptional Drought throughout 2021 (source U.S. Drought Monitor—Retrieved at https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx).

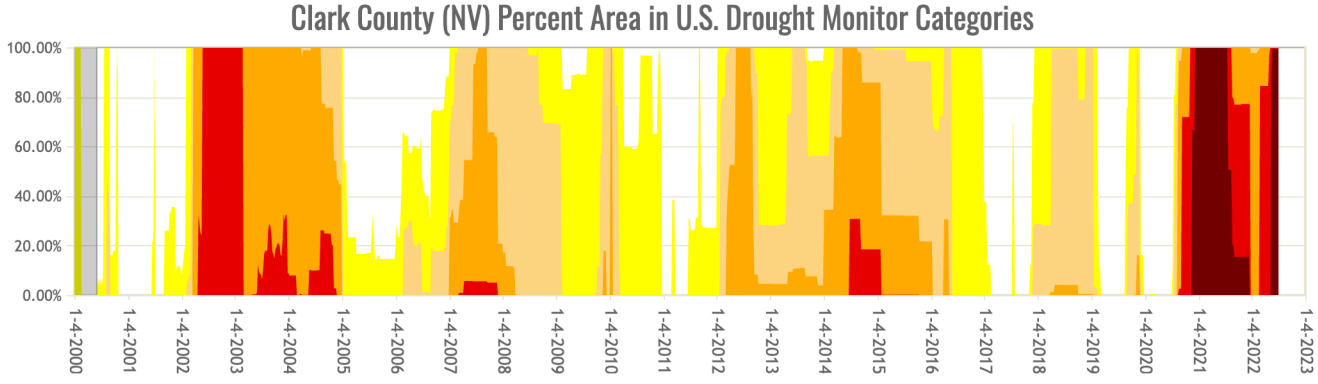


Image courtesy of Mike Steinhoff

Projections

Research suggests that the region will continue to experience more intense and longer drought conditions, fueled by hotter temperatures and a reduction in snowpack in Nevada and in other states within the Colorado River Basin due to climate change.[23] In addition, "megadroughts," multi-decadal droughts (30-40 years long), will become more likely.

Longer and more pervasive droughts are projected to continue across the Colorado River Basin and the State of Nevada, with increasingly significant implications for Clark County's natural resources, infrastructure, and people and potential permanent changes to the landscape (aridification).[24]

Due to climate change, scientists predict that over the next century, there is an 80-90% chance[25] Clark County will experience:

- Another drought that lasts over a decade;
- "Extreme" drought conditions (D3) becoming normal; and
- 30-40 year "megadroughts" becoming a realistic possibility.

Drought may have a slight effect on changes in the dust cycle in the Southwest, according to a comparison of lake sediment records and models. Drought may result in slightly higher dust and in turn, air quality, however, the relationship is not strong.[26]

Wildfire

While the greatest wildfire risk exists in the north and northwest parts of the state, Clark County is exposed to wildfire risk, including large-scale events that have originated in the county and which have originated elsewhere and subsequently crossed county and state boundaries. For the purposes of this assessment, impacts due to poor air quality as a result of wildfire smoke were considered for each system as part of evaluating the overall wildfire hazard.

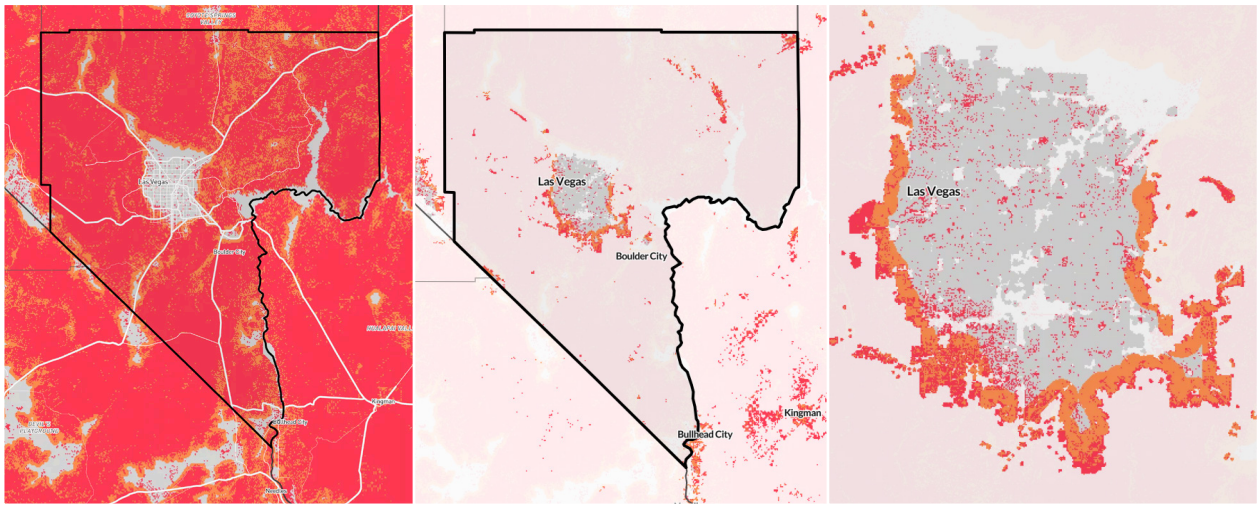
Trends

The current direct threat posed by wildfires in Clark County to people and property is considered to be comparatively low given that most are quickly extinguished and because such a small percentage of people and property are located in these areas of exposure (1,282.2 square miles, or 92% of all at-risk county land, is in unincorporated areas), as shown in **Figure 3.** Wildfires within the county do occur on an annual basis, but most are small and are contained before they cause considerable damage. The Clark County Fire Plan reports that 1,838 wildfires occurred between 1980 and 2003, or about 77 wildfires per year. Despite a wide array of wildfires burning from 1984-2017, four of the five years with the most area burned have occurred since 2005.[27] There are seven Clark County communities that have "high" or "extreme" hazard ratings, including Cold Creek, Kyle Canyon, Lee Canyon, Mountain Springs, Nelson, Torino Ranch, and Trout Canyon. Five communities have a moderate wildfire risk rating including Cactus Springs, Goodsprings, Moapa, Sandy Valley, and Searchlight.[28]

Regional (i.e., northern Nevada) and interstate (i.e., California, Oregon, Utah) wildfires can significantly impact air quality for Clark County residents and have a negative impact on people and resources in Southern Nevada.

FIGURE 3.

Wildfire exposure in all areas of Clark County (left), wildfire exposure in populated areas only (center), and the wildfire risk for the Las Vegas metropolitan area (right). Source: USDA, USFS, 2021. https://wildfirerisk.org/explore/0/32/32003/



In 2021, Clark County issued 11 smoke advisory days and 8 smoke/ozone advisory days.[29]

Between 2017 and 2021, about 73 percent of the ozone exceedance events were attributed at least in part to smoke from local or regional wildfires. In 2022, Clark County issued its first ever seasonal smoke advisory, lasting the duration of the summer.

Projections

Climate change is exacerbating wildfire risk in Clark County due to several interrelated factors, including changing precipitation patterns (which causes an intensification of the drying of vegetation and additional fuel for wildfires) and an increase in invasive plants that are more susceptible to wildfire ignition and spreading (e.g., cheatgrass). Research shows that more area will burn when a wet winter is followed by a dry spring and summer[30], and projections indicate an increase in winter precipitation throughout Nevada, increasing evaporative demand in spring and summer months, and increasing temperatures.[31] Wildfire risk is also expected to worsen over time due to increased development that pushes people closer to and into the Wildland Urban Interface (WUI). Furthermore, factors that help wildfires ignite and spread are exacerbated by changes to wind, humidity, temperature, and precipitation caused by climate change which will lead to more frequent and intense events. Increasing and extended drought conditions will further exacerbate these changes. Statewide, wildfire risk more than doubled from 4.2 million acres burned during the period between 1980 and 1999 to 9.5 million acres burned during the 2000-2019 period.[32] Wildfire risk in the Western United States is increasing because of climate change and is expected to continue to increase over time.

4.2 million acres
burned between 1980 and 1999 statewide

9.5 million acres
burned between 2000 and 2019 statewide

Flooding

Although Nevada has the lowest average annual rainfall among U.S. states and territories, it is affected by flood events due to variations in rainfall from year to year and a tendency for precipitation to occur in less frequent, heavy rainfall events.[33]

Trends

Flash flooding, floods caused by heavy or excessive rainfall in a short period of time, occurs most often during and after the intense summer thunderstorms linked to the region's natural monsoon cycle.[16] The arid region's fine desert soils, which have low infiltration rates, result in more runoff and flash flooding during extreme precipitation events.[34]

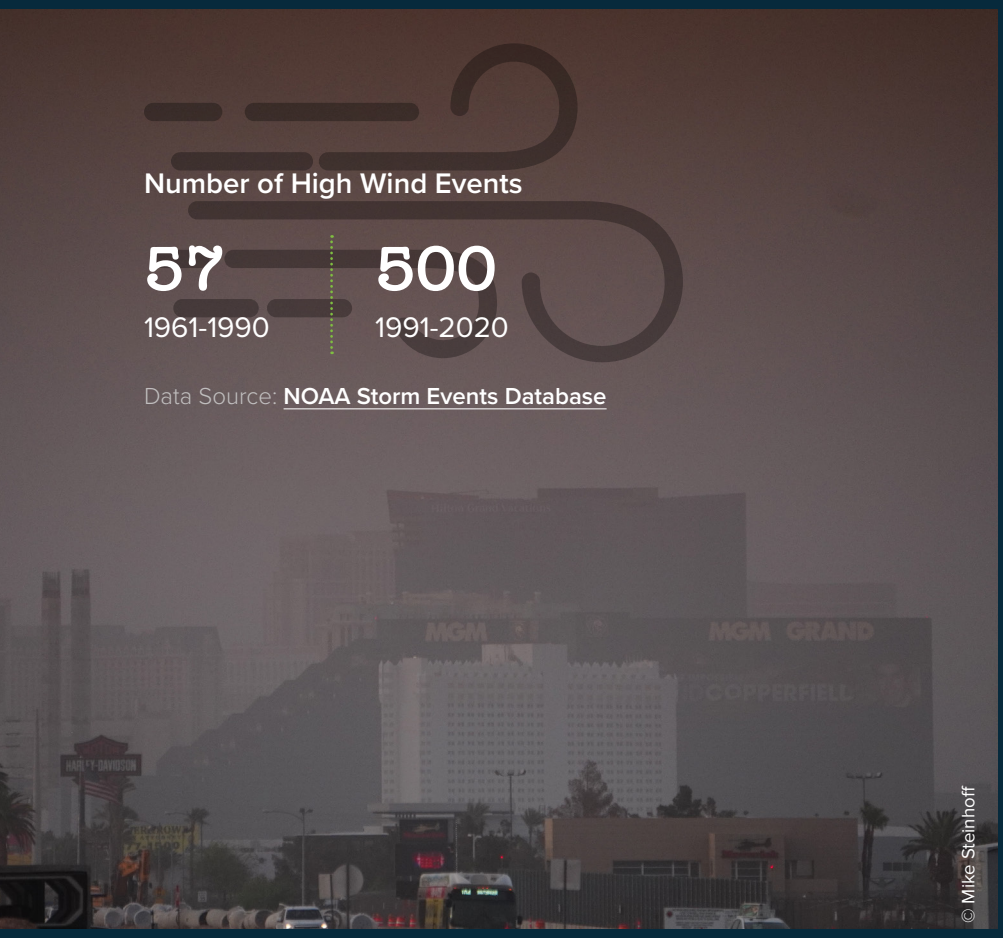
Between 1970 and 2018, Clark County has experienced more than 12 floods resulting in at least $1 million in property damage. In that same period, 33 lives were lost in 22 separate flash flood events.[35]

The Federal Insurance and Mitigation Administration (FIMA) Digital Flood Insurance Rate Map indicates that approximately 5.2% of the county lies within a Special Flood Hazard Area (SFHA) designated zone.[14] The direct and indirect impacts associated with flooding differ greatly in the urban versus rural context. Land included in the SFHA, which is mostly rural and not heavily populated, is concentrated along the Virgin, Muddy, and Colorado rivers in the eastern and southern portions of the county.

Projections

Warmer temperatures will cause precipitation to fall in concentrated bursts rather than gradually over time.[16] Storms will become more intense, leading to higher runoff volumes and more rapid accumulation and flow in populated and developed areas. This will be exacerbated by the reduced absorption capacity of the land due to increased temperatures and more extended periods of drought. In Clark County, where monsoons are also tied to flash flood events, increasing thunderstorm intensity is expected to result in more-severe flooding risks.[16] Peak daily runoff, the primary source of flash flood risk in Clark County, is expected to increase over time. There are areas of the county—including the Las Vegas metropolitan area—that may experience as much as a 150-200% increase over historical peak daily runoff averages.

Though flood management has significantly improved throughout the region in past decades, projected heavier rainfall events still bring some risks to infrastructure. FEMA's National Risk Index (NRI) has calculated the total value of exposed buildings in Clark County to be $2.276 billion.[36] There are 16,755 people who reside in these structures, but given the past flood experience, and expectation of future floods, only 1 fatality every 3.4 years is expected to occur as a result of flood risk. Flood Factor, a nonprofit organization that uses alternative measures to assess flood risk over time, estimates that the total annualized losses expected across Clark County's five metropolitan areas (Las Vegas, North Las Vegas, Mesquite, Henderson, and Boulder City) is $3.721 million per year, with 41,649 properties facing some level of risk. The difference between these figures is that the Flood Factor methodology looks at properties outside of SFHA zones, and incorporates predictive factors associated with climate change.[37]



A Quick Look at Extreme Wind Events

Clark County regularly experiences extreme winds, which can significantly impact infrastructure, businesses, and communities. This is particularly true when coupled with other climate hazards, including drought and wildfire. For example, between 1961 and 1990, Clark County experienced 57 high wind events (dust storm, high wind, strong wind, thunderstorm wind), resulting in at least three deaths. Between 1990 and 2020, Clark County experienced more than 500 high wind events, resulting in at least six deaths. High wind events can damage infrastructure and property, lead to fallen trees, and restrict air travel, which directly impacts the tourism industry.

Although Clark County has not planned for wind as a separate hazard, the County is considering doing so in the context of extreme storms, particularly in the 2018 Multi-Jurisdictional Hazard Mitigation Plan. Climate models are surprisingly accurate predictors for temperature and precipitation projections but currently have a limited ability to project the frequency and intensity of changing wind patterns due to climate change. As the models continue to evolve over the coming years, this will continue to improve. While there are no projections at this time, extreme wind is an important issue that will be considered as a part of the conversations around the vulnerability of county-wide systems.

ASSESS: VULNERABILITY ASSESSMENT RESULTS

This section summarizes the relative vulnerability rankings for systems that are high, moderate, somewhat, or minimally vulnerable to extreme heat, drought, wildfire, and flooding.

Vulnerability Rankings

- Minimally Vulnerable
- Somewhat Vulnerable
- Moderately Vulnerable
- Highly Vulnerable

Summaries include detailed information on the justification of the system's relative vulnerability ranking and are organized by planning subject area. The relative vulnerability rankings for each system were determined based on review of local and regional plans, as well as extensive engagement through surveys, interviews, and workshops with regional stakeholders.

Each system and hazard are nuanced, complex, and interconnected. Multiple hazards may occur simultaneously, in succession, and may exacerbate the sensitivity and/or limit the adaptive capacity of other systems. For example, an extreme heat event may occur during a wildfire or flooding event that could further impact a resident's ability to stay safe. Where possible, this assessment also examines how climate impacts on these systems may overlap, as well as how climate change may result in cascading impacts across systems. For example, increased demand for cooling due to extreme heat could have significant consequences for the electricity grid, which many sectors, services, and residents rely on. Understanding how systems and climate hazards are interconnected can also provide opportunities to identify unique and effective solutions to addressing these challenges.

Cascading Climate Impact:

The interdependencies between systems in response to climate changes and the combined effects of interacting climate stressors[38]

Frontline Communities

Climate hazards have the potential to impact everyone throughout the Southern Nevada region. Decades of research on disasters and climate change have demonstrated that particular social factors can lead to distinctly different outcomes. Factors can include individual characteristics (e.g., age, ethnicity, gender, existing medical challenges), social status, employment, networks, resource availability, and other economic factors.[39] These populations - frontline communities - often experience the first and worst impacts of extreme weather events and other impacts associated with a changing climate. While the potential impacts to frontline communities differ across hazards and systems, these groups of people are disproportionately more vulnerable across them all.

For the purposes of this assessment, vulnerabilities facing frontline communities were assessed across all systems, as these different populations are supported and/or disadvantaged by impacts to infrastructure and services. Additional analysis is needed to understand how climate change specifically impacts these population groups differently.

Elderly populations, or people over 65, are generally more likely to have underlying health conditions or experience other health and age-related issues that may heighten their sensitivity to climate-driven challenges such as wildfire smoke, extreme heat exposure, and interruptions to water and electricity supply.

