APPENDIX C
Vulnerability Assessment

Vulnerability Assessment

This assessment describes existing City plans, assets, and community characteristics, assesses various climate hazards, and discusses specific anticipated impacts on Buena Park residents and city infrastructure. The result of this assessment is a detailed understanding of **risk** relative to how community members experience hazards differently throughout the City. The key findings of the Vulnerability Assessment will inform the development of specific policies and strategies in the Climate Action and Adaptation Plan (CAAP) to address vulnerabilities and strengthen climate adaptation and resilience through infrastructure, education, programs, and policies.

Risk

Risk accounts for a community's exposure to hazards and factors that heighten impacts of hazards.

RELATIONSHIP TO OTHER PLANNING DOCUMENTS

The City of Buena Park has addressed natural hazards and climate adaptation through several existing plans. The CAAP builds off existing policies by utilizing existing background information and maintaining consistency with overarching goals. The related plans are described below.

Local Hazard Mitigation Plan

The 2022 Local Hazard Mitigation Plan (LHMP) is a strategic document intended to reduce or eliminate the impact of natural or human caused hazards, such as floods or earthquakes. The LHMP identifies hazards that have the potential to impact the City and outlines the vulnerability and risk associated with those hazards. Hazards included in the LHMP relevant to climate adaptation include drought, flooding, extreme heat, and dam failure. The LHMP is updated every 5 years to meet federal and state funding incentives. The LHMP informs the CAAP by providing relevant vulnerability and risk analysis, as well as several programs that can be incorporated into the CAAP's policies.

Emergency Operations Plan

The 2021 Emergency Operations Plan (EOP) outlines the City's strategy for responding to disasters or major emergencies. It provides an overview of the emergency response functions of City departments, supporting agencies, public officials, and other public and private organizations during emergencies and disasters. The EOP's strategies for operations, coordination, and

information dissemination before, during, and after emergencies help inform the CAAP's assessment of emergency response facilities and their capability in responding to hazard impacts.

Urban Water Management Plan

The Buena Park 2020 Urban Water Management Plan (UWMP) assesses the reliability of the water supply and drought risk and outlines the City's approach to proactively plan for its water sources over a 25-year planning horizon. Key elements of the UWMP include efficient use of urban water supplies, water conservation programs, and other policies. The 2020 Water Shortage Contingency Plan (WSCP), a new component of the UWMP and regulatory requirement, includes strategies and protocols to prepare for and respond to any water shortages. In addition, the UWMP assesses water reliability given a 5 consecutive dry-year situation and groundwater supplies coordination consistent with an applicable Groundwater Sustainability Plan. The UWMP provides relevant data and includes existing policies that the CAAP will implement, support, and measure.

2035 General Plan

The 2035 General Plan, adopted in 2010, serves as the official "blueprint" for long-range planning and development in the City. It establishes the overall vision for the Buena Park, including current issues, changing conditions, and long-term community priorities for the 25-year planning horizon (2010-2035). While climate action and adaptation concepts are addressed by elements of the General Plan, it is not comprehensive. As a result, the CAAP will expand and refine the climate action and adaptation analysis and policies provided in the General Plan.

Within the General Plan, the 2010 Safety Element identified and assessed the potential impact of hazards to health and safety. Several such hazards are expected to become more intense or frequent as a result of climate change in the region, namely flooding (including resulting mudslides and debris flows) and wildfire.[1] The CAAP builds off the Safety Element's policies addressing flooding and wildfire risk by assessing current conditions with updated data and incorporating best practices for mitigating against these hazards. Other hazards addressed in the CAAP, such as extreme heat, are not currently addressed in the 2010 Safety Element. The City is in the process of updating the Safety Element.

The 2022 Environmental Justice Element addressed disproportionate health risks in disadvantaged communities and set forth policies to reduce pollution burdens, including air pollution, and improve access to healthy food, public facilities, safe and sanitary homes, and recreation. Climate adaptation

[1] State of California (2018a). "Los Angeles Region Report" In California's Fourth Climate Change Assessment. Accessed July 1, 2024: https://climateassessment.ca.gov/regions/

is addressed broadly in policies regarding educating residents about climate vulnerabilities, planning capital improvement projects to account for climate vulnerabilities and increase resilience. The CAAP utilizes the Environmental Justice Element's analysis of disadvantaged communities to identify and prioritize areas that may experience heightened impacts from climate hazards.

Community Overview

The following section describes various community characteristics, demographics, and assets in Buena Park that relate to climate hazards.

HOUSING CHARACTERISTICS

Many hazards are experienced from home, making certain characteristics of homes important to climate adaptation. Based on where you live you may experience hazards more severely due to the location or quality of your housing. Your housing situation can also make it harder to address hazards through maintenance or other remedies due to financial or rental constraints.

Housing Stock and Age

Buena Park's housing stock includes approximately 23,680 units, with approximately 57% of those being owner-occupied and the remaining 43% rented. Nearly 40% of the units were built between 1950 and 1959, and over 30% were built between 1970 and 1989 (see Table C-1). The northern portion of Buena Park has fewer housing units built before 1960, while central areas, such as those intersected by Beach Boulevard, have more units.

Table C-1. Age of Housing Stock

Year Built	Buena Park	Orange County
	Total Units (Percent)	Total Units (Percent)
2014 or Later	305 (1.3%)	24,655 (2.4%)
2010 to 2013	212 (0.9%)	20,991 (2.0%)
2000 to 2009	1,059 (4.5%)	85,206 (8.2%)
1990 to 1999	1,387 (5.9%)	122,601 (11.8%)
1980 to 1989	2,129 (9.0%)	154,042 (14.8%)
1970 to 1979	4,473 (18.9%)	243,025 (23.4%)
1960 to 1969	3,862 (16.3%)	203,214 (19.6%)
1950 to 1959	9,151 (38.6%)	137,480 (13.3%)
1940 to 1949	839 (3.5%)	21,719 (2.1%)
1939 or Earlier	263 (1.1%)	25,099 (2.4%)
Total Units	**23,680**	**1,037,492**

Source: City of Buena Park. 2022. "Housing Element." https://www.buenapark.com/city_departments/community_development/planning_division/general_plan.php#outer-544

Housing Affordability

Housing affordability is an issue that is pervasive across much of the state. One indicator of a lack of affordable housing is cost burden. A household is considered cost-burdened if they spend more than 30% of household income on housing costs. In addition, households spending 50% or more on these housing costs are considered severely cost-burdened. Across Buena Park, 13.2% of low-income homeowners and 27.6% of low-income renters are severely cost-burdened, which is a higher rate than 72% of other California cities. Cost burden tends to have a greater impact on low-income households because the remainder of their income may not be sufficient to afford other necessities such as food and transportation.

Cost burden among renters is prevalent throughout Buena Park; though cost burden is generally highest in the southern half of the city, south of Orangethorpe Avenue, where most census tracts have rates of cost burden of 60% to 80%. Cost burden among homeowners is generally lower than that of renters, mostly between 20% and 40%, except for one census tract directly north of Interstate 5 and below Artesia Boulevard.

Another indicator of a lack of affordable housing is overcrowding. Buena Park has higher rates of overcrowding than 89% of other California cities.[2] The percentage of households that are overcrowded is most pervasive in the North-Central portion of the City, between Orangethorpe

[2] US Census Bureau (2019). "Selected Housing Characteristics (2015-2019)." Table DP04. Accessed July 5, 2024: https://data.census.gov/

Avenue and Artesia Boulevard, in which between 15% and 20% of households are overcrowded and between 5% and 10% are severely overcrowded.

People Experiencing Homelessness

Community members experiencing homelessness can be especially vulnerable to climate hazards due to their heightened exposure to the elements. According to the 2024 Point-in-Time count, there were 379 unhoused individuals in Buena Park, an increase of 42% from the 2022 count. The cause of these increases is impossible to pinpoint, because of the many factors that contribute to a person experiencing homelessness.[3] Monitoring and attempting to reduce the amount of people experiencing homelessness in Buena Park and the region is important to reduce the number of people who will be disproportionately impacted by climate hazard impacts.