Historical legacies of racial discrimination, marginalization, and under-allocation of resources to **communities of color** have resulted in a suite of factors that exacerbate negative outcomes both during and after climate hazard events and within the planning, preparation, and rebuilding efforts seen in many U.S. communities.

Young children and infants have higher metabolic rates, spend more time outdoors, and become dehydrated more easily, making them more sensitive to hazards related to smoke inhalation and extreme heat. Facilities, such as schools and daycares that house large numbers of children, can present unique challenges for emergency response to extreme weather events.

Those **living in poverty or under economic hardship** are generally less able to invest in disaster preparedness and have fewer resources available to respond to climate or weather events if or when they occur. They are also more likely to be unhoused or live in substandard housing that is less able to withstand extreme weather events.

Those who have **limited English proficiency** or primarily speak another language may experience barriers to effective communication that is critical to preparation and response to climate hazards and extreme weather events.

People with **limited or no access to a vehicle** depend more on public transportation, where available, or other people or services to travel in the case of an emergency.

Populations in **rural communities** generally do not have access to as many social or financial resources to help them prepare for, respond to, or recover from extreme weather events or environmental conditions caused or exacerbated by climate change.

Those with **preexisting health conditions,** especially cardiovascular and/or respiratory disease or stress (e.g., asthma, allergies) are more prone to experiencing complications from climate hazards. This population may require additional support during emergencies and may be dependent on medical devices or mobility assistance. From 2016 to 2018, chronic disease ranked among the top 10 causes of death in Clark County. It is identified as the top priority in the Community Health Improvement Plan 2020/2021.[40]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Aquatic/Riparian Habitats

Aquatic and riparian habitats are highly vulnerable to the impacts of extreme heat and drought, moderately vulnerable to the impacts of flooding, and somewhat vulnerable to the impacts of wildfire.

Extreme Heat

Increasing temperature can lead to impairment of water quality and quantity, causing loss of habitat quality and potentially availability and posing a threat to native species, resulting in a high sensitivity (S4). Due to the compounding impacts from increased temperatures and drought conditions, and limited ability to apply proactive interventions to these habitats, aquatic and riparian habitats have low-moderate adaptive capacity (AC1).

Drought

Increasing drought conditions can contribute to habitat fragmentation and changes in water quality, resulting in species isolation and loss of habitat for critical species.[41] These factors contribute to aquatic and riparian habitats' high sensitivity (S4). There are a number of efforts to protect Southern Nevada's aquatic and riparian habitats, including the Las Vegas Wash Wildlife Management Plan, the Clark County Multiple Species Habitat Conservation Plan, and multi-party efforts along the Muddy and Virgin rivers. Limited ability to reverse drought conditions, particularly in the short-term, results in a low-moderate adaptive capacity (AC1).

Wildfire

While water resources are less vulnerable to wildfire than land-based habitats, local wildfires may still contribute to residual impacts, such as depositing debris into nearby rivers, lakes, or streams and contaminating water with sediments, nutrients, and heavy metals. These factors result in a moderate sensitivity (S2). Some effort may be required to manage aquatic and riparian habitats located near wildfire-affected areas, resulting in moderate-high adaptive capacity (AC3).

Flooding

Aquatic and riparian habitats are most impacted by debris loads and contaminants during flash flood events. Larger water sources, such as the Virgin River (which flows across northeast Clark County), collect debris from the Virgin Mountains that can impact municipal water supplies.[42] Ephemeral streams (those that flow in direct response to precipitation), may see some benefit to increased water flow and include the major tributaries to the Las Vegas Wash (accounting for two percent of the water in Lake Mead).[43] These factors contribute to a moderate-high sensitivity (S3). Efforts to protect water quality in the washes may enhance the quality of the regional water system. Aquatic and riparian habitats may require some level of intervention to prevent buildup of debris or pollutants, resulting in its moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Aquatic/Riparian Habitats	Extreme Heat	S4	AC1	High
	Drought	S4	AC1	High
	Wildfire	S2	AC3	Somewhat
	Flooding	S3	AC2	Moderate

Woodland/Forest Habitats

Woodland and forest habitats are highly vulnerable to the impacts of wildfire, moderately vulnerable to the impacts of extreme heat, and somewhat vulnerable to the impacts of drought and flooding.

Extreme Heat

Increasing temperatures lead to forest type conversion, in which tree species are pushed out of their environmental range, resulting in loss of habitat or vegetation types. Cultural significance of tree species is also impacted. For example, the pinyon pine tree, which is particularly sensitive to extreme heat and drought, holds significance to Indigenous communities. Due to these factors, woodland forest habitats have moderate-high sensitivity (S3). Though improvement in woodland and forest health can occur with increased investment and management, the short-term impacts of extreme heat on woodland and forest habitats can be detrimental, resulting in a low-moderate adaptive capacity score (AC1).

Drought

Due to increased stress for woodlands as a result of more frequent and longer bark beetle epidemics and overall loss of tree health from lack of water, they are moderately sensitive (S2) to drought.[44] Reduced tree health has cascading impacts for the species these habitats support and could threaten cultural traditions of local Indigenous peoples. While drought is expected to increase stress on these habitats, woodland and forest health can be improved with increased investment and proactive management, resulting in moderate adaptive capacity (AC2).

Wildfire

Extreme temperature peaks are resulting in increased fire frequency for woodland habitats. The duration of the wildfire season in Nevada is expected to increase and change the composition of woodland habitats. For example, the Carpenter I Fire in 2013 burned across approximately 28,000 acres resulting in an estimated recovery time of more than 100 years. Increased tree mortality due to drought and infestation of pests and disease[45], as well as an increase in invasive species, increases fuel load for wildfires to spread, resulting in a high sensitivity score (S4). Mesquite-acacia woodland habitats, in particular, do not have a frequent fire regime; post-fire, disturbed habitats can be encroached by non-native, invasive plants without post-fire intervention.[46] Burns fueled by non-native species can result in ecological transitions in forest and woodland communities, reducing the likelihood of recovery. Due to the limitations for timely, proactive forest management to prevent these risks, adaptive capacity is considered low-moderate (AC1).

Flooding

For wildfire-affected forests experiencing erosion, heavy rains or flash floods can lead to mudslides, which can cause damage to the habitat and neighboring infrastructure. This results in a moderate sensitivity (S2). Whereas costs to repair infrastructure could be high under these circumstances, costs to restore habitats is not as relatively high, resulting in moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Woodland/Forest Habitats	Extreme Heat	S3	AC1	Moderate
	Drought	S2	AC2	Somewhat
	Wildfire	S4	AC1	High
	Flooding	S2	AC3	Somewhat

© Clark County

Urban & Community Forests

Urban and community forests are moderately vulnerable to the impacts of extreme heat and drought and somewhat vulnerable to the impacts of wildfire and flooding.

Extreme Heat

Some tree species may reach their tolerance limits as the number of extreme heat days increase, resulting in moderate-high sensitivity (S3). Trees play a role in mitigating impacts of climate change, including temperature and air quality regulation, but those benefits are not felt equally throughout the county. According to the Las Vegas Valley Urban Tree Canopy Assessment conducted in 2012, urbanized areas in the Las Vegas Valley are covered by 8.6 percent tree canopy.[47] Tree canopy cover varies by geographic area; there is about 2 to 6 percent tree coverage in areas recording high temperatures compared to 10 to 20 percent in some residential Clark County neighborhoods with lower temperatures. Due to limited investment into planning, management, and enhancement, urban and community forests have moderate adaptive capacity (AC2).

Drought

Some tree species are reaching their tolerance limits as drought conditions worsen, resulting in a moderate-high sensitivity (S3). Use of non-native or non-drought tolerant species in urban or community settings may cause tree stress. For example, the City of Las Vegas Tree Initiative notes that trees commonly planted in urban areas, such as Ash or Catalpas, are not tolerant to heat and drought.[48] Further drought and aridification will negatively impact the ability to expand and preserve the existing urban tree canopy. Due to limited investment into planning, management, and enhancement, urban and community forests have moderate adaptive capacity (AC2).

Wildfire

Trees in urban and community settings are less sensitive to the impacts of wildfire than rural forest and woodland habitats, resulting in a moderate sensitivity (S2). Urban and community forests are less likely to be exposed to wildfires due to surrounding urban development. Encroaching invasive and noxious weeds that increase fire intensity and severity do not pose as significant a threat to trees in urban areas, where landscaping and management can successfully eradicate infestations. As wildfires impact other habitats, urban and community forests with proper investment and management can play an important role in providing habitat for plants and wildlife, resulting in a moderate adaptive capacity score (AC2).[49]

Flooding

Trees in urban settings are less sensitive to flash flooding but may experience health impacts if damage occurs, resulting in low-moderate sensitivity (S1). In some cases, urban and community forests could even mitigate heavy rain and flooding if soils have high enough infiltration rates, resulting in moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Urban & Community Forests	Extreme Heat	S3	AC2	Moderate
	Drought	S3	AC2	Moderate
	Wildfire	S2	AC2	Somewhat
	Flooding	S1	AC3	Somewhat

© Nevada State Museum

Desert Habitats

Desert habitats are moderately vulnerable to the impacts of extreme heat, drought, and wildfire and somewhat vulnerable to the impacts of flooding

Extreme Heat

Increasing annual temperatures may lead to elevational shifts in ecosystem type and species for blackbrush, Mojave Desert scrub, and salt desert scrub habitats.[50] Ecosystem type conversion may lead to loss of genetic diversity, which could limit adaptive capacity, and long-term loss of habitat for critical species such as the Mojave Desert tortoise. These factors result in a moderate-high sensitivity (S3). As changes accumulate, management areas and techniques may need to be modified, resulting in a moderate adaptive capacity (AC2).

Drought

Desert habitats may also be vulnerable under increasing drought conditions, as drier soils may lead to habitat conversion.[51] Drought impacts the severity of insect and disease outbreaks, as the vegetation's ability to resist and recover from these outbreaks is diminished. These factors result in moderate-high sensitivity (S3). Considerable effort may be required to re-establish habitats after type conversion has occurred, resulting in a moderate adaptive capacity score (AC2).

Wildfire

Extreme temperature peaks are resulting in increased fire frequency for desert habitats throughout the county. These conditions create a positive feedback loop between fire frequency and establishment and spread of invasive species; as fires increase in intensity and frequency, so does establishment of invasive species that increase fire risk (e.g., cheatgrass), resulting in moderate-high sensitivity (S3). Desert habitats may not easily adjust to increasing fire frequency since this landscape does not have a frequent fire regime.[52] Quick post-fire intervention will be required to reduce the spread of invasive species, resulting in a low-moderate adaptive capacity score (AC1).

Flooding

Excessively dry soil conditions found in desert habitats are ideal conditions for flash flooding, which may result in worsened flood conditions in these environments that could uproot vegetation, resulting in moderate sensitivity (S2). Moderate intervention to rehabilitate the ecosystems affected by flooding results in a moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Desert Habitats	Extreme Heat	S3	AC2	Moderate
	Drought	S3	AC1	Moderate
	Wildfire	S3	AC2	Moderate
	Flooding	S2	AC2	Somewhat

© Clark County

Water Supply/Quality

Water supply and quality is moderately vulnerable to the impacts of extreme heat, drought, and flooding and somewhat vulnerable to the impacts of wildfire.

Extreme Heat

Increasing temperature can lead to impairment of water quality and quantity, resulting in a moderate-high sensitivity (S3). Drought conditions in combination with warmer temperatures leads to lower water body levels, which can create algal blooms that release contaminants. Due to extensive regional efforts to adapt Clark County's water resources, including construction of new facilities at Lake Mead and water conservation measures, water supply/quality has a moderate adaptive capacity (AC2).[53] If over time conditions deteriorate or progress stagnates, it is at risk of reduced ability to adapt.

Drought

Lake Mead's water level has declined steadily since the early 2000s. As of June 2022, water levels were at 28% of normal capacity, the lowest since it was filled in the 1930s.[54] Drought worsens water quality issues due to higher concentrations of nutrients or contaminants. Due to these impacts, as well as the many systems dependent on water supply and quality, it is highly sensitive (S4) to drought. Due to extensive regional efforts, including construction of new facilities (e.g., low lake level pump station), water supply/quality has a moderate adaptive capacity (AC2). If over time conditions deteriorate, regional progress stagnates, or efforts in other states do not accelerate, water supply and quality of is at risk of reduced ability to adapt.

Wildfire

Wildfires pose fewer risks for water resources than for forest or desert habitats. However, they may contribute to impaired water quality due to contamination from sediments, nutrients, and heavy metals. Increasing frequency and intensity of wildfires may also lead to an increased demand for water for firefighting efforts. These factors result in a moderate sensitivity (S2). Due to the region's extensive efforts to monitor and protect water resources, it has a moderate-high adaptive capacity (AC3).

Flooding

Localized flooding can lead to runoff from roadways and other paved surfaces to waterways that impairs water quality, resulting in moderate-high sensitivity (S3). In the Las Vegas Valley, rainfall flows untreated to the Las Vegas Wash, and extreme weather events brings in excess debris, pollutants, and sediments. There have been numerous efforts to reduce the risk to water quality during flooding; the Clark County Regional Flood Control District uses unlined channels to convey flood flows and the Las Vegas Wash Coordination Committee led by SNWA has constructed weirs to slow the flow of water.[55,56] The level of effort required results in moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Water Supply & Quality	Extreme Heat	S3	AC2	Moderate
	Drought	S4	AC2	Moderate
	Wildfire	S2	AC3	Somewhat
	Flooding	S3	AC2	Moderate

Infrastructure & Facilities

Electricity Infrastructure

Electricity infrastructure is moderately vulnerable to the impacts of extreme heat, wildfire, and flooding and somewhat vulnerable to the impacts of drought.

Extreme Heat

Elevated weather extremes in Clark County, particularly heat, are already stressing the electricity grid. Increased cooling needs on high temperature, high load days have required utilities to reach out to customers to manage demand, causing concern regarding potential brownouts and the need for backup generators. These factors result in moderate-high sensitivity (S3). Electricity providers are preparing for impacts by: designing electrical infrastructure to 112°F, building distributed energy management systems and demand response to support distribution, and providing capacity and education to customers to reduce energy use.[57] This may be sufficient in the short-term, with the exception of summer days that can exceed 112°F. Increased extremes may necessitate costly upgrades for infrastructure to withstand even higher temperatures and prepare for spikes in demand, resulting in low-moderate adaptive capacity (AC1). Furthermore, we can expect to see increased demand as more and more sectors electrify to reduce greenhouse gas emissions.

Drought

Regional drought has the potential to impact hydroelectric capacity at the Hoover Dam, and power supply in the Las Vegas Valley is generally at risk under lower lake and reservoir levels, contributing to moderate sensitivity (S2). Adaptive measures, such as dry cooling, are predominantly in use at most power generation facilities in the region, resulting in moderate-high adaptive capacity (AC3).

Wildfire

The combination of summertime wildfires and extreme heat poses a significant threat to the region's electricity infrastructure due to compounding effects. Regional wildfires can also interfere with energy supply, therefore electricity production, even if specific facilities or infrastructure are not physically affected by wildfire or located in high-risk areas. This results in moderate-high sensitivity (S3). Due to the existing efforts to harden electricity infrastructure and manage surrounding vegetation, electricity infrastructure has moderate adaptive capacity (AC2).[58]

Flooding

Substations and other low-lying assets are at the greatest risk from seasonal flooding, while flash flooding poses a greater threat to power lines and older, above-ground poles (due to the force of rushing water).[59] These factors contribute to moderate-high sensitivity (S3). The system has moderate adaptive capacity (AC2), due to existing efforts in place to harden electricity infrastructure in flood-prone areas[60] and in recognition that some assets may already be hardened or flood-proofed, while others in lower-lying areas may require relocation.

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Electricity Infrastructure	Extreme Heat	S3	AC1	Moderate
	Drought	S2	AC3	Somewhat
	Wildfire	S3	AC2	Moderate
	Flooding	S3	AC2	Moderate

© SNWA

Gas/Oil Infrastructure

Gas and oil infrastructure is somewhat vulnerable to the impacts of extreme heat, drought, wildfire, and flooding.

Extreme Heat

Increased temperatures may impact regional infrastructure, such as oil refining and processing facilities in California, that will have increased cooling loads. The gas and oil sector may also experience cascading impacts from losses of other critical infrastructure (e.g., electricity) due to increased temperatures and demand for cooling. These factors contribute to moderate-high sensitivity (S3). Temperatures may also impact transportation and distribution of oil and gas. While most gas infrastructure is typically rated to handle a high degree of heat, temperature range for specific volatile chemicals might be exceeded during transport requiring refrigerated distribution, resulting in moderate-high adaptive capacity (AC3).[61]

Drought

Supply of petroleum products, which are transported to Southern Nevada from California and Utah through two major pipelines, may be affected by regional drought conditions, as the reduction of water supply impacts the upstream drilling or refining processes.[62] Oil refineries in particular use large volumes of water. The gas and oil sector may also experience cascading impacts from losses of other critical infrastructure (e.g., electricity) due to drought. These factors result in moderate sensitivity (S2). Reliance on gas and oil infrastructure is expected to decrease over time. Additionally, regional outages and supply chain issues changes in sourcing or technology adaptation lead to moderate adaptive capacity (AC2).

Wildfire

While most infrastructure lines are underground, there are some compressor stations located above ground throughout the county.[63] Communities directly impacted by wildfire within the county may have energy services cut off as a safety precaution. Regional wildfires, particularly in California, can damage transmission lines that cut off electricity provided to oil refineries (or they can lose power from public safety power shutoffs), resulting in moderate sensitivity (S2). Direct damage to infrastructure would require moderate intervention or costs, resulting in moderate adaptive capacity (AC2).

Flooding

Flooding may damage or erode above-ground infrastructure, including valves, pumping stations, or foundations, resulting in low-moderate sensitivity (S1). While replacement of infrastructure would likely be necessary in a short timeframe, it would be costly, resulting in moderate adaptive capacity (AC2).[64]

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Gas/Oil Infrastructure	Extreme Heat	S3	AC3	Somewhat
	Drought	S2	AC2	Somewhat
	Wildfire	S2	AC2	Somewhat
	Flooding	S1	AC2	Somewhat

Telecommunications Infrastructure

Telecommunications infrastructure is moderately vulnerable to the impacts of extreme heat, somewhat vulnerable to the impacts of drought and wildfire, and minimally vulnerable to the impacts of flooding.

Extreme Heat

Higher temperatures will increase the need for cooling at data centers, requiring more power for cooling, which in turn creates more heat, resulting in moderate-high sensitivity (S3). As the County prepares for even more telecommunications services to support increasing populations, increased investment for cooling solutions and backup power within the telecommunications industry will be needed, resulting in low-moderate adaptive capacity (AC1).

Drought

While different telecommunications providers employ varying methods for cooling, indirect impacts from drought conditions could include reduced supply of water used for cooling of telecommunications equipment and data centers, resulting in low-moderate sensitivity (S1). In the event of more stringent water restrictions, telecommunications infrastructure would need additional investment to meet cooling demands through alternative strategies, resulting in low-moderate adaptive capacity (AC1).

Wildfire

Direct wildfire impacts to telecommunications infrastructure, such as impacts to above-ground telecommunications lines, are less common, with the exception of higher risk, rural locations (e.g., Mt. Charleston). As regional wildfires result in grid disruptions, and as energy providers shut off services to communities to mitigate wildfire risk, energy needs for telecommunications services may be impacted, resulting in low-moderate sensitivity (S1). Direct impacts to infrastructure would require costly intervention, whereas indirect impacts due to intrastate wildfires may be out of the region's control, resulting in low-moderate adaptive capacity (AC1).

Flooding

Flash foods could damage equipment at critical facilities or data centers located in flood-prone areas, resulting in low-moderate sensitivity (S1). Relocation of equipment within facilities (e.g., elevating critical equipment) would not require intensive or costly interventions, resulting in moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Telecommunications Infrastructure	Extreme Heat	S3	AC1	Moderate
	Drought	S1	AC1	Somewhat
	Wildfire	S1	AC1	Somewhat
	Flooding	S1	AC3	Minimal

© Raquel Baranow

Water Treatment & Distribution

Water treatment and distribution infrastructure is moderately vulnerable to the impacts of extreme heat and drought and somewhat vulnerable to the impacts of wildfire and flooding.

Extreme Heat

Increased temperatures will increase the cost to cool facilities and can directly damage pumping, storage, treatment, and distribution. Water delivery and treatment infrastructure is also sensitive to outages and grid failures because it requires a significant amount of energy resources. These factors contribute to moderate-high sensitivity (S3). Some impacts (e.g., impacts to pumping stations, ability to cool) are easier to mitigate or adapt to, and SNWA is changing the design of buildings and infrastructure construction to be less sensitive. However, regional water coordination may require additional intervention, resulting in moderate adaptive capacity (AC2).

Drought

Drought is expected to continue to impact the region's water resource portfolio, including Lake Mead and Las Vegas Valley aquifers, as well as the treatment and distribution infrastructure managed and operated by SNWA and Las Vegas Valley Water District (LVVWD).[65] Dropping reservoir levels make it more difficult to pump water to facilities. As drought conditions reduce lake and reservoir levels-and as water temperatures increase-water quality issues are also exacerbated. Rural communities may face worsened effects as scarcity of water resources continues, because water distribution may be more likely to prioritize urban areas.[66] These factors result in moderate-high sensitivity (S3). While Southern Nevada's response to drought conditions has been largely successful thus far, continued large investments and increased operational costs are likely, resulting in moderate adaptive capacity (AC2).

Wildfire

Wildfires within Clark County may directly damage infrastructure in higher risk locations, such as Kyle Canyon, resulting in moderate sensitivity (S2). Systems most at risk to damage are smaller systems in more secluded areas. Water systems for the region are fairly well-adapted, but service disruptions could occur in rural areas, contributing to moderate-high adaptive capacity (AC3).

Flooding

Flooding may directly damage pumping, storage, treatment, or distribution infrastructure located in flood-prone areas, resulting in moderate sensitivity (S2). Due to existing flood mitigation efforts and limited infrastructure located in high hazard areas, this system has moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Water Treatment & Distribution	Extreme Heat	S3	AC2	Moderate
	Drought	S3	AC2	Moderate
	Wildfire	S2	AC3	Somewhat
	Flooding	S2	AC2	Somewhat


© SNWA

Wastewater Infrastructure

Wastewater infrastructure is moderately vulnerable to the impacts of drought, somewhat vulnerable to the impacts of flooding and minimally vulnerable to the impacts of extreme heat and wildfire.

Extreme Heat

Changes in temperature of wastewater make it more difficult to treat, however, wastewater treatment officials are closely monitoring changes in temperature, resulting in low-moderate sensitivity (S1).[67] Wastewater infrastructure is generally built to handle heat. During previous extreme heat events, officials have been able to put small fixes in place (e.g., shading) to prevent loss of function, resulting in moderate-high adaptive capacity (AC3).[68]

Drought

Drought impacts the ability to treat water that returns to Lake Mead. If water levels decrease significantly, water quality will decrease, requiring additional treatment to maintain quality to meet water quality standards. These factors result in moderate-high sensitivity (S3). Due to the uncertainty of changing quality conditions and the need for longer-term planning, water reclamation systems have low-moderate adaptive capacity (AC1).

Wildfire

Most of the infrastructure and facilities within the county are located in urban areas and are not vulnerable to wildfire; systems located in rural areas that may be more directly exposed to wildfire already have wildfire mitigation measures in place, including clearing out wildland fuel.[69] As such, wastewater infrastructure has low-moderate sensitivity (S1). While loss of power, due to regional wildfires' impact on the electricity grid, may have a larger impact on wastewater treatment, facilities are already equipped with backup power, resulting in moderate-high adaptive capacity (AC3).[70]

Flooding

Some newer facilities have been constructed to prevent flooding. However, older facilities may not have flood proofing measures in place and some berms are not designed for flood protection, resulting in moderate sensitivity (S2).[71] If major flooding occurs, and flood proofing measures are not in place, repairs or upgrades to facilities would be required, resulting in moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Wastewater Infrastructure	Extreme Heat	S1	AC3	Somewhat
	Drought	S3	AC1	Moderate
	Wildfire	S1	AC3	Minimal
	Flooding	S2	AC2	Somewhat

© Clark County Regional Flood Control District

Stormwater/Flood Protection Infrastructure

Stormwater and flood protection infrastructure is somewhat vulnerable to the impacts of wildfire and flooding, and minimally vulnerable to the impacts of extreme heat and drought.

Extreme Heat

Increasing temperatures are expected to have little to no impact on existing stormwater and flood protection infrastructure. Construction of new infrastructure could be impacted by extreme heat, as higher temperatures could extend construction times and impact construction workers, resulting in low-moderate sensitivity (S1). Most facilities do not rely on power, and monitoring stations are equipped with solar-powered batteries; in the event of grid disruptions, facilities would likely not be impacted.[72] Due to little need for cost or intervention, stormwater and flood protection infrastructure has moderate-high adaptive capacity (AC3).

Drought

Under increasing drought conditions, the risk to stormwater and flood protection infrastructure is greatly reduced, resulting in low sensitivity (S0). It may become increasingly challenging to implement green infrastructure solutions, due to decreased infiltration (i.e., increased dryness) of soils. Because of its ability to adapt to drought conditions with little to no cost or upgrade, stormwater and flood protection infrastructure has high adaptive capacity (AC4).

Wildfire

As wildfires burn vegetation, the stability of the soil decreases. Soil and debris may pass into and clog nearby stormwater and flood protection infrastructure, resulting in moderate sensitivity (S2). For example, the Carpenter 1 Fire in 2013 created so much debris, it was more expensive to clean out the detention basin than to build it.[73] While damage to infrastructure is not expected to be as common as to other systems, the high costs to remove debris and limited solutions to mitigate build-up result in moderate adaptive capacity (AC2).

Flooding

Generally, flood management has significantly improved in past decades. Infrastructure managed and operated by the Clark County Regional Flood Control District is built to withstand a 100-year flood. While infrastructure has been overwhelmed during major flood events, this typically only occurs in areas where infrastructure is still in development, resulting in moderate sensitivity (S2).[74] Designing to withstand a 500-year flood would require significant investment and increased capacity for detention basins and flood channels, meaning that if flood conditions continue to worsen over time, so will the system's adaptive capacity, resulting in moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Stormwater/ Flood Protection Infrastructure	Extreme Heat	S1	AC3	Minimal
	Drought	S0	AC4	Minimal
	Wildfire	S2	AC2	Somewhat
	Flooding	S2	AC2	Somewhat

Emergency Management Facilities

Emergency management facilities and services are moderately vulnerable to the impacts of extreme heat and wildfire and somewhat vulnerable to the impacts of drought and flooding.

Extreme Heat

Increasing extreme heat events place heightened burdens on emergency personnel and lead to increased demand for emergency services, resulting in moderate-high sensitivity (S3). Rural communities, in particular, have fewer resources and capacity to respond. As temperatures increase, emergency management agencies will require increased staff capacity, additional training and communication resources, resulting in moderate adaptive capacity (AC2).

Drought

While emergency response may be involved in cases of extreme drought, emergency facilities and services are likely to be most impacted by cascading impacts from other systems (e.g., water treatment or delivery) due to drought, resulting in moderate sensitivity (S2). Capacity to adapt, particularly in extreme drought situations, would require additional staff capacity and communication resources, resulting in moderate adaptive capacity (AC2).

Wildfire

Local or regional wildfires may prompt heightened demand for emergency response. They may lead to cascading impacts that affect the ability to respond quickly and effectively (e.g., lost power from public safety power shutoffs), resulting in moderate-high sensitivity (S3). Interventions to adapt emergency response services would likely include increased staff and need for additional training or equipment, resulting in moderate adaptive capacity (AC2).

Flooding

Increased flash flooding and extreme precipitation events may impact the supply and demand for emergency response and specialized equipment and training, resulting in moderate sensitivity (S2).[75] Rural communities, in particular, are more sensitive to extreme weather events , because the lack of neighboring communities make it difficult to receive support within shorter timeframes. Capacity to adapt may require additional staff and communication resources, resulting in moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Emergency Management Facilities	Extreme Heat	S3	AC2	Moderate
	Drought	S2	AC2	Somewhat
	Wildfire	S3	AC2	Moderate
	Flooding	S2	AC2	Somewhat

© Republic Services

Sanitation/Waste Management

Sanitation and waste management services are moderately vulnerable to the impacts of extreme heat and somewhat vulnerable to the impacts of drought, wildfire, and flooding.

Extreme Heat

Disruptions to the electricity grid due to extreme heat or increased cooling could cause major disruption to the operations of landfills and materials recovery facilities. Impacts on the waste workforce may be the largest challenge, as increased temperatures will make it difficult for employees to operate equipment outside, resulting in moderate-high sensitivity (S3). Moderate costs to implement backup power at waste facilities, as well as adjustments to workforce conditions, will be required to adjust to increasing temperatures resulting in moderate adaptive capacity (AC2).

Drought

Increasing drought conditions, and water conservation measures may impact sanitation and waste management services such as water use on roads to meet dust permit requirements and for composting.[76] These factors contribute to moderate sensitivity (S2). Water is not necessary for the function of these services, however, resulting in moderate-high adaptive capacity (AC3).

Wildfire

Most waste management facilities are not located in areas at high risk to wildfire exposure, however, regional wildfires and impaired air quality could impact transportation needs or workforce availability, contributing to the system's moderate sensitivity (S2).[77] Wildfires on Mt. Charleston could directly impact transportation if roads are closed.[78] Due to the available options to mitigate these challenges, such as changing shift or pick-up schedules, sanitation and waste management services have moderate-high adaptive capacity (AC3).

Flooding

If flash floods close roadways, pick-up points and waste hauling routes could be impacted, resulting in moderate-high sensitivity (S3).[79] Most waste facilities are built to withstand a 25-year, 24-hour storm.[80] Due to the ability to respond to these challenges by altering routes or schedules, sanitation and waste management services have moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Sanitation/Waste Management	Extreme Heat	S3	AC2	Moderate
	Drought	S2	AC3	Somewhat
	Wildfire	S2	AC3	Somewhat
	Flooding	S3	AC3	Somewhat


© Clark County

Government & Administrative Facilities

Government and administrative facilities are moderately vulnerable to the impacts of extreme heat and somewhat vulnerable to the impacts of drought, wildfire, and flooding.

Extreme Heat

Many mechanical systems throughout County facilities are designed for 125°F, including any new design or retrofit. Facilities with older or under-designed mechanical systems, which are likely designed for 115°F, have often failed at 108°F to 109°F.[81] Public facilities are particularly vulnerable to extreme heat; outages may be caused by grid failures or older systems failing under increased temperatures resulting in moderate-high sensitivity (S3). While all new buildings or retrofits are designed to work up to 125 degrees, not all facilities are equipped with backup generation that can run continued cooling, government and administrative facilities have moderate adaptive capacity (AC2).

Drought

While increasing drought conditions could impact watering schedules and therefore, the ability to use government and administrative facilities under current capacities, this would not likely affect critical services, resulting in moderate sensitivity (S2).[82] In circumstances of severe drought conditions, facility upgrades (e.g., irrigation, efficiency improvements) would be needed for continued sustained use of government and administrative facilities, resulting in moderate adaptive capacity (AC2).

Wildfire

Facilities located near Mt. Charleston are the most likely to be directly impacted by wildfire, while other facilities may be impacted by regional wildfires and smoke events if staff are unable to come to work, resulting in moderate sensitivity (S2). With increasing local wildfires, facilities near Mt. Charleston may need to relocate, resulting in moderate adaptive capacity (AC2).

Flooding

Some Clark County government facilities have been damaged or placed out of service due to flood damage, extreme storms, and heavy winds, particularly in more rural, flood-prone areas, resulting in moderate sensitivity (S2). Some investment may be required to flood-proof facilities located in flood-prone areas resulting in moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Government & Administrative Facilities	Extreme Heat	S3	AC2	Moderate
	Drought	S2	AC2	Somewhat
	Wildfire	S2	AC2	Somewhat
	Flooding	S2	AC3	Somewhat


LEARANCE 8'-2"
RESERVED CHARGING
ELECTRIC VEHICLE CHARGING STATION

Residents in rural communities have a more limited adaptive capacity to extreme events due to limited access to social and financial resources, limited or absent organizational support during extreme events and more direct reliance on transportation, water, and communication infrastructure for basic needs and services.

Climate Considerations and the Urban/Rural Divide

Climate change presents unique challenges to both rural and urban Clark County communities. The majority of the Clark County population is located in the Las Vegas Valley.[83] Increased urbanization and development in the Valley have led to an increasing number of residents at risk to extreme events. For example, floods on August 4, 2017 along the Las Vegas Strip area led to eight individuals being swept away by floodwaters, one of whom did not survive. Yet, urban areas often itinerantly provide increased social support, access to county and municipal resources, system redundancy, and increased flexibility which contribute to a higher adaptive capacity.

Generally, residents in rural communities have a more limited adaptive capacity to extreme events because they have limited access to infrastructure or services due to geographic distance. Rural areas experiencing higher poverty rates, such as the Moapa Indian Reservation (37.2% compared to the City of Las Vegas's 14.9%), may also be more vulnerable to extreme events.[84] Rural communities may also face more frequent disruptions to essential services. For example, the flooding that occurred on September 9, 2014 reduced accessibility to and from the Moapa River Indian Reservation, leaving residents with reduced access to critical services.[85] Some communities in the northeast part of the county (like Moapa, Bunkerville, and Warm Springs) are especially remote, leading to potentially longer response times during emergencies due to travel distances and the availability of equipment and personnel to respond.[86] In addition, the limited transportation infrastructure in rural areas may be aging, damaged, or in disrepair due to underinvestment, which can further exacerbate access to resources, support, and supplies before, during, and after an event.