Over half of the unhoused individuals in Buena Park are sheltered. Buena Park is part of the North Service Planning Area along with 13 nearby cities in Northern Orange County. These 13 cities jointly fund two regional shelters located in the Cities of Buena Park and Placentia to serve individuals experiencing homelessness. In 2022, Buena Park added 150 shelter beds with the development of the Navigation Center. The City of Anaheim also hosts a Project Homekey Program site, which has been operated as a temporary shelter but will transition to permanent housing.

RACE/ETHNICITY

While race and ethnicity do not directly relate to hazard impacts, many historic, societal, or cultural factors can contribute to a particular race or ethnicity experiencing heightened impacts from hazards. For example, if a racial or ethnic group is concentrated in an area with limited investment, they may experience disproportionate impacts from climate hazards. Efforts to support these neighborhoods should be culturally competent to effectively communicate with communities.

The three largest racial/ethnic groups in Buena Park are consistent with those of Orange County and the State as a whole—Hispanic and Latino/a, White, and Asian. However, in Buena Park, the Asian population and those who identify as multiple races comprise a significantly larger percentage than in Orange County or the State, and the Hispanic and Latino/a population comprises a larger percentage than in Orange County (see Table C-2).

According to the State Department of Housing and Community Development, most of the City is characterized as low-medium segregation, meaning census tracts are not typically dominated by a

[3] Orange County (2024), "Everyone Counts: 2024 Point in Time Summary." https://unitedtoendhomelessness.org/wp-content/uploads/2024/05/2024-Point-In-Time-Count-Summary-FINAL.pdf

single racial or ethnic group and are moderately integrated. Furthermore, there are no racially concentrated areas of poverty within the City.[4]

Table C-2. Race/Ethnicity in Buena Park

	City	County	State
Hispanic/Latino/a	40.0%	34.2%	40.4%
White Alone	38.3%	37.4%	70.4%
Asian Alone	32.7%	23.7%	16.5%
Black Alone	2.4%	2.3%	6.5%
Multiple Races/Other	12.6%	3.9%	4.3%
Indigenous People	0.9%	1.1%	1.7%
Pacific Islander	0.4%	0.4%	0.5%

Source: US Census Bureau (2023). American Community Survey (ACS) and Population Estimates Program (PEP)

PHYSIOLOGICAL CHARACTERISTICS

Many physiological characteristics, such as age or chronic health conditions, can make a person more susceptible to experiencing health issues during hazard events. Table C-3, below, shows rates of various conditions and age demographics in Buena Park compared to the State. All physiological conditions are equally or less prevalent than the State average.

Table C-3. Physiological Characteristics in Buena Park

Health Indicator	Rate of Physiological Characteristics		
	Buena Park	Orange County	California
Heart Disease	**4.96%**	**4.84%**	**5.16%**
Asthma	**8.24%**	**8.32%**	**9.08%**
Older Adults (age 65 and above)	**13.3%**	**14.3%**	**14.0%**
Children (age 5 or below)	**6.14%**	**5.93%**	**6.30%**
Disability	**4.04%**	**3.21%**	**4.04%**

Source: Public Health Alliance of Southern California (2018). *Healthy Places Index.* https://map.healthyplacesindex.org/

COLOR CODE COMPARED TO THE STATE:

- **Quartile 1 = Most Vulnerable**
- **Quartile 2 = Vulnerable**
- **Quartile 3 = Somewhat Vulnerable**
- **Quartile 4 = Least Vulnerable**

[4] HCD (2023). "TCAC/HCD Opportunity Map – High Segregation and Poverty." AFFH 2.0 Data Viewer. Accessed July 12, 2024: https://experience.arcgis.com/experience/834b33b812c949a0820ed25c8ee4eedd/?draft=true

SOCIOECONOMIC CHARACTERISTICS

Socioeconomic characteristics can impact resident behavior in a variety of ways that alter day-to-day hazard experiences. For example, economic characteristics can cause variations in an individual's hazard exposure and ability to respond to hazards, while social factors like language proficiency can impact communication styles.

Income

The highest concentrations of households below the Federal poverty line are in two census tracts near Interstate 5 in the north-central part of Buena Park.[5] The City has a similar rate of low-income households to the state, and a higher rate of low-income households than the County (see Table C-4).

Outdoor Workers

No census tracts in Buena Park have a high proportion of outdoor workers, and the City as a whole has a smaller proportion of outdoor workers compared to either Orange County or the State. The natural resources, construction, and maintenance occupation category comprises 5.67% of all civilian (non-military) workers in Buena Park. However, census data does not capture the complete set of workers who spend at least some of their working hours outdoors. Knott's Berry Farm, for example, whose employees are primarily categorized as being in a "service occupation," often work outdoors for all or a majority of their work shift. As a result, the number of outdoor workers represented in **Table C-4**, may be an undercount of actual outdoor workers.

Language

There is a high rate of Korean and Spanish speakers in Buena Park, which is an important factor to consider when sending emergency alerts or communication. For the purposes of this Vulnerability Assessment, a person is considered to have limited-English proficiency if they are over age 5 and speak English less than "very well." As indicated in Table C-4 below, Buena Park has a significantly larger percentage of people with Limited English Proficiency compared to both Orange County and the State. Several other neighboring cities in northern Orange County also have high rates of Limited English Proficiency, such as Fullerton, Anaheim, La Palma and Cerritos.

Several of the City's census tracts score in the bottom 25% of California tracts for English proficiency. These tracts are primarily in the central and southern portions of Buena Park.

[5] Note: 200% of the Federal poverty level is often used as a measure of poverty in California due to the high cost of living.

Table C-4. Socioeconomic Characteristics in Buena Park

Health Indicator	Rate of Socioeconomic Characteristics		
	Buena Park	Orange County	California
Low-income Households[1]	**30.4%**	**25.5%**	**30.9%**
Outdoor Workers	**5.31%**	**6.15%**	**8.00%**
Limited English Proficiency	**27.2%**	**19.3%**	**17.9%**

Sources: Public Health Alliance of Southern California (2018). *Healthy Places Index.* https://map.healthyplacesindex.org/

COLOR CODE COMPARED TO THE STATE:

- **Quartile 1 = Most Vulnerable**
- **Quartile 2 = Vulnerable**
- **Quartile 3 = Somewhat Vulnerable**
- **Quartile 4 = Least Vulnerable**

1 Low-income households are those that earn at or below 200% of the Federal poverty level.

ENVIRONMENTAL HEALTH BURDENS

The State uses **CalEnviroScreen 4.0** to combine socioeconomic and environmental factors, like income and air pollution, to understand a community's overall environmental health burden. Environmental health burdens can be exacerbated by climate hazards, widening the disproportionate burdens experienced. According to the EPA "the most severe harms from climate change fall disproportionately upon underserved communities who are least able to prepare for, and recover from, heat waves, poor air quality, flooding, and other impacts."[6]

CalEnviroScreen 4.0

CalEnviroScreen 4.0 is a tool developed by the State of California to understand what communities are disproportionately burdened by pollution or other environmental health burdens.

Census tracts that rank in the 75% or higher across California for environmental burden are defined as disadvantaged communities (DACs). Six census tracts making up approximately 36% of the City

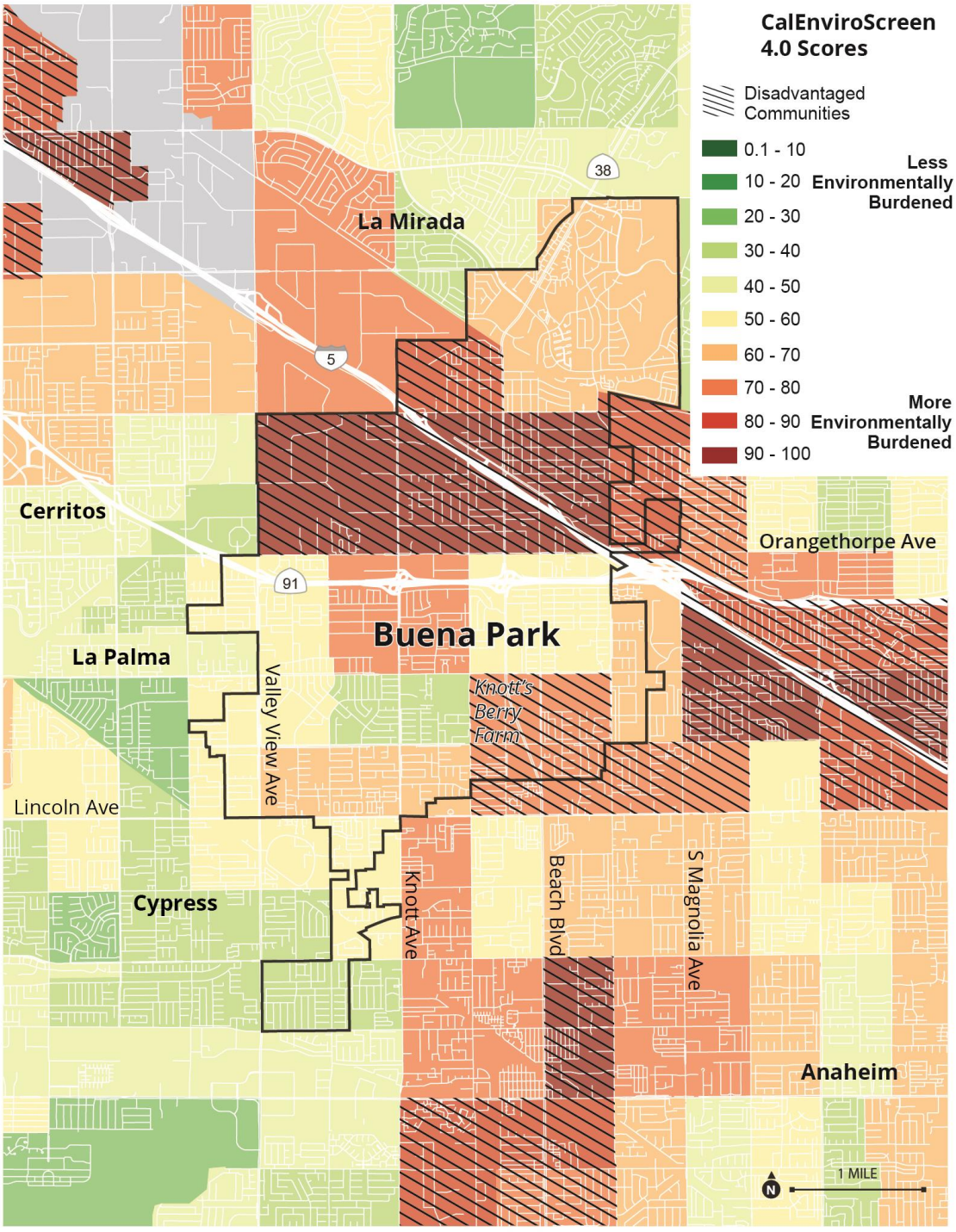
6 EPA (2021). "EPA Report Shows Disproportionate Impacts of Climate Change on Socially Vulnerable Populations in the United States". https://www.epa.gov/newsreleases/epa-report-shows-disproportionate-impacts-climate-change-socially-vulnerable

are considered DACs based on their CalEnviroScreen 4.0 scores (see Figure C-1).[7] These DACs are most concentrated in the north-central section of Buena Park.

Within the tracts that are considered DACs, land uses are a mix of commercial and industrial/warehouses, with a small amount of residential mixed in. Other tracts are primarily residential and commercial but exist along the freeway. As such, the City's most burdened tracts have very high pollution relative to the average in California, indicating high exposure to airborne pollutants such as toxic releases, particulate matter (PM) less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and diesel PM. Additionally, these tracts are disproportionately exposed to high traffic volumes, solid waste sites, and hazardous waste cleanup sites.

[7] City of Buena Park (2022). "Environmental Justice Element." https://www.buenapark.com/city_departments/community_development/planning_division/general_plan.php#outer-544

Figure C-1. Disadvantaged Communities per CalEnviroScreen 4.0



Source: OEHHA (2023). CalEnviroScreen 4.0. https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40

Community Assets

Understanding community assets can help to determine how facilities impact **adaptive capacity** throughout the community and where facilities may be leveraged to provide additional resilience. Some facilities, like fire stations, respond directly to health issues during hazard events. Others offer community benefits, like a public place to go to for air conditioning, or a shaded and vegetated park that reduces hazard severity. This analysis considers emergency response facilities and community serving facilities.

> **Adaptive Capacity**
>
> A community's ability to withstand, adapt to, and recover from hazards. City facilities and programs can impact adaptive capacity.

EMERGENCY RESPONSE FACILITIES

Emergency response facilities are activated during an emergency and used to respond to potentially harmful situations, including hazard events. These facilities include police, fire, and other emergency response services. In Buena Park there are three Orange County Fire Authority (OCFA) fire stations and a Police Department headquarters. None of these facilities are located in fire or flood hazard zones. These facilities play an essential operational role during hazard events, enabling a response and allowing first responders to reach community members in need. Additionally, they serve as a hub for preparation and mitigation activities, such as public outreach and training, which lower the risk and severity of climate hazards. In large events that require interagency cooperation, an Emergency Operations Center (EOC) is activated to ensure coordination of operations and resources.

Hospitals are also essential emergency facilities. During hazard events, life-threatening impacts or injury may occur that require medical attention. Although there are no hospitals within city boundaries, five hospitals in neighboring cities provide emergency services and care to Buena Park residents. These include the following:

- La Palma Intercommunity Hospital (La Palma)
- Anaheim Regional Medical Center (Anaheim)
- Anaheim Global Medical Center (Anaheim)
- Providence St. Jude Medical Center (Fullerton)
- University of California, Irvine (UCI) Medical Center (Orange)

COMMUNITY-SERVING FACILITIES

Gathering Places

Places where community members gather can provide refuge for community members during hazard events. If residents already use these facilities for recreation, social events, education, or other activities in their day-to-day lives, it can make them more welcoming and effective as a cooling center or shelter. These locations may also be used to share resources and information after particularly impactful hazards.

Parks

Parks provide places for community gathering, recreation, habitat for wildlife, and ecosystem services. Greenspace in urban or suburban areas can reduce the heat exposure and promote absorption of stormwater during heavy rain events. Vegetated areas, rain gardens, and bioswales can also absorb rainfall, decreasing stormwater flows.[8]

There are several parks of various sizes located throughout Buena Park, including a linear park along La Palma Avenue. 44.3% of Buena Park residents live within a 10-minute walk (0.25 miles) of a park, and 85% live within biking distance (0.5 miles). This means most residents have access to parks and can benefit from them, whether it be their cooling effect on neighborhoods, stormwater management, and ecosystem services. However, there are gaps in access to parks: residents near Beach Boulevard, east and south of Interstate 5, as well as south of La Palma Avenue, live farthest from a park.

Water features can also offer safe forms of recreation during extreme heat events. There are two pools at City parks including the Peak Park Pool and Boisseranc Park Pool. There is also a wading pool at Carl Brenner Park. Each of these parks is near central Buena Park, spread out east to west between State Route 91 and La Palma Avenue.