People & Community

Housing

Housing is moderately vulnerable to the impacts of extreme heat and drought and somewhat vulnerable to the impacts of wildfire and flooding.

Extreme Heat

Under extreme heat conditions, there is an increased energy and utility cost burden on the housing system due to demand for cooling. Further, state law currently does not have clear standards for heating and cooling in housing and few energy, cooling, and weatherization programs are specific to Clark County. Housing has moderate-high sensitivity (S3) and low-moderate adaptive capacity (AC1).

Drought

Housing development, including much needed affordable housing, could be affected by demand-management strategies triggered by water shortages. Housing can also increase water usage, exacerbating drought exposure and impacts, though high-density housing tends to be more efficient than single-family homes. Additionally, options to significantly temper water usage can be challenging, especially for housing in rural areas. The moderate-high sensitivity (S3) and low-moderate adaptive capacity (AC1) of Clark County's housing system compounds the sensitivity of its residents, especially low- and fixed-income, unhoused, or rural residents.

Wildfire

Seven Clark County communities have "high" or "extreme" wildfire hazard ratings, including: Cold Creek, Kyle Canyon, Lee Canyon, Mountain Springs, Nelson, Torino Ranch, and Trout Canyon. Residents and homes in these communities are at greater risk of direct wildfire impacts. Local and regional wildfires can cause smoke inhalation and poor air quality, which negatively impact residents living in homes without adequate air filtration systems. Increasing development in wildland, urban interface areas (WUIs) across the state puts additional demand on public resources.[87] Housing has low-moderate sensitivity (S1) and moderate adaptive capacity (AC2).

Flooding

The majority of at-risk people and property are in the Las Vegas Wash, which contains Las Vegas, North Las Vegas, and Henderson.[88] Though not heavily populated, housing in rural areas may be significantly impacted by flooding because of fewer resources available for response and recovery. This includes areas alongside the Muddy River (which flows through Overton and Logandale) and the Virgin River (which runs along the southern boundary of Mesquite), much of which is within the County's SFHA.[89] Unhoused residents (especially those living in stormwater infrastructure) also face acute risk in the event of flash flood events. Housing has moderate sensitivity (S2) and moderate adaptive capacity (S2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Housing	Extreme Heat	S3	AC1	Moderate
	Drought	S3	AC1	Moderate
	Wildfire	S1	AC2	Somewhat
	Flooding	S2	AC2	Somewhat

© Clark County

Schools

Schools are moderately vulnerable to the impacts of extreme heat and drought and somewhat vulnerable to the impacts of wildfire and flooding.

Extreme Heat

Extreme heat may negatively impact learning, physical health, mental health, socio-personal development, mood, and compliance. Excessive heat limits access to outdoor spaces, and impacts those who walk, roll, or bike to school. Increasing temperatures negatively impact school infrastructure, operations, and programming as higher temperatures cause increased demand for cooling that strains older HVAC systems or increases the risk of power outage, with health and safety implications. Clark County School District (CCSD) is well positioned to successfully adapt to future conditions through available and anticipated funding resources, staffing capacity, programmatic initiatives, and ongoing partnerships. Through the current Capital Improvement Program (2015-2025) and the recently developed Sustainability, Energy, and Environmental Services Department, the district is renovating facilities with sustainability in mind. Schools have moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Drought

As the 5th largest school district in the nation and the largest non-federal, single-entity public employer in Nevada,[90] CCSD has relatively high demand for water, as well as aging or inefficient water infrastructure (e.g., lack of clean, functioning, and efficient water fountains and leaking irrigation systems). However, CCSD is well positioned to successfully adapt to future drought through available and anticipated funding and resources. Schools have moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Wildfire

The largest cities within the county served by CCSD include Las Vegas, Henderson, and North Las Vegas. But, the district also services cities and rural areas as far north as Indian Springs and Mesquite and as far south as Laughlin and Searchlight. If Clark County's rural schools were grouped into their own district, it would be the fourth-largest rural district in the state.[91] While not all schools are at equal risk of wildfire impacts, the school district is impacted by poor air quality due to wildfire smoke. These smoke events impact health and limit outdoor access for CCSD students, teachers, administrators, and staff, leading to moderate sensitivity (S2) and adaptive capacity (AC2).

Flooding

While not all schools are at equal risk of flood impacts because of variations in topography and urbanization, flooding can pose mobility issues for those traveling to CCSD facilities.[92,93] Floods can also disrupt school operations, interfering with programming or causing delays or closures. CCSD is well positioned to successfully adapt to future conditions through available and anticipated funding and resources, leading to moderate sensitivity (S2) and moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Schools	Extreme Heat	S3	AC2	Moderate
	Drought	S3	AC2	Moderate
	Wildfire	S2	AC2	Somewhat
	Flooding	S2	AC3	Somewhat

Correctional Facilities & Detention Centers

Correctional facilities and detention centers are moderately vulnerable to the impacts of extreme heat and wildfire, somewhat vulnerable to the impacts of drought, and minimally vulnerable to the impacts of flooding.

Extreme Heat

Excessive heat is a great concern for incarcerated and detained individuals, as well as staff, threatening physical and mental health, socio-personal development, mood, and compliance. Increasing temperatures strain these facilities by increasing utility costs and power outages, which in turn have health and safety implications. High temperatures also strain older and inefficient HVAC systems in many older facilities, leading to moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Drought

Currently, correctional and detention facilities already ration water use, including shortened shower times and toilet flushing, as well as automatic shut offs. Water usage issues are exacerbated by leakage due to aging infrastructure. To the extent possible, facilities have water storage on site for emergency use. Continued extreme drought conditions will stress facility operations and reduce incarcerated individuals' regular access to basic needs, leading to moderate sensitivity (S2) and moderate-high adaptive capacity (AC3).

Wildfire

In 2021, the Mt. Charleston facilities (Spring Mountain Youth Camp and Residential Center) had to evacuate due to impending wildfire—a process that was time and resource intensive. When not facing direct wildfire impacts, both corrections and detention inmates and staff are negatively impacted by poor air quality. This impacts lung health, exacerbates preexisting conditions, and limits incarcerated and detained individuals' access to outdoor spaces, leading to moderate-high sensitivity (S3) and moderate adaptive capacity (AC3).

Flooding

Existing facilities experience few flooding impacts during heavy rain events. That said, facilities in lower lying areas are especially at risk for flash flooding, and impacts are generally worse in rural areas compared to urban areas. Correctional facilities and detention centers have low-moderate sensitivity (S1) and moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Correctional Facilities & Detention Centers	Extreme Heat	S3	AC2	Moderate
	Drought	S2	AC3	Somewhat
	Wildfire	S3	AC2	Moderate
	Flooding	S1	AC3	Minimal


© Clark Cty Public Library

Public & Community Facilities

Public and community facilities are moderately vulnerable to the impacts of extreme heat and drought and somewhat vulnerable to the impacts of wildfire and flooding.

Extreme Heat

Increasing temperatures pose extreme heat impacts to public and community facility operations and to programming and service providers, impacting at-risk community members who use these facilities and services. Under extreme heat conditions, public and community facilities often have issues maintaining air conditioning and, at facilities that double as cooling centers, their HVAC systems can be stressed by extended cooling hours. Extreme heat also increases the risk for power outages, and facilities without backup power are especially vulnerable to brownouts. Heat can impact physical and mental health of users especially in youth centers. Given these factors, the system has moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Drought

Increased drought could impact water availability and quality at community facilities, which poses a public health concern to youth and members of the public engaged in outdoor programming. Drought can also place increased stress on facilities staff because of secondary and tertiary impacts on at-risk community members they serve. As a result, the system has moderate-high sensitivity (S3) and low-moderate adaptive capacity (AC1).

Wildfire

While many public and community facilities do not face direct wildfire impacts, their operations, staff, and members experience indirect wildfire impacts. This primarily includes poor air quality, which impacts lung health, exacerbates preexisting conditions, and limits access to outdoor spaces and programming. In addition to directly affecting residents who use public and community facilities, wildfire impacts can increase stress on public and community facilities staff because of secondary and tertiary impacts on at-risk community members they serve. Given these factors, the system has moderate sensitivity (S2) and adaptive capacity (AC2).

Flooding

While not all public and community facilities are at risk of significant flash flooding impacts, flooding can cause mobility issues for community members traveling to and from public and community facilities including pedestrians and those relying on public transit, especially seniors, youth, and disabled community members.[94,95] Programming and services may also be limited as a result of heavy rain and flood impacts. As a result, the system has moderate sensitivity (S2) and moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Public & Community Facilities	Extreme Heat	S3	AC2	Moderate
	Drought	S3	AC1	Moderate
	Wildfire	S2	AC2	Somewhat
	Flooding	S2	AC3	Somewhat

Parks, Open Space, & Recreation

Parks, open spaces, and recreation are moderately vulnerable to the impacts of extreme heat and drought and somewhat vulnerable to the impacts of wildfire and flooding.

Extreme Heat

These public assets and activities derive their value from community use and the ability to engage in activities outdoors. During extreme heat events, people are unable to recreate outdoors and engage in activities at parks and other outdoor spaces. Prolonged exposure to extreme temperatures puts additional stress on vegetation and increases the financial burden to maintain various functions and operations of these spaces and facilities.[96] Fewer trees in parks can directly impact the wildlife. These spaces have moderate-high sensitivity (S3) and low-moderate adaptive capacity (AC1). that depend on them and lead to less shade cover for wildlife and people in the area.

Drought

Vegetation in many parks and public spaces already require irrigation support, and prolonged drought conditions lead to limited water supply. Supporting vegetation with additional irrigation impacts the plants and animals that rely upon and compete for the same water supply.[97] In some areas, particularly riparian wetland and upland areas, trees require substantial water to survive. Prolonged drought can lead to a loss of urban tree cover, which can exacerbate impacts from heat. These spaces have moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Wildfire

Local or regional wildfires can restrict the ability of people to spend time outdoors due to the proximity to an active fire or reduced air quality from wildfire smoke. For those who continue to go outdoors, there are increased health risks from either prolonged or limited exposure to smoke.[98] The direct threat of wildfire to the lands and facilities is particularly elevated in rural communities, for example Mt. Charleston. Individuals can adapt their activities to protect themselves, however, outdoor spaces and facilities are less able to adapt to more frequent and intense wildfires. These spaces have moderate sensitivity (S2) and moderate adaptive capacity (AC2).

Flooding

Increased incidence and severity of flash flooding can be detrimental to land and infrastructure that supports public and outdoor recreation. For example, a microburst in 2021 at Arroyo Grande Park caused significant damage to the softball fields. Flash flooding already causes trash and debris buildup in areas such as the Sunrise Golf Course, and runoff can cause a buildup of debris and silt that can impact trails within parks or those that connect to parks, impacting access. These spaces have moderate sensitivity (S2) and moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Parks, Open Space, & Recreation	Extreme Heat	S3	AC1	Moderate
	Drought	S3	AC2	Moderate
	Wildfire	S2	AC2	Somewhat
	Flooding	S2	AC2	Somewhat

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Critical Health Facilities

Critical health facilities are moderately vulnerable to the impacts of extreme heat and wildfire and somewhat vulnerable to the impacts of drought and flooding.

Extreme Heat

The increase in heat-related illnesses, including cardiovascular and respiratory stresses, puts additional stress on critical health facilities and healthcare workers. Frontline communities are generally more sensitive groups to the impacts of extreme heat. Disruptions to power systems during extreme heat events can have a significant impact on the functionality of health care facility operations, storage and access to essential medications, and medical treatments of individuals. Critical health facilities have moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Drought

Due to the dependence on water critical health facilities are considered moderately sensitive (S2) to prolonged periods of drought. Critical health facilities are likely prioritized during periods of heightened water conservation efforts; however, water levels of Lake Mead are continually decreasing and reaching historic lows, leaving critical health facilities at risk if water quantities continue to diminish. Critical health facilities have moderate adaptive capacity (AC2).

Wildfire

Critical health facilities observe increases in respiratory and cardiovascular cases when air quality is degraded, from particulate matter in wildfire smoke.[99] These impacts to public health and air quality can occur from distant or regional wildfires, such as in 2021 from the Caldor Fire. Individuals with preexisting health conditions are more sensitive to the impacts from wildfire smoke, and Clark County observed a higher mortality rate (50.1 per 100,000) from Chronic Lower Respiratory Diseases (CLRD) in 2016-2018 compared to the national rate (40.4 per 100,000).[100] Wildfires can directly affect the ability of emergency services to provide access to impacted areas, and indirectly impact facilities due to power disruptions. While healthcare facilities are generally equipped to handle additional cases of respiratory and cardiovascular illness, these facilities and workers are often at capacity. Critical health facilities have moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Flooding

While floods can be costly, there is generally not a significant impact to public health. Most critical health facilities within the county are located safely outside of flood hazard areas; yet flash floods can temporarily restrict access by community members and healthcare workers to critical health and emergency services. If a flash flood directly impacts a critical health facility, hospital staff and patients are not well-equipped to move quickly to another facility. Critical health facilities have low-moderate sensitivity (S1) and moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Critical Health Facilities	Extreme Heat	S3	AC2	Moderate
	Drought	S2	AC2	Somewhat
	Wildfire	S3	AC2	Moderate
	Flooding	S1	AC2	Somewhat

Cultural & Spiritual Sites

Cultural and spiritual sites are moderately vulnerable to impacts of drought, wildfire, and flooding and somewhat vulnerable to the impacts of extreme heat.

Extreme Heat

Extreme heat events reduce the ability of people to visit outdoor sites and travel to other cultural and spiritual sites or facilities. Prolonged exposure to extreme temperatures can negatively impact certain native plant and animal species (such as pine nuts and the Mojave Desert tortoise) that have significant cultural/spiritual significance. Many cultural and spiritual sites have been around for many years and endured and adapted to changing environmental conditions and social changes. These sites have moderate sensitivity (S2) and moderate adaptive capacity (AC2).

Drought

Many sites holding cultural and spiritual significance have experienced historical periods of extensive drought and adapted to changing environmental conditions.[101] Indigenous peoples have mirrored these natural adaptations in how they use these sites and associated resources. Some cultural and spiritual sites rely on water resources or the water itself, and will certainly be impacted from prolonged drought periods and reduced water supply. These sites have moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Wildfire

The Spring Mountains hold particular cultural significance, as they are considered the center of Creation for the Southern Paiute[102], and this area is increasingly threatened by wildfire. While smaller wildfires are a regular occurrence throughout parts of the county, projected changes in wildfires (and mega-fires) pose additional challenges and stressors that can negatively impact culturally significant resources and accessibility to these areas.[103] In addition, financial barriers prohibit many Tribal members from being able to move even if the opportunity was available to them. These sites have moderate-high sensitivity (S3) and moderate adaptive capacity (AC2).

Flooding

Flash flooding can significantly impact some cultural and spiritual sites. For the Las Vegas Paiute, flash flooding impacts sacred places more than any other hazard by washing out monuments and eroding terrain and sandstone.[104] The impacts of more intense flash flood events have the potential to make these sites inaccessible or erode them completely. Tribal members and other culturally significant sites residing on a reservation cannot simply relocate away from a hazard. These sites have moderate-high sensitivity (S3) and low-moderate adaptive capacity (AC1).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Cultural & Spiritual Sites	Extreme Heat	S2	AC2	Somewhat
	Drought	S3	AC2	Moderate
	Wildfire	S3	AC2	Moderate
	Flooding	S3	AC1	Moderate

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Art Centers/Venues

Art centers and venues are somewhat vulnerable to the impacts of extreme heat, drought, and wildfire, and minimally vulnerable to the impacts of flooding.

Extreme Heat

Generally, extreme heat may reduce peoples' ability to travel to and visit art centers, galleries, and other venues, therefore reducing visitation to these businesses and venues and leading to moderate sensitivity (S2). Many facilities throughout the county are equipped with cooling devices and are able to offer respite from extreme temperatures for visitors; however, some facilities and venues have outdoor components and can limit the ability to adapt during extreme heat events. This results in moderate-high adaptive capacity (AC3).

Drought

Prolonged periods of drought and increased water conservation efforts have the potential to impact visitation and attendance at art centers and venues, resulting in low-moderate sensitivity (S1). Certain actions can be taken to reduce the impacts of drought on these particular facilities; however, these actions and associated available resources, benefits, and challenges to implementing them differ across facilities. This results in moderate adaptive capacity (AC2).

Wildfire

As wildfires are projected to increase in frequency and intensity, art centers and venues within Clark County are increasingly vulnerable to direct and indirect impacts of wildfire. People may be less likely to visit galleries and other art events and venues during periods of low air quality, but many of these facilities located in more urban areas are not directly threatened by wildfire, resulting in low-moderate sensitivity (S1). Indoor facilities have opportunities to mitigate the impacts of poor air quality and could potentially serve as areas of respite from wildfire smoke, resulting in moderate adaptive capacity (AC2).