Public Indoor Gathering Places

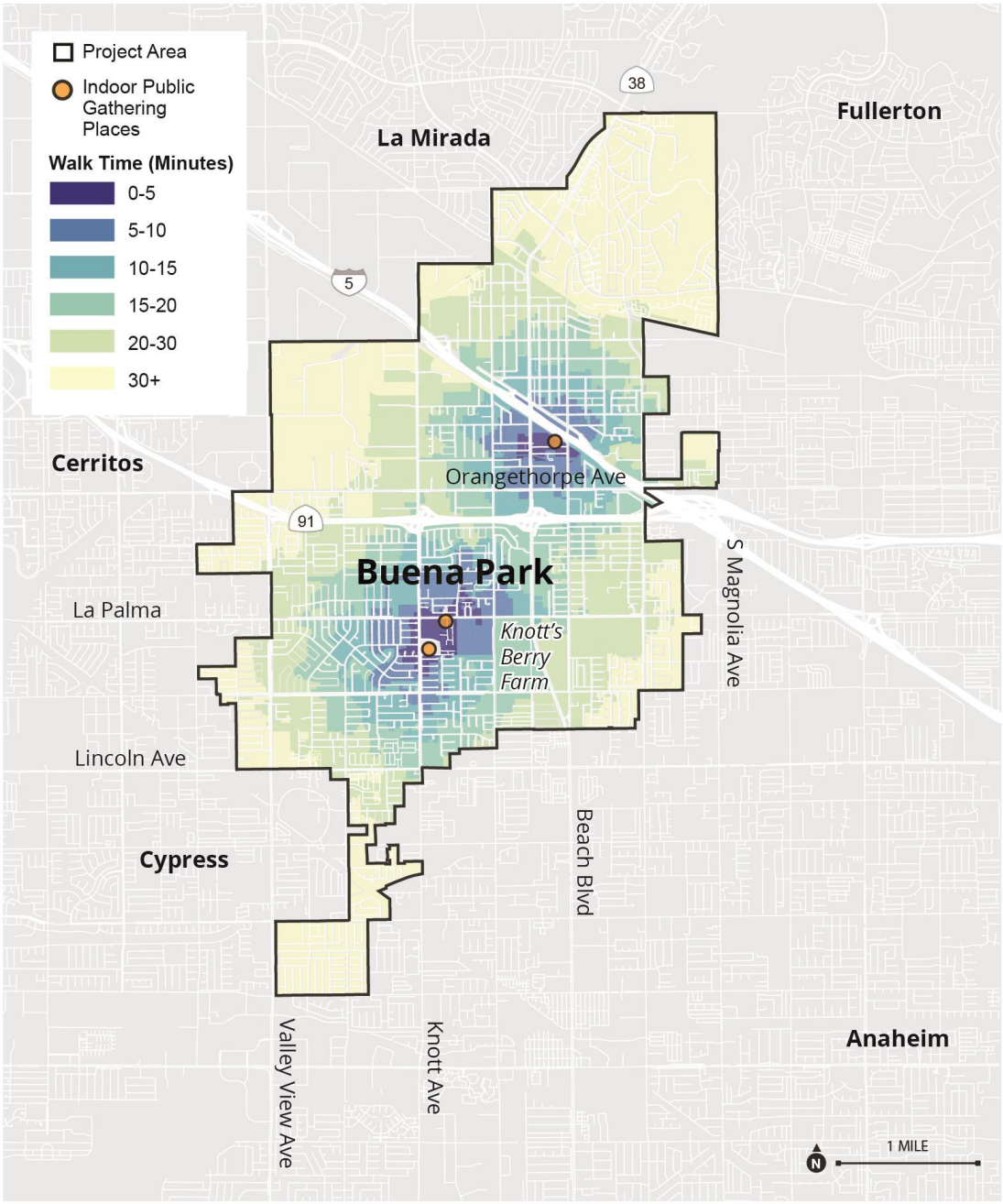
The City is home to a variety of public indoor gathering places, including Ehlers Event Center, a Community Center, and a Library. The Event Center and Library are official cooling centers, meaning they're advertised as a space for members of the public to come and cool off during extreme heat events.

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[8] EPA (2024d). "Performance of Green Infrastructure." https://www.epa.gov/green-infrastructure/performance-green-infrastructure

All residents are within a relatively short drive of these facilities, but those without access to a car must rely on walking, biking, or public transit (see Figure C-2). 7.3% of Buena Park households are within a 10-minute walk of at least one of these facilities, and 21.4% are within a short bike ride, although the City's bikeway network is limited (see Bike and Pedestrian Infrastructure section, below). Transit offers residents another option to access facilities. Bus Route 38 and 25 offer access to the Library and Senior Activity Center, while the Community Center may be accessed by Routes 29 or 529.

Figure C-2. Access to Indoor Public Gathering Places in Buena Park



Source: UrbanFootprint (2024). Walk and Transit Accessibility Analysis.
https://docs.urbanfootprint.com/private/analyst/en/base-canvas-methodology/walk-and-transit-accessibility-analysis.html

Utilities

Utilities provide residents and businesses with day-to-day essentials. Some hazards can disrupt utilities, either locally or regionally. This section describes electricity and water systems present in the City.

Electricity

The City's electricity grid is part of a large network of overhead transmission lines in the Los Angeles Metropolitan Region operated by Southern California Edison (SCE). A 10-mile, 220 kilovolt (double circuit) line runs through the center of Buena Park along with several smaller 66 kilovolt (single circuit) lines.[9] Aspects of the grid infrastructure, City facilities, energy operator actions, and State oversight help to facilitate enhanced energy resilience. To prepare for the event of utility failure, the City has established redundant connections for all utility systems, including electrical, and backup generators for limited capacity backup power at isolated locations, including City Hall, the Buena Park Police Department, the City Yard, Ehlers Event Center, and groundwater pumps. Additionally, to reduce the risk of damage to transmission lines from tree limb breakage, the City performs ongoing tree trimming and maintenance as part of its community forestry program. The City also intends to pursue grant funding to encourage the development of microgrids that use battery arrays and renewable energy. Since microgrids can operate in grid-connected and island modes, they are more resilient in the face of hazards, able to avoid large-scale power shutoffs.[10]

SCE and Orange County Power Authority (OCPA) offer several assistance programs for income-qualified households to offset energy costs. These include the California Alternate Rates for Energy (CARE), which provides about a 30% discount on monthly electricity bills for very-low-income households; the Family Electric Rate Assistance (FERA) program, which provides an 18% discount for low-income households; SCE's Energy Assistance Fund (EAF), which provides cash assistance to qualified households once per year; and the Energy Savings Assistance Program (ESAP), which provides qualified households free replacement appliances, weatherization, and LED lightbulbs to

[9] California Energy Commission (2024). "California Electric Transmission Lines." https://cecgis-caenergy.opendata.arcgis.com/search?categories=%252Fcategories%252Fenergy%2520infrastructure

[10] City of Buena Park (2022b). "Local Hazard Mitigation Plan." Accessed July 9, 2024: https://cms7files1.revize.com/buenaparkca/Document_center/Residents/City%20Documents/Buena%20Park%20LHMP%2003-28-2024.pdf

conserve energy and thereby lower electricity bills.[11] Altogether, these programs can help to reduce the burden of energy costs on low-income households.

Water

Water supply availability is expected to change in the coming years due to climatic factors discussed more in the drought section. Buena Park's water supply consists of approximately 80% groundwater and 20% imported water. For local groundwater, the City's water is supplied by a large reservoir and service connections with the Municipal Water District of Orange County (MWDOC). Imported water comes from the Colorado River and the State Water Project.

Water service in the city can vary by location; three parts of the city are served by the City of Fullerton and Suburban Water Systems, and the City provides service to one area in the City of Anaheim and another in the City of La Mirada. The City works with MWDOC and Orange County Water District (OCWD) to ensure safe and reliable water supply during droughts.

The Metropolitan Water District of Southern California (MET) and MWDOC's 2020 UWMPs each conclude that they can meet full-service demands of their member agencies starting 2025 through 2045 during normal years, a single-dry year, and 5 consecutive dry years. In case of a water supply shortage, additional water can be conveyed by the city's secondary interconnections with MET.[12]

Water quality in the Orange County Basin can impact water availability if the quality does not meet regulatory standards and is therefore unfit for human consumption. OCWD manages and conducts extensive monitoring of the Orange County Basin. In April 2024, the U.S. Environmental Protection Agency (EPA) established National Primary Drinking Water Regulations[13] to monitor per- and poly-fluoroalkyl substances (PFAS), a group of chemicals of particular concern for groundwater quality. Since 2020, OCWD has undertaken funding and construction of treatments systems for production wells impacted by PFAS compounds, initiating design, permitting and construction for rapid deployment. Other contaminants of concern include methyl tertiary butyl ether (MTBE), volatile organic compounds (VOCs), N-Nitrosodimethylamine (NDMA), 1,4-Dioxane, and constituents of

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11 SCE (2019). "Lower Your Electricity Bill, Increase Energy Efficiency." Energized. Accessed July 16, 2024: https://energized.edison.com/stories/lower-your-electric-bill-increase-energy-efficiency#:~:text=About%20one-third%20of%20SCE%E2%80%99s%20residential%20customers%20are%20enrolled,but%20may%20also%20lower%20the%20amount%20customers%20pay.

12 City of Buena Park (2020). "Urban Water Management Plan." Accessed July 9, 2024: https://cms7files1.revize.com/buenaparkca/BuenaPark2020UWMPFINALDRAF.pdf

13 EPA (2024e). "Per- and Polyfluoroalkyl Substances (PFAS): Final PFAS National Primary Drinking Water Regulation." Accessed July 9, 2024: https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas

emerging concern (CECs), which are substances not currently regulated. OCWD continues to monitor these contaminants and ensure they do not exceed applicable criteria.[14]

To plan for the event of a potential water shortage, the City has created a Water Shortage Contingency Plan (WSCP). The WSCP provides real-time water supply availability assessments and strategic steps to respond to conditions and maintain adequate, reliable supplies that minimize impacts or supply interruptions.[15]

Bike and Pedestrian Infrastructure

Bike and pedestrian infrastructures are important components of day-to-day life and provide alternatives to car trips. This relates to climate hazards because residents without cars may need to use some form of walking, biking, and/or public transit to get to their destinations, and based on the infrastructure and surrounding environment they may be exposed to climate-related hazards along the way.

Walkability is a term that describes how desirable it is to choose to walk instead of drive. Walkability can be "scored" using the EPA's walkability index. The highest walkability scores in Buena Park occur in the northern part of the City, primarily characterized by open space and single-family housing. Other highly walkable areas include segments of commercial corridors along Beach Boulevard and on the east side of La Palma Avenue. Almost all other tracts in Buena Park score above average on walkability, with only one tract scoring below average and none scoring as "least walkable."

Walkability

EPA defines walkability as a "place that's easy to walk around." Their index is based on variables that include intersection density, proximity to transit, and diversity of land uses. Walkable places help keep people active, reduce traffic, encourage social interaction, and improve overall environmental health.

The City's bike network is an area that can be improved upon. The northern part of Buena Park has some Class II bikeways that continue into neighboring cities; the Silverado Trail runs for one large city block near the center of the city; and along Ball Road a Class II bikeway connects Anaheim and La Palma through a thin segment of Buena Park. Aside from this infrastructure, most roads do not

[14] City of Buena Park (2020). "Urban Water Management Plan." Accessed July 9, 2024: https://cms7files1.revize.com/buenaparkca/BuenaPark2020UWMPFINALDRAF.pdf

[15] City of Buena Park (2021). "Water Shortage Contingency Plan." Accessed July 9, 2024: Microsoft Word - Buena Park 2020 WSCP FINAL DRAFT-2021.06.04

have bike lanes or paths. An impediment to implementing bike infrastructure is the high traffic volumes and fast speed limits on primary roads (typically 40 to 45 mph), which can make biking dangerous, particularly if bike lanes are not separated or there is no barrier between vehicular and bicycle traffic.

The City recently completed an Active Transportation Plan (ATP). During outreach for the ATP, community members identified several key needs: crosswalks for both major arterials and smaller roads, particularly near schools; additional bike lanes and parking racks; and reduced speed limits. Recommended programs include a Safe Routes to School Program, Safe Routes for Seniors Program, centralized platform for trips utilizing a variety of trip types (transit, rideshare, bikeshare, etc.), open streets and demonstration events, and more.[16] The ATP, along with past planning efforts such as the 2017 Complete Streets Master Plan, Safe Routes to School program, and Fifteen in Twenty-Twenty (FIT) program are advancing active transportation projects within the City.[17]

Risk Identification

The following section describes the climate hazards that are projected to impact residents and businesses in Buena Park. Climate hazards are natural hazards that are caused by or overlap with climate-related processes. These are discussed in more detail in California's Fourth Climate Change Assessment Regional Report, which for Orange County is the Los Angeles Region Report. This section summarizes information from the regional report and other State and local data sources to outline historic and future climate hazard impacts specific to Buena Park.

The following climate hazards are assessed for Buena Park:

- Extreme Heat
- Flooding
- Wildfire and Santa Ana Winds
- Air Pollution
- Climate Migration
- Drought

Exposure to extreme heat, flooding, and wildfire has been determined using the following **Hazard Criteria**: magnitude, timing, spatial extent, and level of certainty. Together these criteria indicate

[16] City of Buena Park (2024). "Active Transportation Plan." https://cms7files1.revize.com/buenaparkca/Document_center/City%20Departments/Community%20development/Planning%20Division/Keynote%20Projects/ATP%20Final%20w_appendices_adopted%209-10-2024.pdf

[17] City of Buena Park (2017). "Complete Streets Master Plan." Accessed July 9, 2024: https://www.buenapark.com/city_departments/public_works/engineering_services/complete_streets.php

when, where, and how hazards might impact the city, as well as the reliability of these predictions. Air pollution is considered within the magnitude of these three hazards, as each hazard influences air pollution uniquely.

Hazard Criteria

- **Magnitude** is the severity of an impact.
- **Timing** describes how often an impact occurs.
- **Spatial extent** is the area that is impacted.
- **Level of certainty** involves how accurate and precise climate model projections are.

Due to differences in hazard projections and impacts, narratives were crafted for climate migration and drought in place of the hazard criteria listed above. These narratives compile projections, impacts, and local conditions.

At the conclusion of each hazard, the **Impact on Buena Park** section describes key city assets most relevant to a hazard, and prevalent population groups with heightened potential for impacts from a hazard. While any community member can be impacted by a hazard, some people may be more likely to experience adverse effects due to physiological risk factors, like preexisting conditions or age, or due to heightened exposure to a hazard, meaning a resident is in close proximity of a hazard more regularly than most.

EXTREME HEAT

Extreme heat, especially prolonged heat waves, can have severe impacts on human health and moderate impacts on public infrastructure. An extreme heat day is defined as a day when daily maximum temperature exceeds the 98th percentile of daily maximum temperatures for a given area based on historical data. Buena Park's 98th percentile is a daily maximum temperature of 97.8°F. A heat wave is a stretch of 2 or more consecutive extreme heat days.

Magnitude

Historically, Buena Park had an average of 3 days per year above 97.8°F. By mid-century (2035-2064), 13 extreme heat days are projected per year on average. By end-century (2070-2099), under a **medium-emissions scenario,** 14 extreme heat days per year are projected, while under a **high-emissions scenario**, Buena Park is projected to experience 27 extreme heat days per year on

average (see Figure C-3). Heat waves are also projected to lengthen, with the average maximum duration doubling by mid-century (2035-2064) (see Table C-5).[18]

Emissions Scenarios

Climate models that project changes in hazards are heavily impacted by the amount of global greenhouse gas emissions that occur. For that reason, you'll see different emission scenarios discussed. The medium-emissions scenario is formally known as RCP 4.5, and the high emission scenario is RCP 8.5.

By 2050, the two scenarios result in minimal differences so only the high emissions scenario is discussed in-line with State recommendations. For 2100, both scenarios are discussed.

Table C-5. Heat Wave Duration Projections

	Historic (1961-1990)	Mid-Century (2035-2064)	End-Century (2070-2099)	
			Medium-Emission Scenario	High-Emission Scenario
Average Heatwave Duration	2 days/year	4 days/year	4 days/year	7 days/year
30-year Range of Heatwave Durations	0-6 days/year	0-13 days/year	0 – 10 days/year	1-24 days/year

Source: Cal-Adapt. (2024). "Extreme Heat Days and Warm Nights for Buena Park, Global Climate Models HadGEM2-ES, CNRM-CM5, CanESM2, MIROC5." Cal-Adapt website developed by University of California at Berkeley's Geospatial Innovation Facility under contract with the California Energy Commission. Accessed July 1, 2024 from https://cal-adapt.org

It is important to discuss the public health impacts of extreme heat. Extreme heat causes more deaths per year on average than any other weather hazard in the US.[19] Heat-related illness is often underreported and misdiagnosed; nonetheless, statewide data indicates spikes in deaths and hospitalizations in 2006 and 2017, when summertime temperatures were exceptionally high.[20] Extreme heat can also impact public health through its effects on air quality; higher temperatures can accelerate and trap ground-level ozone, particulate matter, and other air pollutants. Increased