Flooding

Extreme weather events, such as flash flooding, reduce peoples' ability to travel to and visit art centers, galleries, and other venues, therefore reducing visitation to these businesses and venues. Flash flood events can cause reduced operating hours that can impact workers and artists, and significant flood events may affect the facilities, resulting in low-moderate sensitivity (S1). The ability of these facilities to be flexible in operating procedures and timing results in moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Art Centers/Venues	Extreme Heat	S2	AC3	Somewhat
	Drought	S2	AC2	Somewhat
	Wildfire	S1	AC2	Somewhat
	Flooding	S1	AC3	Minimal

Regional Economy & Transportation

Small Business

Small businesses are moderately vulnerable to the impacts of extreme heat and wildfire and somewhat vulnerable to the impacts of drought and flooding.

Extreme Heat

Extreme heat can affect small businesses in a range of ways including productivity loss, impact on outdoor workers, loss of work time due to extreme events, and increased energy and operating costs. In addition, non-climate related stressors (e.g., business growth demands and stressors) contribute to the sensitivity of small businesses. Due to these factors, and the high proportion of small businesses in the region (they employ 42% of the private workforce across the State)[105], small businesses have moderate-high sensitivity (S3) to the impacts of extreme heat. Generally speaking, a variety of factors contribute to small businesses having low-moderate adaptive capacity (AC1) to extreme heat, including: limited support systems, limited financial resources, elevated flexibility, and limited agency (ability or authority to take action).

Drought

Generally, small businesses across Clark County have low-moderate sensitivity (S1) to the impacts of drought. However, limited size and sensitivity to some non-climate related stressors (e.g., business growth demands, operating costs, affordability) can exacerbate that sensitivity. Experience with past events, agency, and enhanced flexibility result in moderate adaptive capacity (AC2).

Wildfire

Although dependent on the industry, wildfires and smoke can impact small businesses through productivity disruptions, non-climate related stressors (e.g., business demands), and impacts on outdoor workers or those working in buildings with inadequate filtration systems. Generally, small businesses have moderate sensitivity (S2) to the impacts of wildfire. Limited support systems, financial resources, and elevated agency and flexibility contribute to low-moderate adaptive capacity (AC1).

Flooding

Flooding can directly and indirectly impact small businesses resulting in disruptions to business operations, impacts to workers, and damage to buildings. In addition, non-climate related stressors (e.g., supply chain constraints) contribute to low-moderate sensitivity (S1) to the impacts of flooding. Access to resources, organizational support, ongoing investments in policies and projects that limit the development of businesses in flood-prone areas, elevated flexibility, and the innate agency of small businesses contribute to moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Small Businesses	Extreme Heat	S3	AC1	Moderate
	Drought	S1	AC2	Somewhat
	Wildfire	S2	AC1	Moderate
	Flooding	S1	AC2	Somewhat

Regional Economy & Transportation

(CONTINUED)

Manufacturing/Industrial

Manufacturing and industrial systems are moderately vulnerable to the impacts of extreme heat and drought and somewhat vulnerable to the impacts of wildfire and flooding.

Extreme Heat

Extreme heat events can result in productivity loss, impact outdoor workers, and increase energy and operational costs for the manufacturing and other industries, resulting in moderate-high sensitivity (S3) to the impacts of extreme heat. The sensitivity of frontline community members who work outdoors, or for those with preexisting health conditions exacerbated due to extreme heat events can be particularly severe.[106] Limited operational flexibility and production needs as well as additional constraints (e.g., market demands) result in low-moderate adaptive capacity (AC1).

Drought

Due to the general dependence of many manufacturing and industrial businesses on water resources,[107] these systems are moderately sensitive (S3) to the impacts of drought. For example, large industrial warehouses and commercial businesses have traditionally relied on evaporative cooling-which is the second largest consumptive use of water for our community behind landscape irrigation-to reduce ambient temperatures.[108] In a push to tighten water conservation measures across the region, SNWA recently passed a resolution supporting a moratorium on installing evaporative cooling in commercial and industrial buildings, which may result in higher energy costs for manufacturing/industrial businesses.[109] The slow uptake of water conservation technology by the industry result in low-moderate adaptive capacity (AC1).

Wildfire

Wildfires and smoke can result in productivity loss and can impact workers, particularly for outdoor workers or those working in buildings with limited filtration, resulting in moderate sensitivity (S2) to wildfire. Frontline community members (e.g., individuals who work outdoors or in buildings without proper filtration, those that with preexisting health concerns exacerbated by wildfire smoke, etc.) are more sensitive to the impacts of wildfire and wildfire smoke. Access to resources, organizational support, and constraints (e.g., market demands) result in moderate adaptive capacity (AC2).

Flooding

Flooding can directly and indirectly impact businesses, resulting in disruptions, loss of productivity, and impacts to the supply chain. Manufacturing and industrial systems have moderate sensitivity (S2) to the impacts of flooding. The majority of manufacturing and industrial operations are located in Las Vegas; therefore, these industries are more likely to have access to resources, invest in organizational support, and pursue ongoing planning and policy updates to reduce the sensitivity of the city to flooding. Ongoing efforts to enhance the adaptive capacity to extreme precipitation events result in moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Manufacturing/ Industrial	Extreme Heat	S3	AC1	Moderate
	Drought	S3	AC1	Moderate
	Wildfire	S2	AC2	Somewhat
	Flooding	S2	AC2	Somewhat

Food Systems

Food systems are moderately vulnerable to the impacts of extreme heat and somewhat vulnerable to the impacts of drought, wildfire, and flooding.

Extreme Heat

While very little of Clark County's food is grown locally[110] extreme heat events can result in supply chain disruptions in other states, increasing energy demand and cost, and impacts to outdoor workers, resulting in a moderate-high sensitivity (S3). This is particularly true for the approximately 50 food producers who operate in the region (like Gilcrease Orchard) and for the regional food suppliers.[111] Food systems' ability to adapt with new technologies (e.g., aquaponics), in combination with increasing flexibility and supply chain efficiency improvements result in moderate adaptive capacity (AC2).

Drought

Because very little of the region's food is grown locally, partially due to already limited access to water,[112] food systems are only moderately sensitive (S2) to the impacts of drought. Drought may, however, result in supply chain disruptions, increasing water restrictions, and increasing energy demand and cost for food suppliers and/or distributors. Drought can also impact farming[113] and exacerbate existing inequities for frontline community members due to the cost and availability of food, particularly in food deserts. It can also impact food system employment availability and stability. Generally speaking, due to the ability of food producers in the region to learn from past events and to be flexible in the processes used and the varieties of foods produced, food systems have moderate adaptive capacity (AC2) to drought.

Wildfire

Most of the region's food is produced in a fire-prone state (California), where wildfires and smoke have the ability to impact the food supply chain. Local and regional wildfires pose a direct threat to I-15, the primary roadway for food delivery from California. Food system, therefore, have moderate-high sensitivity (S3). New technologies, more efficient supply chain improvements, and increasing flexibility in the food system result in moderate adaptive capacity (AC2).

Flooding

Flash floods can result in supply chain disruptions and impact outdoor workers. In addition, non-climate related stressors (including food insecurities, the amount of food that is imported, and vulnerabilities in the food systems) contribute to moderate sensitivity (S2). Frontline community members who work in food systems may be particularly sensitive to the impacts of flooding due to disruptions to their employment. More efficient supply chain improvements and increasing flexibility in the food system result in moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Food Systems	Extreme Heat	S3	AC2	Moderate
	Drought	S2	AC2	Somewhat
	Wildfire	S3	AC2	Moderate
	Flooding	S2	AC2	Somewhat

Regional Economy & Transportation

(CONTINUED)

Trades

Trades are somewhat vulnerable to the impacts of extreme heat, drought, and flooding, and minimally vulnerable to the impacts of wildfire.

Extreme Heat

In general, extreme heat events can impact outdoor workers, increase energy demand costs, and result in productivity loss. In Clark County, these factors contribute to low-moderate sensitivity (S1) of the trades to the impacts of extreme heat. In addition, frontline community members (e.g., those with preexisting health conditions, older adults, those who work outdoors) may be more sensitive to the impacts of extreme heat than other trade workers. The industry's experience with extreme heat, its dynamic ability to be flexible, and current and future policy investments that protect trade workers contribute to moderate adaptive capacity (AC2). For example, recent adaptations in the trade industry include moving critical building activities (like pouring concrete) to cooler times throughout the day and implementing strategic community engagement to ensure minimal disruptions to neighbors.[114]

Drought

While water poses an existential threat to many systems across the county, trades have low-moderate sensitivity (S1) to the impacts of drought. In some cases, water shortages could trigger new development moratoriums, but local and regional development goals across the region continue to support trades. Due to the relative flexibility and agency that trade industries assume, adaptive capacity to drought conditions is moderate (AC2).

Wildfire

Wildfires and smoke can impact outdoor workers and workers in buildings with inadequate filtration systems, increase energy demand costs due to supply chain disruptions, and can result in productivity loss. These factors contribute to a low-moderate sensitivity (S1) of trades to the impacts of wildfire. Yet, frontline community trade workers (e.g., individuals who may experience preexisting health concerns, older adults, limited access to air filtration systems, etc.) have increased sensitivity to wildfires and wildfire smoke. The industry's experience, ability to be flexible, and existing resources contribute to moderate-high adaptive capacity (AC3).

Flooding

Flooding can directly and indirectly impact businesses, resulting in disruptions, loss of productivity, and impacts to the supply chain. Trades have low-moderate sensitivity (S1) to the impacts of flooding. Ongoing planning and policy interventions that prevent development in flood-prone areas, as well as increased flexibility and resources contribute to moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Trades	Extreme Heat	S1	AC2	Somewhat
	Drought	S1	AC2	Somewhat
	Wildfire	S1	AC3	Minimal
	Flooding	S1	AC2	Somewhat

Professional and Public Service Employment

Professional and public service employment is somewhat vulnerable to the impacts of extreme heat, drought, wildfire, and flooding.

Extreme Heat

Professional and public service employees have an overall moderate sensitivity (S2) to extreme heat. In addition to ongoing concerns and identified needs for additional investment in Clark County's education system (the State has ranked last or towards the bottom of recent national education metrics),[115] extreme heat events can lead to additional productivity loss and increased energy and operating costs. Inherent and contributed resources of the professional and public service employment sector, experience with extreme heat, and new technologies contribute to moderate adaptive capacity (AC2).

Drought

Professional and public service employment has low-moderate sensitivity (S1) to the impacts of drought. Some municipalities - like Las Vegas - are focused on growth and target education, economy, and housing as primary indicators for enhancing the quality of life for Las Vegas residents.[116] The prioritization of quality of life, as well as flexibility particularly in larger urban centers,[117] result in moderate adaptive capacity (AC2).

Wildfire

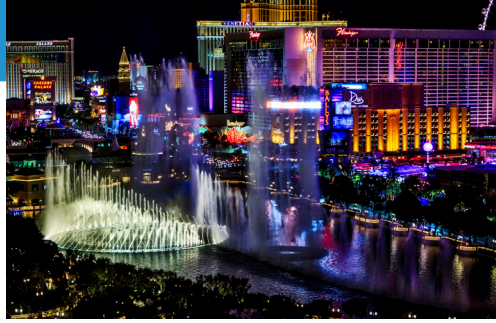
Wildfires and smoke can cause productivity disruptions and increased energy and operating costs, resulting in moderate sensitivity (S2). Experience with, inherent and contributed resources, and new technologies (e.g., better smoke filtration systems in buildings) contribute to moderate adaptive capacity (AC2).

Flooding

Flash flooding can directly and indirectly impact professional and public service employment across the county, resulting in productivity loss, impacts to workers, and disruption of operations. These factors contribute to low-moderate sensitivity (S1) to the impacts of flooding. Inherent and contributed resources, organizational support, access to tools, information, and new technologies contribute to moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Professional and Public Service Employment	Extreme Heat	S2	AC2	Somewhat
	Drought	S1	AC2	Somewhat
	Wildfire	S2	AC2	Somewhat
	Flooding	S1	AC2	Somewhat



Tourism

Tourism is somewhat vulnerable to the impacts of extreme heat, drought, and wildfire, and minimally vulnerable to the impacts of flooding.

Extreme Heat

Extreme heat events can directly and indirectly impact tourism, restricting travel (e.g., airport operations due to impacts on tarmac), increasing energy and operating costs for businesses, affecting hospitality workers who have limited access to shade or air conditioning, and limiting outdoor tourist activities. That being said, the most popular tourist destinations in the county provide a variety of tourist activities that have a limited sensitivity to extreme heat events.[118] Tourism is moderately sensitive (S2) to the impacts of extreme heat. The industry's experience with extreme heat, resources, and ability to be flexible during extreme heat events contribute to moderate-high adaptive capacity (AC3).

Drought

Water restrictions in place due to drought conditions can negatively impact and even deter tourism, particularly for operations that utilize a lot of water, such as golf courses, casinos, and hotels.[119] Therefore, tourism is moderately sensitive (S2) to the impacts of drought. Because tourism has been prioritized as a major industry, it has dedicated resources to ensuring its success. Therefore, it has moderate-high adaptive capacity (AC3).

Wildfire

Wildfires and smoke can directly and indirectly impact tourists by reducing the desire to travel, increasing energy and operating costs for tourism businesses, and limiting the ability of tourists to recreate outdoors. Tourism has moderate-high sensitivity (S3) to the impacts of wildfire. The industry's experience with wildfire and smoke events, resources, agency, and ability to be flexible during wildfire events contribute to moderate-high adaptive capacity (AC3).

Flooding

Flash flooding can directly and indirectly impact tourists, limit the ability of travel, impact critical infrastructure and services, and limit the ability of tourists to recreate outdoors.[120] Despite the vast number of tourists that visit Clark County every year,[121] the tourism sector only has low-moderate sensitivity (S1) to the impacts of flooding. Though flooding has not previously posed significant risks to the tourism industry, as flooding worsens, there is potential for this risk to increase. For example, an increase in flooding in 2022 has led to flooding at hotels and casinos. The industry's experience, resources, policy and planning efforts, development restrictions in flood-prone areas, and the ability to be flexible during flash flooding events contribute to moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Tourism	Extreme Heat	S2	AC3	Somewhat
	Drought	S2	AC3	Somewhat
	Wildfire	S3	AC3	Somewhat
	Flooding	S1	AC3	Minimal

Regional Economy & Transportation

(CONTINUED)

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Transit and Bike/Pedestrian Infrastructure

Transit and bike/pedestrian infrastructure is moderately vulnerable to the impacts of extreme heat and drought and somewhat vulnerable to the impacts of wildfire and flooding.

Extreme Heat

Extreme heat impacts the operational capacity of transit systems and increases energy needs and costs, resulting in moderate-high sensitivity (S3). The sensitivity to extreme heat events can be particularly severe for frontline community members who rely on transit operations and/or bike/pedestrian infrastructure to access critical services, especially in rural areas.[122] Over 90% of the 41,000 one-way trips per month on the Southern Nevada Transit Coalition (SNTC) Silver Rider service–which provides services in several rural communities across the County–are work-related.[123] New technologies (e.g., electric buses), resource allocation and planning efforts that are prioritizing Complete Streets in urban centers in the County,[124] and flexibility in the system contribute to moderate adaptive capacity (AC2). As technologies evolve and additional investments are made in transit and bike/pedestrian infrastructure in urban areas, the sensitivity will decrease.

Drought

Non-climate related stressors (e.g., continuous maintenance needs) that impact transit and bike/pedestrian infrastructure contribute to a moderate-high sensitivity (S3) to the impacts of drought. The region's experience, continued investment in transportation improvement projects, and planning efforts result in moderate adaptive capacity (AC2).

Wildfire

Wildfires and smoke can directly and indirectly impact the operational capacity of transit systems (e.g., disruptions and closures of roads and highways resulting in more transit ridership), resulting in moderate sensitivity (S2). Sensitivity may increase for frontline community members who rely on transit and for those who need to travel using transit but experience preexisting health concerns.[125] Wildfires and smoke also directly and indirectly impact bikers and pedestrians who access these critical services. New technologies (e.g., wildfire smoke filtration in buses), existing resources, increased learning, and flexibility in the system contribute to moderate adaptive capacity (AC2).[126]

Flooding

Flooding directly and indirectly impacts transit and bike/pedestrian infrastructure, resulting in moderate sensitivity (S2). Sensitivity to flooding may increase for frontline community members who rely on transit and bike/pedestrian infrastructure to access critical services. Ongoing planning and policy interventions (e.g., flood control program by Clark County Regional Flood Control District), as well as access to resources and flexibility in the system contribute to moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Transit and Bike/ Pedestrian Infrastructure	Extreme Heat	S3	AC2	Moderate
	Drought	S3	AC2	Moderate
	Wildfire	S2	AC2	Somewhat
	Flooding	S2	AC3	Somewhat

Freight & Passenger Rail

Freight & Passenger Rail systems are moderately vulnerable to the impacts of extreme heat, somewhat vulnerable to the impacts of wildfire and flooding, and minimally vulnerable to the impacts of drought.

Extreme Heat

Extreme heat events can directly and indirectly impact rail infrastructure, as higher temperatures may lead to buckling of tracks and slowing of operations. Although current rail use in the county is limited, the rail system in Clark County has moderate sensitivity (S2) to extreme heat events. Despite ongoing discussions about enhancing passenger rail service in the county in the future, 77% of freight tonnage across the state is currently carried by trucks, the majority of which are moving to and from California.[127] Non-climate related stressors (e.g., aging and expensive infrastructure) contribute to the sensitivity of rail to extreme heat events. Limited investment in, and flexibility of, the rail system result in low-moderate adaptive capacity (AC1).

Drought

Generally, drought rarely directly impacts rail infrastructure, resulting in low sensitivity (S0). Limited investment in and flexibility of rail infrastructure in the region results in moderate adaptive capacity (AC2).

Wildfire

On rare occasions, wildfires can directly damage rail infrastructure, resulting in low-moderate sensitivity (S1). In addition, non-climate related stressors (e.g., aging and expensive infrastructure) contribute to the sensitivity to wildfires. Limited investment in and flexibility of rail infrastructure in the region results in moderate adaptive capacity (AC2).

Flooding

Although rare, flooding can directly and indirectly impact rail infrastructure, including direct damage and disruptions to the supply chain and operations, leading to low-moderate sensitivity (S1). Limited investment in and flexibility of rail infrastructure in the region results in moderate adaptive capacity (AC2).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Rail	Extreme Heat	S2	AC1	Moderate
	Drought	S0	AC2	Minimal
	Wildfire	S1	AC2	Somewhat
	Flooding	S1	AC2	Somewhat

Regional Economy & Transportation

(CONTINUED)

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Roads/Bridges

Roads and bridges are somewhat vulnerable to the impacts of extreme heat, drought, wildfire, and flooding.

Extreme Heat

In addition to non-climate related stressors (e.g., cost and maintenance needs), roads, bridges, and related traffic management equipment can experience deterioration from long-term and consecutive extreme heat events, resulting in moderate sensitivity (S2). Despite the innate lack of flexibility in roads and bridges to accommodate extreme heat events, inherent and contributed resources, new technologies, and flexible multimodal transportation infrastructure investment contribute to moderate adaptive capacity (AC2).[128]

Drought

Impacts to roads and bridges are possible during extreme drought events, and non-climate related stressors (e.g., continuous maintenance needs, population growth, etc.), resulting in moderate sensitivity (S2). Drought also exacerbates wildfire conditions which can impact roads and bridges, which may burden residents across the county who rely on single-use vehicles for the majority of their transportation needs. The region's experience, continued investment in transportation improvement projects, and planning efforts contribute to the moderate adaptive capacity (AC2) of roads and bridges to drought conditions.

Wildfire

In addition to non-climate related stressors (e.g., cost and maintenance needs), roads and bridges can be directly impacted by wildfires (e.g., road closures), resulting in moderate sensitivity (S2). Despite the innate lack of flexibility in roads and bridges to accommodate extreme heat events, inherent and contributed resources, new technologies, and flexible multimodal transportation infrastructure investments contribute to moderate adaptive capacity (AC2).

Flooding

In addition to non-climate related stressors (e.g., cost and maintenance needs), roads and bridges experience direct and indirect impacts from flooding, resulting in moderate sensitivity (S2). The local roadway network is designed, as part of regional flood control efforts, to withstand flooding. Dedicated existing resources, ongoing investments in policies and projects that reduce the sensitivity of roads and bridges to flooding, new technologies (e.g., flow detectors, ramp switches, meters, signs), and flexible multimodal transportation infrastructure investments all contribute to moderate-high adaptive capacity (AC3).

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Roads/Bridges	Extreme Heat	S2	AC2	Somewhat
	Drought	S2	AC2	Somewhat
	Wildfire	S2	AC2	Somewhat
	Flooding	S2	AC3	Somewhat

Regional Economy & Transportation

(CONTINUED)

Aviation

Aviation is moderately vulnerable to the impacts of extreme heat, somewhat vulnerable to the impacts of wildfire, and minimally vulnerable to drought and flooding.

Extreme Heat

Extreme heat events can directly and indirectly impact aviation operations and employees, including flight delays, closures, and damage to infrastructure (e.g., runways).[129] Non-climate related stressors, such as a significant influx of visitors to a limited number of airports, aging infrastructure, expensive maintenance costs and ongoing needs, and the limited ability to expand contribute to its high sensitivity (S4).[130] The aviation system may be particularly sensitive during high energy load and high temperature periods.[131] Experience with past extreme heat events, emergency contingency plans,[132] access to funding resources, and dedicated staff to accommodate changes during events contribute to moderate adaptive capacity (AC2).

Drought

Clark County's aviation system is not regularly impacted by drought conditions resulting in low-moderate sensitivity (S1). Due to experience with past drought events, access to funding resources, and dedicated staff to accommodate changes during drought conditions, aviation has moderate-high adaptive capacity (AC3).

Wildfire

While smoke events do not necessarily delay or cancel flights, rolling blackouts due to wildfire events near critical electrical infrastructure can impact airports connected to the grid regionally.[133] Overall, Clark County's aviation system has low-moderate sensitivity (S1). Access to resources, organizational support, access to learning and information, and dedicated staff to accommodate changes during events contribute to moderate adaptive capacity (AC2).

Flooding

Although not common for Clark County, flooding can result in flight delays, closures, and, in extreme circumstances, can directly damage critical aviation infrastructure (e.g., runways). The impacts can be particularly poignant for small regional airports.[134] As a whole, the aviation system has low-moderate sensitivity (S1). Access to resources (particularly for larger airports like McCarran), ongoing improvements that enhance the adaptive capacity of aviation to flooding events, and dedicated and experienced staff capacity contribute to moderate-high adaptive capacity (AC3).[135]

SUMMARY VULNERABILITY RANKING

System	Climate Hazard	Sensitivity	Adaptive Capacity	Vulnerability
Aviation	Extreme Heat	S4	AC2	Moderate
	Drought	S1	AC3	Minimal
	Wildfire	S1	AC2	Somewhat
	Flooding	S1	AC3	Minimal

PRIORITIES FOR ACTION: RECOMMENDED STRATEGIES

Strategies were identified to address the greatest challenges each system faces and to build resilience to climate hazards. Strategies are meant to encompass the general approach to achieve an overall goal or objective, while actions include examples of specific activities to achieve the strategy.

Priority Strategies

The project team identified 57 total strategies across all the systems evaluated through the CVA process. Of those strategies, 25 were identified as priority strategies. Strategies were prioritized by the Stakeholder Working Group and further refined by the Project Team to ensure recommended strategies address the vulnerabilities resulting from the CVA process. Additional implementation details were recorded as example actions or equity considerations. For a list of the 32 lower-priority strategies that were considered during the CVA process, see Appendix 2: Complete Strategies List.

STRATEGIES ARE ORGANIZED BY:

NATURAL SYSTEMS

INFRASTRUCTURE & FACILITIES

PEOPLE & COMMUNITY

REGIONAL ECONOMY & TRANSPORTATION

CROSS-CUTTING STRATEGIES

How to Read This Section

Strategy

General approach the County will take to advance climate resilience

Resilience Value	How the strategy advances climate resilience
Relevant Systems	Specific infrastructure, services, or habitats the strategy affects
Example Actions	Specific activities that will be undertaken as part of the strategy
Who Needs to Be Involved?	Types of organizations and agencies that should be involved in implementation of the strategy
Equity Considerations	Approaches the County can take to ensure the implementation of the strategy does not create new or exacerbate existing inequities

Natural Systems

Promote conservation and preservation practices to protect and enhance water quality and maintain riparian and aquatic habitat connectivity.[1]

Resilience Value The health and quality of aquatic and riparian habitats is critical for proper ecosystem functioning, but is also connected to the broader water system, meaning it also has an impact on our ability to distribute water for human consumption and industry use.

Relevant Systems Aquatic/Riparian Habitats

Example Actions Facilitate private-public partnerships to implement management strategies along riparian corridors.

Who Needs to Be Involved? Conservation organizations; community-based organizations; Federal land management agencies; County and municipal environmental or parks departments; State environmental agencies; water utilities; regional agencies; private businesses; HOAs

Equity Considerations Existing or new conservation programs can be revamped to advance more intentional goals of equity and inclusiveness in open space protection through providing equitable access or securing partnerships with local community-based organizations.

Ensure adequate protection of permanently protected desert, forest, and woodland and habitats.

Resilience Value The survival and health of permanently protected habitats, from desert to woodland, provide important resilience value to Clark County in terms of biodiversity, recreation and tourism, and ability to mitigate the worst impacts from climate hazards.

Relevant Systems Woodland/Forest Habitats; Desert Habitats

Example Actions

- Continue with implementation of the Clark County Multiple Species Habitat Conservation Plan, which identifies conservation areas and provides for regional avoidance, minimization, and mitigation of impacts to species and habitats from development.
- Support designation of additional conservation areas in Clark County.
- Partner with Federal land management agencies on species and habitat conservation.
- Implement urban/wildland interface design standards to reduce indirect impacts from development.

Who Needs to Be Involved? Conservation organizations; community-based organizations; Federal land management agencies; County and municipal planning departments; State environmental agencies; private land developers

Equity Consideration Existing or new conservation programs can be revamped to advance more intentional goals of equity and inclusiveness in open space protection through providing equitable access or securing partnerships with local organizations.

1 Aligns with Nevada Division of Forestry's Nevada Forest, Range & Watershed Action Plan

Maintain and expand healthy urban and community tree canopy and support ongoing efforts to expand drought-tolerant trees, focusing on communities that are most vulnerable to high heat.

Resilience Value

Maintaining a healthy urban forest improves the ability of trees to provide resilience benefits such as cooling, shading, and air quality improvements, as well as to support ecosystem function, wildlife, and pollinators.

Relevant Systems

Urban and Community Forests

Example Actions

- Increase plant and tree cover and reduce black-top surfaces in heat vulnerable neighborhoods.

Who Needs to be Involved?

Developers; conservation organizations; community-based organizations; County and municipal environmental departments; public works departments; parks departments; State environmental agencies; HOAs

Equity Considerations

On average, communities across the county with 2 to 6 percent tree coverage (low coverage) record higher temperatures than areas with 10 to 20 percent tree coverage (high coverage). It is imperative that efforts to maintain or expand tree canopy throughout the county focus on areas of high heat vulnerability.

Infrastructure & Facilities

Provide resources for local governments and organizations to participate in state utility regulatory proceedings to ensure utility decisions represent the broadest array of stakeholders.

Resilience Value As impacts from climate hazards continue to verify the need for grid reliability and resource planning, it will be important for regulators and service providers to have an understanding of community-level needs and how utility decisions impact the broadest array of stakeholders and customers.

Relevant Systems Electricity Infrastructure

Example Actions Provide the educational resources and tools needed for local governments and organizations to submit comments during each resource planning process for each utility that serves Clark County.

Who Needs to Be Involved? Utilities commissions; energy service providers; County and municipal departments; developers; community-based organizations

Equity Considerations Utility proceedings, which may cover resource planning, energy efficiency and demand side management program changes, or rate cases, can have an impact on local stakeholders. Providing opportunities for local governments, along with community-based organizations, agencies, and large utility customers, to be involved in these processes will help create more community-driven outcomes.

Prioritize demand-side energy management programs.[1]

Resilience Value As rising temperatures increases the demand for cooling, managing energy demand will be an important strategy to prevent major grid disruptions.

Relevant Systems Electricity Infrastructure

Example Actions Promote coordination between energy utilities and local governments to leverage existing demand-side energy management programs and incentives.

Who Needs to Be Involved? Utilities commissions; County and municipal departments; State agencies; electricity service providers; critical industries; service providers

Equity Consideration In promotion of existing programs, or implementation of new programs, particular attention should be given to heat-stressed neighborhoods and low- and moderate-income households that may be cost-burdened or located in heat stressed neighborhoods, as well as small businesses or critical industries that may be more negatively affected by demand management.

1 Aligns with Nevada's State Climate Strategy

Enhance collaboration and transparency between energy utilities and critical agencies whose operations rely on consistent power.

Resilience Value

While evaluating the cascading impacts that result from the effects of climate change, electricity/power supply frequently rose to the top due its relationship with other systems (e.g., telecommunications, water treatment). Increasing temperatures, increased cooling demand, and reduced water supply are expected to impact electricity supply and demand, which emphasizes the importance of collaboration with agencies relying on consistent power supply.

Relevant Systems

Electricity Infrastructure; Water Treatment & Distribution; Telecommunications Infrastructure; Manufacturing/Industrial

Example Actions

- Establish a utility working group with energy utilities and cross-sector agencies (e.g., telecoms, water) to collaborate on power needs and reliability in the face of climate impacts.
- Improve the overall quality and ability of natural resources in neglected parks and green spaces to deliver ecosystem benefits.

Who Needs to be Involved?

County and municipal departments; electricity service providers; other service providers (e.g., telecommunications, water, gas/oil); industry and tourism representatives

Equity Considerations

As climate impacts affect power supply and demand (and in turn, prices), particular attention should be given to meeting the needs of low- to moderate-income households with higher energy cost burden.

Continue to advance regional collaboration on water resiliency planning and management.

Resilience Value

Prolonged and increasing drought conditions pose a significant threat on water supply and delivery across the region. Continued and strengthened collaboration amongst water utilities, local governments, and water-intensive industries is critical to making actionable progress and promoting transparency.

Relevant Systems

Water Treatment & Distribution

Example Actions

Establish a working group with SNWA and local governments to share information and establish partnerships.

Who Needs to Be Involved?

Water utilities; local government agencies; State government agencies; private industry

Equity Considerations

Regional collaboration efforts focused on water resiliency should include groups or geographic areas that are and/or will be most impacted by drought conditions to ensure more equitable outcomes.

Work with local agencies to integrate climate-related risks into wastewater infrastructure design and maintenance plans.

Resilience Value	Increasing temperatures and drought conditions present a significant threat to water quality, requiring additional long-term planning and investment for the region's wastewater treatment infrastructure.
Relevant Systems	Wastewater Infrastructure
Example Actions	Anticipate treatment standards/processes based on projected water levels and raw water quality in order to engage in proactive (rather than reactive) long-range planning.
Who Needs to Be Involved?	Water utilities; wastewater treatment agencies; regional flood agencies; stormwater agencies
Equity Consideration	Wastewater infrastructure design and planning should ensure that neighboring communities are protected from any harmful impacts.

Expand resources for addressing extreme heat (e.g., cooling centers, water stations, and public showers) in communities that are most vulnerable to extreme heat.

Resilience Value	As extreme heat days increase, an important aspect of response is to mitigate exposure to extreme heat in order to prevent resulting health impacts. Populations that tend to be more sensitive to the impacts of extreme heat may also have fewer resources to respond in a heat emergency, such as air conditioning.
Relevant Systems	Emergency Management, Public and Community Facilities, Schools
Example Actions	Expand cooling centers, water stations, and public showers in communities that are most vulnerable to extreme heat.[2]
Who Needs to be Involved?	School districts; municipalities; community-based organizations; local and State emergency management agencies; faith-based organizations; transit agencies
Equity Considerations	Prior to expansion of cooling resources, an important first step is to better understand how cooling centers and other resources are used and barriers to accessing them. Addition of new cooling centers, water stations, or public showers should be prioritized in high heat vulnerability areas that currently have limited access to these resources.

2 Aligns with recommendations from the Guinn Center's Strengthening Heat Resiliency in Communities of Color in Southern Nevada

Formalize a network of well-resourced mobile crisis intervention (MCI) services to engage communities of concern during emergency and non-emergency situations and address heat, flood, and wildfire impacts on at-risk residents before or as they occur.

Resilience Value

Emergency response is critical to reacting to impacts as they occur and must be augmented to fully integrate a diversity of needs and equitable outcomes for all residents, especially the most at risk of adverse extreme heat, drought, wildfire, and flooding impacts. This includes bringing services directly to vulnerable residents through mobile crisis intervention. The County and community organizations already have existing mobile crisis intervention programs that often target a specific subset of the population or a specific climate condition. Bringing these initiatives into communication with one another and building out their capacity to reach all communities of concern is essential.

Relevant Systems

Emergency Management

Example Actions

- Develop an extreme heat and air quality preparedness and response program.
- Develop short- and long-term support systems to help populations experiencing homelessness reduce reliance on stormwater infrastructure for shelter.
- Integrate mobile crisis intervention and outreach into the "continuum of care" for vulnerable populations.
- Provide MCI teams with adequate supplies so they can provide items that are needed on site.

Who Needs to be Involved?

Social service providers; County and local agencies (e.g., emergency management); libraries, community-based organizations; faith-based organizations

Equity Considerations

Emergency response and intervention should ensure there are adequate resources, awareness, and communication of those resources for frontline communities. For example, those without caseworkers or phones should still receive timely and relevant climate resilience and emergency response information and services through the MCI network.