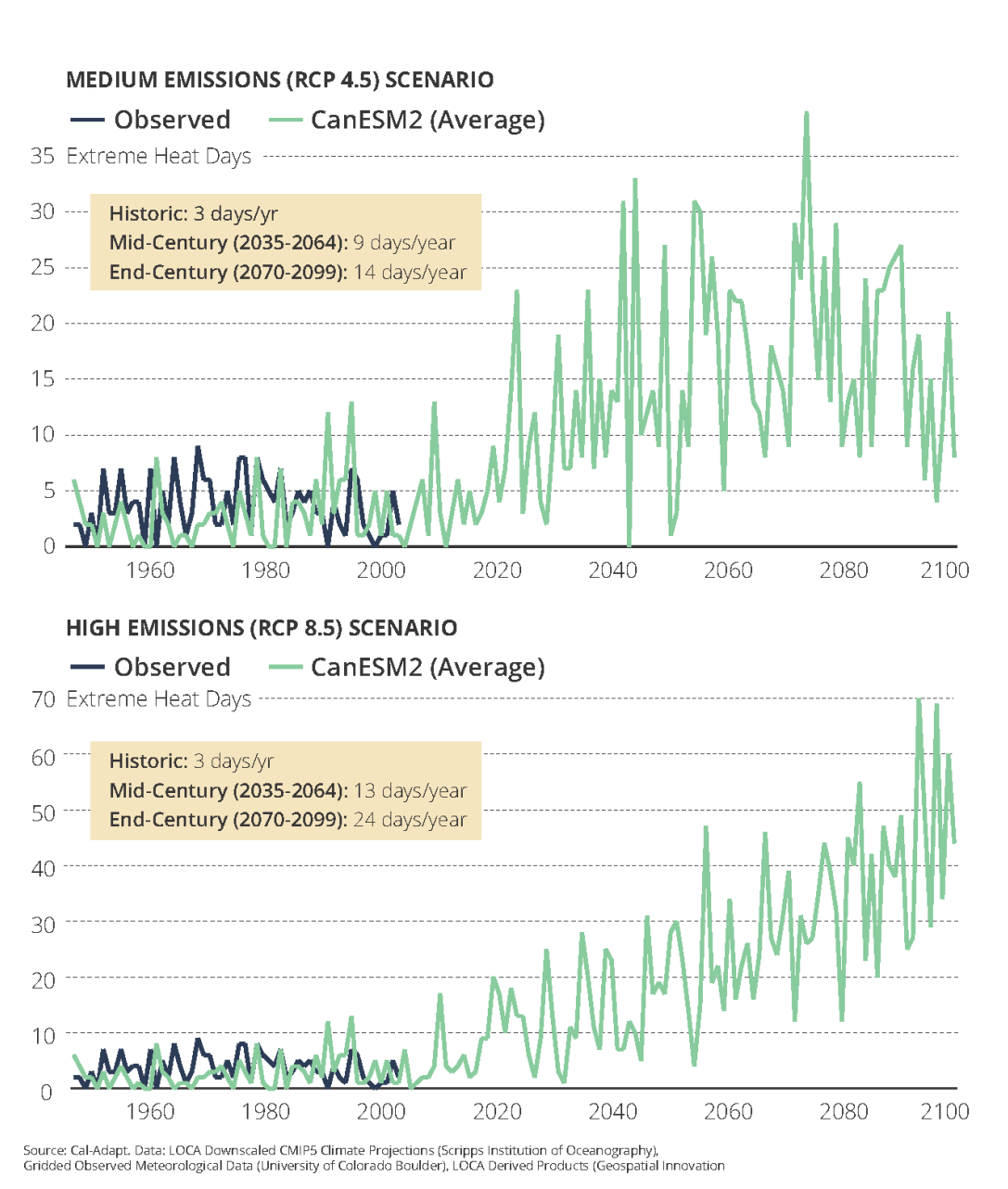
[18] Cal-Adapt. (2024). "Extreme Heat Days and Warm Nights for Buena Park, Global Climate Models HadGEM2-ES, CNRM-CM5, CanESM2, MIROC5." Cal-Adapt website developed by University of California at Berkeley's Geospatial Innovation Facility under contract with the California Energy Commission. Accessed July 1, 2024 from https://cal-adapt.org

[19] National Weather Service. (2023) "Weather Related Deaths." https://www.weather.gov/media/hazstat/80years_2022.pdf

[20] California OEHHA (2022). "Impacts on Human Health." Indicators of Climate Change in California (2022). https://oehha.ca.gov/media/humanhealthsection2022.pdf

exposure to these pollutants can lead to adverse respiratory, cardiovascular, mental health, and reproductive outcomes[21, 22]

Figure C-3. Extreme Heat Days per Year in Buena Park



22 California OEHHA (2022). "Impacts on Human Health." Indicators of Climate Change in California (2022). https://oehha.ca.gov/media/humanhealthsection2022.pdf

Timing

Extreme heat most commonly occurs between June and October in Buena Park, but it can happen at any point during the year. The rate of increase in the frequency of extreme heat days has varied according to the time of year, as well. Monthly average temperature and minimum daily temperatures have increased the most in September, meaning already warm months are receiving more sustained heat. Monthly maximum temperatures have increased the most in January, meaning the infrequent days of extreme heat in the winter are becoming more severe.[23]

Spatial Extent

Extreme heat can be experienced differently on a neighborhood-to-neighborhood basis due to the **urban heat island effect**. The tree canopy combats the urban heat island effect by providing shade to block the sun's rays and reduces the surface temperatures in areas with tree canopy. In Buena Park the urban tree canopy is most prevalent in the northeastern portion of the City, though much of that is concentrated within Ralph B. Clark Regional Park and Los Coyotes Country Club. Tree canopy in residential areas is fairly limited throughout the city. Areas with the highest rates of dark, impervious surfaces are surrounding the warehouses and industrial uses north of Orangethorpe Avenue and west of Knott Avenue, and the large parking lots surrounding the commercial and entertainment areas near Beach Boulevard and La Palma Avenue (See Figure C-4). Another factor that can impact extreme heat is proximity to the ocean. The northern and eastern parts of the City are farther inland and may have less exposure to cooler ocean winds or marine layer fog.

Urban Heat Island Effect

Temperatures in urban areas with higher rates of dark and impervious surfaces, like roads, parking lots, and buildings, can be up to 7° F warmer than outlying areas. This is due to these materials absorbing and re-emitting heat more than natural features like trees.[24]

Level of Certainty

Increased instances of extreme heat are near certain. According to California's Fourth Climate Change Assessment, models projecting future warming have a **high degree of confidence**.[25]

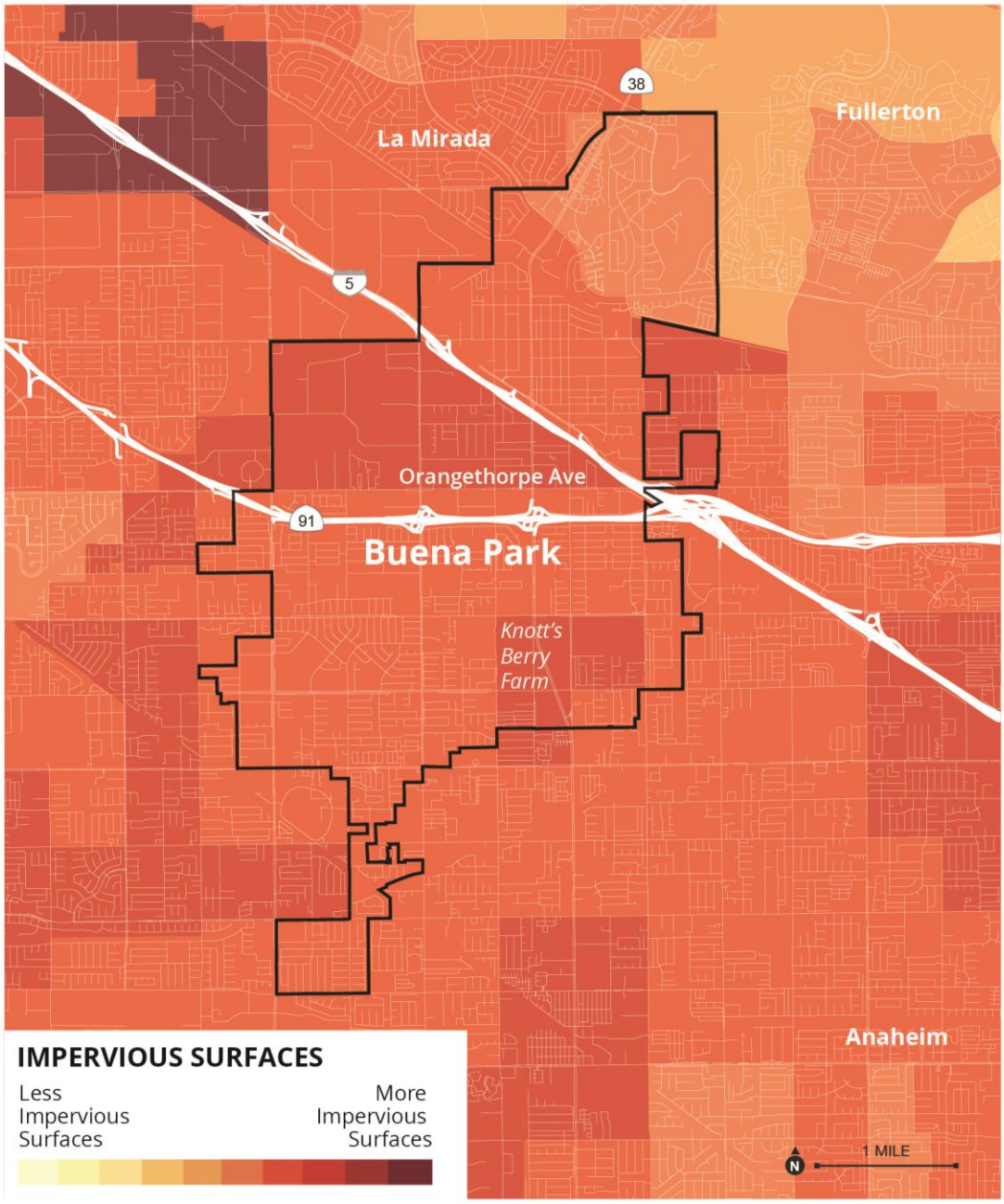
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23 State of California (2018a). "Los Angeles Region Report" In California's Fourth Climate Change Assessment. Accessed July 1, 2024: https://climateassessment.ca.gov/regions/

24 EPA (2024b). "Heat Island Effect." https://www.epa.gov/heatislands

25 State of California. (2018c). "Statewide Summary Report" In California's Fourth Climate Change Assessment. Accessed December 1, 2023: https://climateassessment.ca.gov/state/index.html

Figure C-4. Impervious Surfaces in Buena Park



Source: California Natural Resources Agency (2018). California Heat Assessment Tool (CHAT). Cal-heat.org.

Impacts on Buena Park

Community Members

For a variety of social, economic, and cultural reasons, there are differences in how extreme heat impacts people depending on race, ethnicity, sex, and age. As can be seen on Table C-6, in recent years in Orange County, people who are male, or over 65 years old are experiencing approximately double the heat-related emergency room visits as compared to other genders or age demographics, while people who are black are experiencing approximately triple the heat-related emergency room visits compared to other races or ethnicities. That being said, the rate of black residents and segregation is limited in Buena Park and rates of older adults are on-par with the State (see Community Overview section).

Table C-6. Orange County Heat-related Emergency Department Visits by Race / Ethnicity

	Race / Ethnicity			
	Asian and Pacific Islander	**Black**	**Hispanic / Latino**	**White**
Heat-related Emergency Department Visits per 100,000 people	3.3	23.1	6.2	8.0
	Sex			
	Female		**Male**	
Heat-related Emergency Department Visits per 100,000 people	4.7		8.4	
	Age			
	5 – 17 years old	**18 – 34 years old**	**35 – 64 years old**	**65+ years old**
Heat-related Emergency Department Visits per 100,000 people	3.5	8.3	6.4	11.1

Note: Data is age-adjusted. Data from 2018-2022 was used when possible, though availability for certain characteristics varied by year. Data was only available for the year 2020 for the African American/Black race, and only available for the years 2018-2020 for the Asian American / Pacific Islander race. Averages of as many available years as possible were used to attempt to account for variations in extreme heat instances each year. In Orange County from 2018-2022, 2018 saw the most heat-related emergency department visits at 12.88 per 100,000, while 2021 saw the least at 4.83 per 100,000.
Source: Tracking California (2024). *Data Explorer.* data.trackingcalifornia.org

While outdoor workers are fairly limited in Buena Park (see Socioeconomic Characteristics section), outdoor workers who engage in strenuous physical activity on the worksite, such as construction workers, face the highest risk of heat-related illness among all occupations.[26] To reduce the risk of heat-related illness, employers can implement preventative measures such as ensuring access to water, training workers to recognize signs of heat-related illnesses, mandating frequent breaks and shade, providing heat-appropriate protective equipment, and limiting work during the hottest times of day.[27]

Another consideration with extreme heat is pollution burden. When high temperatures occur, it accelerates the creation of ozone. This means environmentally burdened communities near sources of ozone pollution, such as the City's DACs along Interstate 5, will experience further impacts as high temperatures become more common. This creates health concerns related to respiratory outcomes such as asthma that should be monitored.

Many residents withstand extreme heat events from home, emphasizing the importance of insulation and access to air conditioning. Poor insulation and energy efficiency is common among older homes, which are a regular occurrence in Buena Park with over 40% of homes built before 1960 (see Housing Characteristics section). High energy costs contribute to housing cost burdens. Further, if residents have air conditioning, the costs to run A/C may discourage use. SCE and OCPA's assistance programs reduce this cost burden, though some programs, like ones focused on weatherization may be difficult for renters to navigate or access.

Infrastructure and City Programs

While uncommon, large-scale blackouts are possible and can be caused by an extreme heat event that requires extensive air conditioning needs. Several key city assets have backup power, including Ehlers Event Center, and the City may develop microgrids in the future with the support of grant funding.

[26] EPA (2024a). "A Closer Look: Heat-Related Workplace Deaths." Accessed July 8, 2024: https://www.epa.gov/climate-indicators/closer-look-heat-related-workplace-deaths

[27] Dong, X. S., West, G. H., Holloway-Beth, A., Wang, X., & Sokas, R. K. (2019). Heat-related deaths among construction workers in the United States. American Journal of Industrial Medicine, 62(12), 1047–1057. https://doi.org/10.1002/ajim.23024

FLOODING

Magnitude

The impacts of flooding can endanger human life; damage infrastructure, homes, and other structures; trigger debris flows; affect water quality through sanitary sewer overflows; and disrupt various services due to road closures.

Extreme precipitation events in Buena Park are defined as 2-day periods in which there is more than 0.97 inches of rainfall. The intensity of extreme precipitation events is projected to increase slightly under a low-emissions scenario but by approximately 50% under a high-emissions scenario by end-century (2070-2099).[28]

Additionally, extreme storms such as atmospheric rivers (regions of water vapor transported from warm water in the tropics) are expected to increase in frequency and intensity. Current global climate models project a nearly 40% increase in precipitation during atmospheric river events in Southern California by 2100 under a high-emissions scenario.[29]

Dam failure presents another risk factor for flooding. Approximately 33% of dam failures are due to overtopping, which is when water spills over the top of a dam, often due to a combination of wind and high-water levels. The failure of either the Carbon Canyon or Prado Dam, respectively located on the northern edge of Orange County east of the City of Brea and near the City of Corona in Riverside County, could cause significant flooding. According to Buena Park's 2022 LHMP, the entire city south of Malvern Avenue could be impacted by a flood wave 2 to 4 feet deep, which would reach Buena Park in about 6 hours following a dam failure. Both the Carbon Canyon Dam and Prado Dam are owned and operated by the U.S. Army Corps of Engineers Los Angeles District. The LHMP assesses this scenario as "likely," or having the probability of occurring between 1 in 10 years and 1 in 100 years.[30]

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28 Cal-Adapt. (2024). "Extreme Precipitation Events for Buena Park, Global Climate Models HadGEM2-ES, CNRM-CM5, CanESM2, MIROC5." Cal-Adapt website developed by University of California at Berkeley's Geospatial Innovation Facility under contract with the California Energy Commission. Accessed July 1, 2024 from https://cal-adapt.org

29 State of California. (2018c). "Statewide Summary Report" In California's Fourth Climate Change Assessment. Accessed December 1, 2023: https://climateassessment.ca.gov/state/index.html

30 City of Buena Park (2022b). "Local Hazard Mitigation Plan." Accessed July 9, 2024: https://cms7files1.revize.com/buenaparkca/Document_center/Residents/City%20Documents/Buena%20Park%20LHMP%2003-28-2024.pdf

Flooding can also negatively impact air quality by creating conditions for indoor mold to grow, resulting in increased rates of respiratory infection, including pneumonia.[31]

Timing

Historically (1961-1990), Buena Park has experienced 3 extreme precipitation events per year on average. The majority of precipitation events in California occur between November and March, though extreme precipitation is possible at any point during the year. Cal-Adapt predicts the frequency of extreme precipitation events to increase to 4 events per year on average under a medium-emissions scenario and 6 events per year on average under a high-emissions scenario by end-century (2070-2099).