Coordinate dissemination of information related to climate hazards with community organizations and service providers to ensure all residents have access to information and support networks.[3]

Resilience Value

Effective communication and dissemination of information is critical to increasing awareness about the impacts of climate hazards, particularly on human health.

Relevant Systems

Emergency Management

Example Actions

- Identify gaps in current communication pathways, especially with residents that have disabilities, are unhoused, or are undocumented.
- Connect elderly residents with organizations, local support networks, neighbors that provide services to mitigate extreme heat and other climate impacts.
- Expand the emergency alert system to include communications related to extreme heat.

Who Needs to be Involved?

Community-based organizations; social service agencies; faith-based organizations, State, County, and municipal agencies

Equity Considerations

While educational resources and materials already exist to emphasize the importance of emergency preparedness and climate threats, access to or awareness of those resources differ for community members. Translation of materials and resources is an important first step but coordinating with service providers and community-based organizations that directly serve a diverse range of community members is an effective way to reach the people that will be affected most. Educational resources and materials should be provided in multiple formats and languages to reduce structural barriers (e.g., internet access, language and cultural barriers, disabilities, social isolation, age, health).

3 Aligns with recommendations from the Guinn Center's Strengthening Heat Resiliency in Communities of Color in Southern Nevada

Encourage installation of solar plus storage, vehicle to grid technology, and microgrids to support system reliability.

Resilience Value

As the impacts from climate hazards threaten power supply and grid reliability, ensuring backup power systems are in place for critical facilities and services is an important aspect of improving energy resiliency. Use of solar plus storage and microgrids is beneficial compared to generators because diesel fuel may also be impacted by climate-induced supply chain disruptions, and can increase climate risk for certain hazards (e.g., wildfires).

Relevant Systems

Government & Administrative Facilities

Example Actions

- Equip County facilities with solar plus storage or microgrids.
- Encourage installation of solar plus storage, vehicle to grid technology, and microgrids on brownfield sites and parking lots.

Who Needs to be Involved?

County and local government agencies; private developers; HOAs; emergency management organizations ; critical service providers (e.g., energy, water, transportation)

Equity Considerations

Facilities equipped with solar plus storage or microgrids could be used to provide additional benefits to the community by serving as resilience hubs during grid disruptions or emergency events. Installing these technologies throughout the region, including the places where frontline community members live and work, will ensure everyone can benefit from them.

People & Community

Develop utility assistance and weatherization programs for low- and fixed-income individuals and improve existing programs.

Resilience Value

Low- and fixed-income residents often lack financial and material resources to prepare for or respond to climate hazards, both at and away from home (e.g., money for a new AC unit, car to access a cooling center). As Clark County develops initiatives that will reduce climate risk and increase resilience, this strategy is an opportunity to provide much needed financial support and technical assistance that will directly improve the living conditions of some of the County's most socially vulnerable residents.

Relevant Systems

Housing

Example Actions

- Implement direct financial programs that offset increasing energy costs (e.g., bill discounts, lower rates, etc.).
- Increase accessibility to current programs by reducing documentation requirements and streamlining administrative processes.

Who Needs to be Involved?

Utilities commissions; energy providers; County and local government agencies; social service providers; faith-based organizations; neighborhood associations; property managers/landlords; community-based organizations

Equity Considerations

These programs will directly impact the quality of life and resilience of low- and fixed-income residents, thus, engaging with these groups is critical. The program design and implementation process should be streamlined, efficient, and without barriers to access (e.g., unnecessary paperwork, poor translation services, confusing user interfaces, no phone or in-person enrollment options, unresponsiveness). Property owners and managers, service providers, public health workers, and relevant community organizations should be aware of programs and trained to inform residents of opportunities or provide support.

Provide financial assistance and incentives to implement and maintain cooling and clean air features in existing and new affordable housing developments and low- and fixed-income households.

Resilience Value

Implementing targeted heat reduction and clean air strategies in affordable single- and multi-family residences can reduce negative and disproportionate heat and wildfire impacts on low- and fixed-income residents, many of whom also are seniors, live with a disability or chronic health condition, or have other special needs. Providing developer-, homeowner-, and renter-specific cooling and clean air incentives, investments, and resources is one of several ways the County can reduce in-home exposure to climate hazards for some of its most at-risk residents.

Relevant Systems

Housing, Trades

Example Actions

- Establish a public fund to provide financial assistance for air purifiers, air conditioning, and back-up power sources, especially for residents with limited mobility, health conditions, and other risk factors.
- Coordinate with existing private and nonprofit programs that provide additional financial or operational support.

Who Needs to be Involved?

Social service providers; low- and fixed-income residents; County and local government agencies (planning and development, social services); developers; property managers/landlords

Equity Considerations

Efforts should be focused on and successfully address residents' climate resilience interests and avoid closed door negotiations by leading with transparency. Incentives and other cooling and clean air programs and services should not be designed, advertised, or implemented in ways that exclude or preclude rural communities from participating. The development and provision of incentives and other financial or operational support for implementing and maintaining cooling and clean air features in low- and fixed-income households must be streamlined, clear, and without undue burden on residents.

Invest in resilience hubs and public resources that reduce exposure to multiple climate and health hazards.

Resilience Value

This resilience strategy involves leveraging inter-agency, cross-sectoral, multi-organizational, and grassroots expertise, relationships, and resources to establish a network of comprehensive and accessible climate resilience hubs.[136] Multi-hazard and multi-service resilience hubs provide critical respite from extreme heat, wildfire, poor air quality, flooding, and drought. At the same time, they provide resources and services that meet the needs of special needs individuals, unhoused individuals, seniors, youth, and other under-resourced or marginalized residents. For example, the Boyle Heights Art Conservatory in Los Angeles, California serves as a community resilience hub that is both a cooling and heating facility with back-up power that's available to residents in case of a disaster.[137]

Relevant Systems

Public & Community Facilities; Emergency Management, Transit & Bike/Pedestrian Infrastructure

Example Actions

- Retrofit cooling centers to also serve as air quality centers and warming centers, and stock and distribute resources to protect residents during these events (e.g., water, masks, blankets).
- Increase available shelter during extreme heat events or power outages by utilizing larger facilities like the convention center or a network of facilities like schools.
- Supply refrigerated lockers for unhoused individuals to store medications.
- Partner with transportation providers (e.g., regional transit, rideshare) to provide free, accessible transportation to cooling centers.

Who Needs to be Involved?

Social service providers; public health workers; neighborhood associations; County and local government agencies; youth and senior centers; schools; libraries; recreation centers; health facilities; homeless shelters; community-based organizations; faith-based organizations; transit agencies

Equity Considerations

Comprehensive resilience hubs should be designed in partnership with and implemented in rural communities and Tribes to the same extent that they are designed and implemented in urban communities. Access to resilience hubs (both tangible and intangible) is critical. This includes transit options, operating hours, locations, forms of communication and engagement, language access, not requiring ID, proof of residency or other documentation, and having trained volunteers or staff who are representative of the surrounding community.

Implement heat reduction strategies, including shade structures, cool pavements, and cool roofs, at parks and recreational sites.

Resilience Value

Parks and recreational facilities derive their value from public use, and extreme heat events limit visitation and may prohibit the public from enjoying these community assets. Implementing targeted heat reduction strategies at the sites and facilities can allow for continued use and reduced negative health impacts during heat events, while also potentially serving as an area of respite for individuals who may not have access to cooling.

Relevant Systems

Parks, Open Spaces, & Recreation

Example Actions

- Implement design standards requiring shade structures, and design features and materials to withstand higher temperatures.
- Evaluate the use of natural infrastructure options to reduce surrounding air temperatures and mitigate urban heat island.
- Encourage use of efficient water features, such as spray showers and splash pads, into parks and community centers.

Who Needs to be Involved?

Local and State government agencies; community-based organizations; conservation organizations; federal agencies

Equity Considerations

It is important to consider the demographics of the community members using the recreational sites and ensure that the locations in which heat reduction strategies are implemented serve portions of the population that likely have the highest need for assistance and resources.

Enhance coordination and collaboration with Tribal Nations and communities throughout the region to strengthen resilience to climate hazards.

Resilience Value	Tribes have lived on and used the land for generations, and the Traditional Knowledge related to the landscape and natural resources in the area has historically been underutilized. Ensuring Tribal voices are heard and involved in the decision-making process regarding infrastructure and development projects is essential, and it will likely take a concerted effort to engage with partners and the community to make sure equitable consultation with Tribes takes place.
Relevant Systems	Cultural and Spiritual Sites
Example Actions	Identify opportunities to collaborate on current or future projects based on common shared interests with Tribal Nations and communities.
Who Needs to be Involved?	Local and State government agencies; Tribal organizations and community members; community based organizations
Equity Considerations	Tribes have historically been marginalized and underrepresented in decision making. Ensuring these voices are heard and respected throughout all phases of planning is necessary to creating an equitable project planning process. Successful implementation of this strategy requires going beyond initial outreach to Tribes and requires: establishing relationships built on trust and respect between and among decision makers, stakeholders, and government staff; using outreach and communications methods preferred by these communities; maintaining relationships throughout project planning processes; and continuing to foster these relationships and partnerships across projects.

Regional Economy & Transportation

Provide worksite emergency preparedness training for employers and employees to proactively prepare for climate hazards.

Resilience Value	The workplace provides an excellent opportunity to train residents and community members in community preparedness, particularly in industries that are more vulnerable to the impacts of current and future projected changes. This can both help the businesses clarify roles and responsibilities during an emergency and give the workers and employees the tools they need to proactively prepare their homes and their families for emergency situations.
Relevant Systems	Manufacturing/Industrial; Trades; Tourism; Small Businesses; Sanitation/Waste Management
Example Actions	Create tools and conduct outreach with business owners to educate the workforce on the impacts of climate change. Support planning for emergency preparedness measures.
Who Needs to be Involved?	Chambers of commerce; trade unions; economic development agencies; municipalities; community-based organizations
Equity Considerations	Frontline community members who work outside or in industries with limited health care or other organizational support systems may experience disproportionate impacts of climate hazards in the workplace and at home. Successful implementation of this strategy requires supporting frontline community members in a variety of ways. These include customizing materials for workers who do not speak English as their first and/or primary language, identifying and using community-based approaches to engagement, and creating accessible entry points for planning and preparedness for a variety of communities.

Identify opportunities to make the supply chain more climate resilient.

Resilience Value

Thinking strategically and critically about how extreme weather and climate-related hazards impact supply chain disruptions can help businesses across Clark County operate more effectively and limit down-time during disruptions. Using a scenario planning approach and investing in ways that prepare businesses for the future can also give a business a competitive advantage as conditions continue to change.

Relevant Systems

Manufacturing/Industrial; Food Systems; Trades; Tourism; Professional and Public Service Employment; Small Businesses

Example Actions

- Conduct a risk assessment and volatility test for the food supply chain.
- Identify opportunities to integrate additional necessary redundancies in the supply chain that reduces disruptions during an event.
- Conduct a county-wide study to assess climate risk for the core transportation network and critical infrastructure that the supply chain relies upon.

Who Needs to be Involved?

Economic development and planning agencies; transportation agencies; private industry; businesses; municipalities

Equity Considerations

Identifying and reducing vulnerabilities in the supply chain could prevent work disruptions for frontline community members, thereby increasing the adaptive capacity of individuals and communities to be able to respond to extreme events. Successful implementation of this strategy requires using an equity lens to identify the intersectionality between community and workforce wellbeing.

Support and promote requirements that protect workers from extreme heat events.[1]

Resilience Value

Extreme heat events can limit the ability of local businesses to use outdoor spaces or decrease tourism revenue during those events. In 2022, the Occupational Safety and Health Administration (OSHA) issued a new national emphasis program to institute standards for indoor and outdoor heat-related hazards.[138] Having a strategic plan to address those risks will make implementation of any necessary investments for normal business operations more cost effective.

Relevant Systems

Manufacturing/Industrial; Trades; Tourism; Small Businesses; Sanitation/Waste Management

Example Actions

- Launch education and workforce training campaigns for companies to identify ways to keep employees cooler during extreme heat events.
- Support adoption of regulation R053-20, proposed by Nevada's Department of Business and Industry, to add requirements for employers of employees exposed to high temperatures.
- Work with operators and trade representatives to update employee protection measures and protocols to be used during an extreme event.

Who Needs to be Involved?

Economic development agencies; municipalities; private industry; small businesses; State agencies

Equity Considerations

Extreme heat disproportionately impacts outdoor workers, those with preexisting health conditions, individuals with limited access to air conditioning or a vehicle with air conditioning, and others. Promoting policies, projects, and programs that protect workers from extreme heat events requires an understanding of the ways in which extreme heat events impact frontline community members differently and integrates solutions that accurately reflect current and future extreme heat projections.

1 Aligns with recommendations from the Guinn Center's Strengthening Heat Resiliency in Communities of Color in Southern Nevada.

Regional Economy & Transportation (CONTINUED)

Prioritize safe and protected (i.e., high-comfort) bicycle and pedestrian infrastructure in locations most vulnerable to the impacts of climate change.

Resilience Value

A safe, equitable, and reliable transportation system that continuously invests in multiple modes of transportation (including pedestrian trails and bike paths) provides residents with access to critical services such as employment, education, and health care. Developing a resilient multi-modal transportation system will require preparing for future climate exposures (such as flash flooding, extreme heat, and wildfire) and investing in protecting infrastructure as well as enhancing the redundancy of the network.

Relevant Systems

Transit & Bike/Pedestrian Infrastructure; Parks & Open Spaces/Lands

Example Actions

- Coordinate with regional partners to identify active transportation corridors that are at-risk from the impacts of climate change.
- Promote the use of bikes and e-bikes by building supportive and climate resilient infrastructure.
- Consider opportunities to protect space for biking and walking, and provide high-comfort facilities (e.g., protected bike lanes, buffered sidewalks, shade), when making street infrastructure or roadway painting/striping improvements.

Who Needs to be Involved?

Planning and development agencies; municipalities; private developers; public works agencies; transportation agencies

Equity Considerations

Pedestrian and bicycle trails can be critical transportation pathways to a variety of services for frontline community members. They can also present significant challenges and hazards to the health, safety, and wellbeing of residents, particularly as extreme weather events increase due to climate change. For example, extreme heat events pose significant risks to bicyclists and pedestrians. For individuals, infrastructure investments must utilize an equity lens in order to reduce harm and protect frontline community members now and into the future.

Invest in projects, programs, and policies that reduce the impacts of climate change on public transit users, infrastructure, and operations.[2]

Resilience Value

Safe, accessible, reliable, and affordable public transit provides Clark County residents with access to vital services, including employment, education, and health care. A redundant, safe, and accessible transportation system is critical to connecting residents to opportunities for goods, services, and people to move to and from their destinations. It also supports safe and equitable emergency evacuations. As the climate changes, the public transit system and its users are increasingly vulnerable to extreme weather events (e.g., extreme heat events, flooding, wildfire), requiring continued investments in policies, programs, and projects that enhance the resilience of infrastructure and operations.

Relevant Systems

Transit & Bike/Pedestrian Infrastructure

Example Actions

- Require shade and other design features in transit stops that provide relief from extreme heat.[3]
- Identify technologies that improve the adaptive capacity of transit operations and buses during extreme heat events, especially during the transition to zero emissions buses.

Who Needs to be Involved?

Local, regional, and State transportation agencies; municipalities

Equity Considerations

Public transit plays an important role in providing frontline community members with access to employment, education, health care, groceries, community, and a variety of other critical services. Individuals without vehicles, low-income families, students, those with disabilities, those experiencing homelessness, seniors, and others rely on public transportation to service their immediate and long-term needs. This is particularly true for residents in rural areas and in urban areas disconnected from city services.

2 Aligns with recommendations from the Guinn Center's Strengthening Heat Resiliency in Communities of Color in Southern Nevada.

3 Aligns with recommendations from the Guinn Center's Strengthening Heat Resiliency in Communities of Color in Southern Nevada.

Promote strategic investment opportunities to improve and expand high capacity transit, using a climate resilience lens.

Resilience Value

Clark County's multi-modal transportation system is essential to the delivery of goods, people, and services at a local, regional, state, and national level. Multi-modal transportation options provide residents with safe, affordable, and efficient modes of transportation that connect community members to employment, education, and health care. It also plays a central role in evacuation and emergency management needs.

Relevant Systems

Roads & Bridges, Transit & Bike/Pedestrian Infrastructure, Freight & Passenger Rail

Example Actions

- Identify opportunities to invest in and promote light rail, rapid bus, and/or bus rapid transit (BRT) services and operation in Clark County.[4]
- Develop a rail operating plan specific to Clark County.

Who Needs to be Involved?

Local and State transportation and development agencies; municipalities; transit agencies; private rail transportation

Equity Considerations

For frontline community members, public transit can be a lifeline to critical services, especially for those without access to a vehicle, low-income families, students, those with disabilities, those experiencing homelessness, and others. Ensuring investments that improve and expand passenger public transit services are made using a climate resilience and equity lens are critical.

4 Aligns with recommendations identified in the Regional Transportation Commission's On Board Mobility Plan.

Cross-Cutting Strategies

Coordinate and maintain inter-agency and multi-organizational working groups to share knowledge, plans, and resources.

Resilience Value

As climate impacts extend well past jurisdictional boundaries and affect community members differently based on demographic factors, a collaborative, inclusive regional approach is necessary to achieve actionable results. Climate change does not impact the region in silos; inter-agency and multi-organizational collaboration provides opportunities for cross-sectoral information sharing and holistic approaches to implementation.

Relevant Systems

Relevant across all systems

Example Actions

Establish a working group to maintain coordination during implementation of the recommendations from this climate vulnerability assessment.

Who Needs to be Involved?

Local and State government agencies; community-based organizations; advocacy groups; industry and trade representatives; utilities; service providers; Tribal organizations

Equity Considerations

Equitable formation of the working group will ensure that organizations representing communities most affected by the impacts of climate change have a seat at the table and are provided ample participation opportunities.

Integrate climate-related risks, including climate projections and impact analyses, into planning processes, including capital improvement and comprehensive plans.

Resilience Value

Awareness of climate-related risks should be incorporated into all near- and long-term planning efforts in order to better anticipate potential impacts, disruptions, or costs.

Relevant Systems

Relevant across all systems

Example Actions

- Incorporate climate adaptation goals into comprehensive plans.
- Require capital improvement plans to align with community adaptation goals.
- Add climate adaptation benefits to capital improvement project scoring criteria.

Who Needs to be Involved?

Local and regional government agencies

Equity Considerations

Consideration of the climate adaptation value of capital improvement projects or plans must include an assessment of how the failure of the project or plan's major facilities or infrastructure would impact frontline communities.

REFERENCES / KEY TERMS & DEFINITIONS

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KEY TERMS & DEFINITIONS

Action: The specific activity that will be undertaken to achieve a strategy.

Adaptation: The process of adjusting to new climate conditions in order to reduce risks.

Adaptive capacity: The ability of actors, organizations, or systems to adjust to and mitigate extreme weather events, climate conditions and natural hazards. When assessing adaptive capacity, key factors include assets, constraints, needs, and opportunities.

Aridification: The gradual, long-term change of a region becoming increasingly arid, or dry.

Cascading Impacts: The interdependencies between systems in response to climate changes and the combined effects of interacting climate stressors.[1]

Climate: The long-term average weather conditions over a given area.

Climate change: The long-term change in average weather conditions attributed to increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Climate hazard: A climate-related event or condition that may cause injury, illness, or death to people or damage to assets.

Climate projection: Model-derived estimates of future climate, which account for the likelihood that something will happen several decades to centuries in the future based on developing conditions.

Climate resilience: The capacity to prevent, withstand, respond to, and recover from a climate-related disruption.

Climate vulnerability assessment: An adaptation planning tool that identifies high-risk systems, people, and services, as well as opportunities to enhance near- and long-term resilience.

Dry Spell: The maximum number of consecutive days with precipitation less than 0.04 inches for each year.

Exposure: The magnitude or rate of change an individual, organization, system, or community experiences due to stressors such as storms, floods, and other extreme weather and climate events or conditions. Exposure can be direct or indirect.

Extreme Heat Day: In Clark County, an extreme heat day is defined as a day with temperatures exceeding 106 °F.

Megadrought: A prolonged drought lasting two decades or longer.

Sensitivity: The degree to which an actor, organization, or system can be directly or indirectly affected by climate exposure. When assessing sensitivity, current stressors and future stressors are key factors. Assessing sensitivity can help identify which components are most and least likely to be affected under changing conditions.

Special Flood Hazard Area (SFHA): Areas determined to have at least a 1% annual chance of flooding, also known as the “100-year floodplain”.

Strategy: The general approach used to accomplish a goal.

Vulnerability: The degree to which a system is susceptible to (sensitivity) and unable to cope with (adaptive capacity) adverse effects of extreme weather events like drought or wildfire. The core elements of vulnerability include exposure, sensitivity, and adaptive capacity.

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APPENDIX 1:
STAKEHOLDER ENGAGEMENT MATERIALS

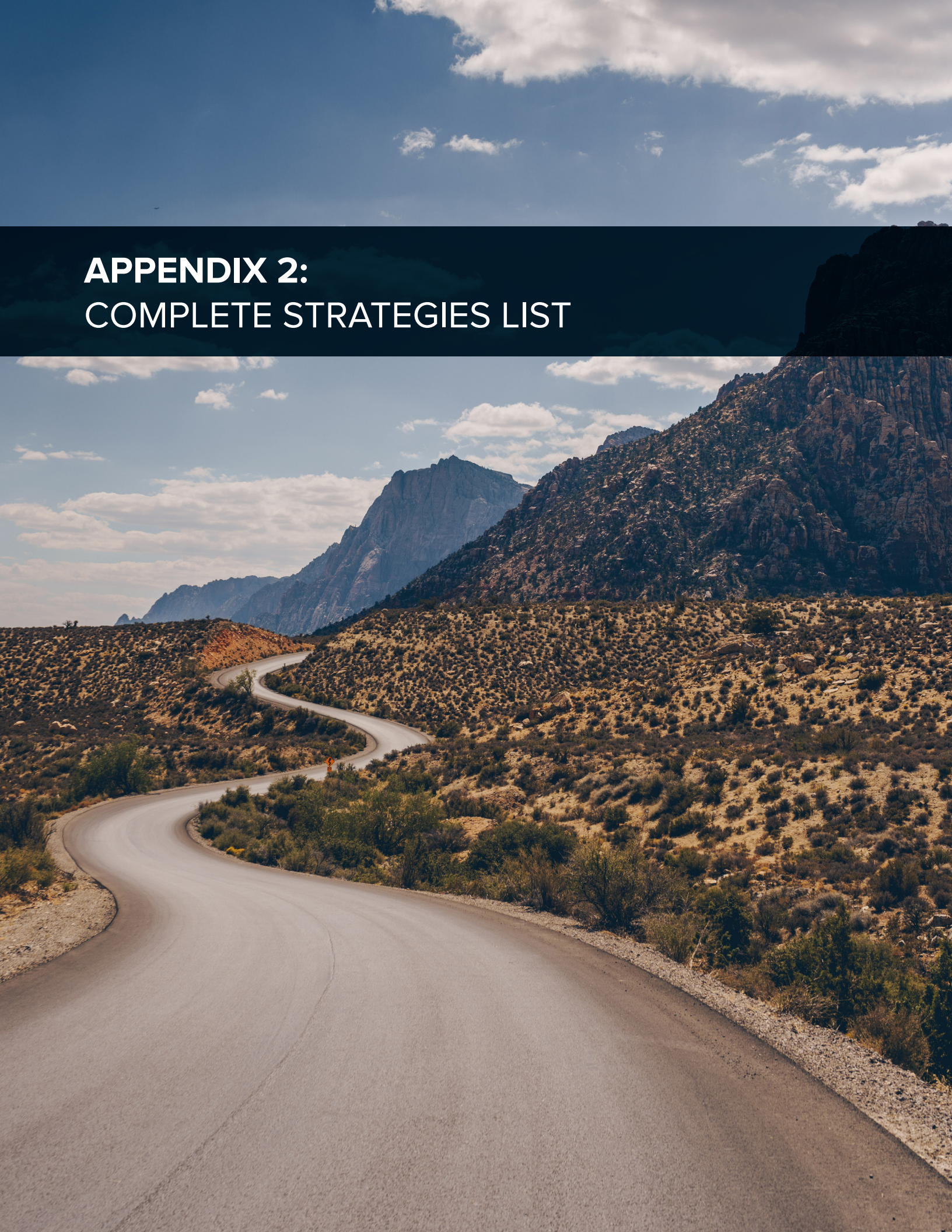
This appendix contains the following documents, which were used to inform and collect input from stakeholders throughout the development of the CVA:

Interview and Survey Summary

Workshop 1 Summary and Engagement Results

Workshop 2 Engagement Results

Workshop 3 Summary and Engagement Results



APPENDIX 2:
COMPLETE STRATEGIES LIST

Strategy	Relevant Systems
Preserve natural drainage systems to protect ecosystems and provide natural flood protection.	Aquatic/Riparian Habitats
Promote conservation and preservation practices to protect and enhance water quality and maintain riparian and aquatic habitat connectivity.[1]	Aquatic/Riparian Habitats
Support ongoing restoration efforts to enhance aquatic and riparian area conditions to improve water quality and increase groundwater recharge.	Aquatic/Riparian Habitats
Promote investment in restoration and enhancement efforts for wildfire and drought affected areas.	Woodland/Forest Habitats
Ensure adequate protection of permanently protected desert, forest, and woodland and habitats.	Woodland/Forest Habitats; Desert Habitats
Implement preventative land and forestry management and fuel reduction techniques in key locations at the desert/wildland urban interface (e.g., Mt Charleston).	Woodland/Forest Habitats; Desert Habitats
Maintain and expand healthy urban and community tree canopy and support ongoing efforts to expand drought-resilient trees in communities that are most vulnerable to high heat.	Urban and Community Forests
Provide resources for local governments and organizations to participate in state utility regulatory proceedings to ensure utility decisions represent the broadest array of stakeholders.	Electricity Infrastructure
Prioritize demand-side energy management programs.[2]	Electricity Infrastructure
Enhance collaboration and transparency between energy utilities and critical agencies whose operations rely on consistent power.	Electricity Infrastructure; Water Treatment & Distribution; Telecommunications Infrastructure; Manufacturing
Ensure adequate and efficient cooling for IT infrastructure, both within Clark County facilities and elsewhere (e.g., data centers).	Telecommunications Infrastructure
Introduce a proactive replacement and maintenance schedule and budget for equipment that is reflective of climate projections.	Telecommunications Infrastructure
Incorporate contractual obligations for telecommunications providers that accounts for risk sharing (e.g., remove the “act of God” provision).	Telecommunications Infrastructure
Continue to advance regional collaboration on water resiliency planning and management.	Water Treatment & Distribution
Anticipate treatment standards/processes based on projected water levels and raw water quality in order to engage in proactive (rather than reactive) long-range planning.	Wastewater Infrastructure
Work with local agencies to integrate climate-related risks into wastewater infrastructure design and maintenance plans.	Wastewater Infrastructure
Consider wastewater treatment capabilities as part of development planning.	Wastewater Infrastructure
Work with regional and local agencies to integrate the compounding impacts of wildfire and flash flooding in the design of new stormwater infrastructure.[3]	Stormwater/Flood Protection Infrastructure
Develop short- and long-term support systems to help populations experiencing homelessness reduce reliance on stormwater infrastructure for shelter.	Stormwater/Flood Protection Infrastructure
Expand resources for addressing extreme heat (e.g., cooling centers, water stations, and public showers) in communities that are most vulnerable to extreme heat.[4]	Emergency Management

1 Aligns with Nevada Division of Forestry’s Nevada Forest, Range & Watershed Action Plan.

2 Aligns with Nevada’s State Climate Strategy.

3 Aligns with Nevada Division of Forestry’s Nevada Forest, Range & Watershed Action Plan.

4 Aligns with recommendations from the Guinn Center’s Strengthening Heat Resiliency in Communities of Color in Southern Nevada.

Strategy	Relevant Systems
Coordinate dissemination of information related to climate hazards with community organizations and service providers to ensure all residents have access to information and support networks.	Emergency Management
Formalize a network of well-resourced mobile crisis intervention services to engage communities of concern during emergency and non-emergency situations and address heat, flood, and wildfire impacts on at-risk residents before or as they occur.	Emergency Management
Ensure that Clark County emergency operations are prepared for climate-related disruptions.	Emergency Management
Identify critical public facilities that face enhanced wildfire risk and put in place protections.	Government & Administrative Facilities
Encourage installation of solar plus storage, vehicle to grid technology, and microgrids to support system reliability.	Government & Administrative Facilities
Work with haulers and regulators to plan for long-term impacts of climate hazards–particularly extreme heat–on waste processing operations and personnel.	Sanitation/Waste Management
Develop utility assistance and weatherization programs for low- and fixed-income individuals and improve existing programs.	Housing
Provide financial assistance and incentives to implement and maintain cooling and clean air features in existing and new affordable housing developments and low- and fixed-income households.[5]	Housing
Implement drought resilience strategies to public school facilities alongside planned campus construction, improvements, maintenance, and site-funded projects.	Schools
Install resilient design features in corrections and detention facilities.	Correctional Facilities & Detention Centers
Audit procurement and facility management and identify cost-saving, sustainable alternatives to current general use products and operations.	Correctional Facilities & Detention Centers
Engage corrections and detention leadership and staff on best practices for resilient corrections and detention facilities.	Correctional Facilities & Detention Centers
Increase the energy efficiency and climate resilience of public and community facilities.	Public & Community Facilities
Invest in resilience hubs and public resources that reduce exposure to multiple climate and health hazards.	Public & Community Facilities; Emergency Management
Implement heat reduction strategies, including shade structures, cool pavements, and cool roofs, at parks and recreational sites.[6]	Parks & Open Spaces/Lands
Promote expanded protection and preservation of cultural and spiritual resources and sites.	Cultural & Spiritual Sites
Enhance coordination and collaboration with Tribal Nations and communities throughout the region to strengthen resilience to climate hazards.	Cultural & Spiritual Sites
Provide worksite emergency preparedness training for employers and employees to proactively prepare for climate hazards.	Manufacturing/Industrial; Trades; Tourism; Small Businesses; Sanitation; Waste Management
Foster climate literacy using an equity lens for Southern Nevada's local workforce.	Manufacturing/Industrial; Trades; Tourism; Small Businesses; Professional & Public Service Employment; Food Systems
Enhance the climate resilience of Southern Nevada's local workforce.	Manufacturing/Industrial; Trades; Tourism; Small Businesses; Professional & Public Service Employment; Food Systems

5 Aligns with recommendations from the Guinn Center's Strengthening Heat Resiliency in Communities of Color in Southern Nevada.

6 Aligns with RTC's Southern Nevada Extreme Heat Vulnerability Analysis.

Strategy	Relevant Systems
Identify opportunities to make the supply chain more climate resilient.	Manufacturing/Industrial; Food Systems; Trades; Tourism; Professional and Public Service Employment; Small Businesses
Ensure trade business operation, strategy, and maintenance plans incorporate climate change projections and related impacts.	Trades
Support and promote requirements that protect workers from extreme heat events.[7]	Manufacturing/Industrial; Trades; Tourism; Small Businesses; Sanitation/Waste Management
Promote and advance climate justice, diversity, equity, and inclusion practices in Clark County systems, workplaces, programs, and practices.	Professional and Public Service Employment
Coordinate with key partners to ensure that the professional and public service workforce has access to climate health related resources, training, and support.	Professional and Public Service Employment
Create additional employment opportunities for special needs individuals, unhoused individuals, seniors, and youth that do not expose them to extreme heat and other climate hazards.	Professional and Public Service
Identify opportunities to help businesses understand and take action to reduce their climate related risks.	Small Business
Ensure transportation infrastructure asset management performance and investment estimates account for climate-related changes.	Roads/Bridges
Invest in existing and new key transportation corridors to ensure that infrastructure is in a state of good repair, climate resilient, and can accommodate current and future multimodal transportation demands.	Roads/Bridges
Continue to prioritize complete streets using a climate lens in capital improvement planning.	Roads/Bridges
Prioritize safe and protected (i.e., high-comfort) bicycle and pedestrian infrastructure in locations most vulnerable to the impacts of climate change.	Transit & Bike/Pedestrian Infrastructure; Parks & Open Spaces/Lands
Invest in projects, programs, and policies that reduce the impacts of climate change on public transit users, infrastructure, and operations.[8]	Transit & Bike/Pedestrian Infrastructure
Promote strategic investment opportunities to improve and expand high capacity transit, using a climate resilience lens.	Transit & Bike/Pedestrian Infrastructure; Freight & Passenger Rail
Collaborate with service providers to improve the safety of pedestrian corridors, especially for special needs individuals, seniors, and youth.	Transit & Bike/Pedestrian Infrastructure
Increase availability and accessibility of public transit options for all Clark County residents with attention to special needs individuals, unhoused individuals, seniors, and youth.	Transit & Bike/Pedestrian Infrastructure
Coordinate and maintain inter-agency and multi-organizational working groups to share knowledge, plans, and resources.	All
Integrate climate-related risks, including climate projections and impact analyses, into planning processes, including capital improvement and comprehensive plans.	All
Prioritize mixed use and climate resilient development to support better access to necessary goods and services.	All

7 Aligns with recommendations from the Guinn Center's Strengthening Heat Resiliency in Communities of Color in Southern Nevada.

8 Aligns with recommendations from the Guinn Center's Strengthening Heat Resiliency in Communities of Color in Southern Nevada.

ALL-IN CLARK COUNTY

BOLD ACTION FOR A SUSTAINABLE FUTURE