More frequent extreme precipitation events may cause compounding impacts. For example, if recovery from a previous event is still underway when another storm hits, the extent of damage, incurred costs, and time of recovery could increase.

Spatial Extent

Federal Emergency Management Agency maps denote areas with 1% annual chance of flooding. In Buena Park, there are relatively few at-risk areas. Most areas at risk of flooding are in the north-eastern portion of Buena Park including a floodplain and three isolated areas with a 1% annual change of flooding. These specific areas are primarily along local roadways or contained within creek beds, though there is an area of special concern along Beach Boulevard and Fullerton Creek that overlaps with surrounding industrial, commercial, and residential parcels (see Figure C-5, FEMA Flood Zones).

Level of Certainty

According to California's Fourth Climate Change Assessment, models projecting future increases in heavy precipitation events have a **medium-high degree of confidence**. However, annual precipitation trends are less well-understood, having a **low degree of confidence** owing to their high degree of variability.[32]

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31 Kontowicz, E., Brown, G., Torner, J., Carrel, M., Baker, K. K., & Petersen, C. A. (2022). Days of Flooding Associated with Increased Risk of Influenza. Journal of environmental and public health, 8777594. https://doi.org/10.1155/2022/8777594

32 State of California. (2018c). "Statewide Summary Report" In California's Fourth Climate Change Assessment. Accessed December 1, 2023: https://climateassessment.ca.gov/state/index.html

Impacts on Buena Park

Community Members

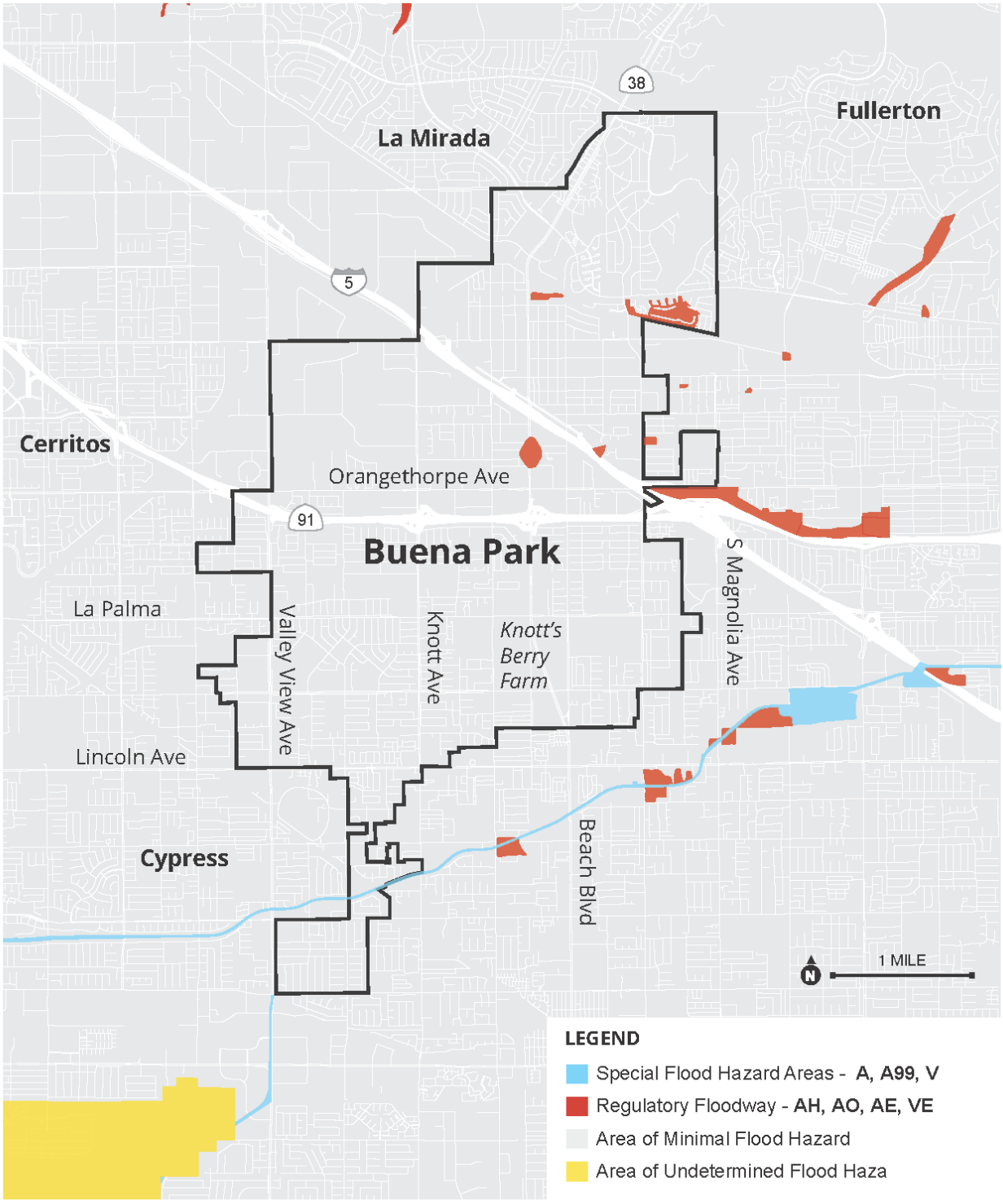
Extreme precipitation can result in damage to a home, such as water damage or the development of mold. As is discussed in the Housing Characteristics section, Buena Park has a high housing cost burden which impacts how a homeowner responds to damages. There is also a significant renter population (43%), which must receive home improvements through their landlord. Further, the area with flood risk where Beach Boulevard and Fullerton Creek intersect is part of the City's DACs, meaning potentially impacted structures already face disproportionate environmental burdens. Mold can also lead to health issues such as respiratory infections, which can be a particular issue for people with compromised respiratory or immune health. A study has also found a 1% increase in risk of influenza diagnoses associated with each day of flooding, with increased risk in more densely populated areas.[33]

Infrastructure and City Programs

Related to dam failure, nearby dams have potential to result in 2 to 4 feet of flooding if failure occurs, which is possible as a result of heavy precipitation. An Operational Plan for the Carbon Canyon Dam is underway to address concerns but is not yet in development for the Prado Dam.

[33] Kontowicz, E., Brown, G., Torner, J., Carrel, M., Baker, K. K., & Petersen, C. A. (2022). Days of Flooding Associated with Increased Risk of Influenza. *Journal of environmental and public health*, 8777594. https://doi.org/10.1155/2022/8777594.

Figure C-5. FEMA Flood Zones



Source: FEMA (2024). National Flood Hazard Layer. Floodmaps.fema.gov/NFHL/status.sht

WILDFIRE AND SANTA ANA WINDS

Magnitude and Spatial Extent

Wildfires are large uncontrolled fires that primarily burn through wildlands but can spread to developed areas.

In Buena Park, there is limited exposure to wildfire hazards due to the City's limited overlap with wildlands. There is no record of wildfires occurring within city limits. However, the northeastern portion of Buena Park, near Ralph B Clark Park and Los Coyotes Country Club are designated as **Very High, High, and Moderate Fire Hazard Severity Zones.** Within the City's FHSZ's, approximately 166 dwelling units and a handful of commercial development exists. The FHSZ that dips into the City extends more deeply into Fullerton and the West Coyote Hills to the northeast. The City's FHSZ's can be seen on Figure C-6. This area likely poses the greatest potential of wildfire hazard within Buena Park.

Fire Hazard Severity Zones

These are areas throughout the State designated by the California Department of Forestry and Fire Protection and adopted by local governments to signify elevated likelihood of fire hazard due to inherent characteristics of the land, like fuel loading, slope, and weather patterns. These zones do not account for mitigation measures such as vegetation management.

Timing

Fires can occur at any time, but are most likely to occur during the warm, dry season from April to October. Hot and dry Santa Ana winds that blow primarily from October to April further increase wildfire risk by exacerbating the spread of fire (see Secondary Hazards section below).[34]

Level of Certainty

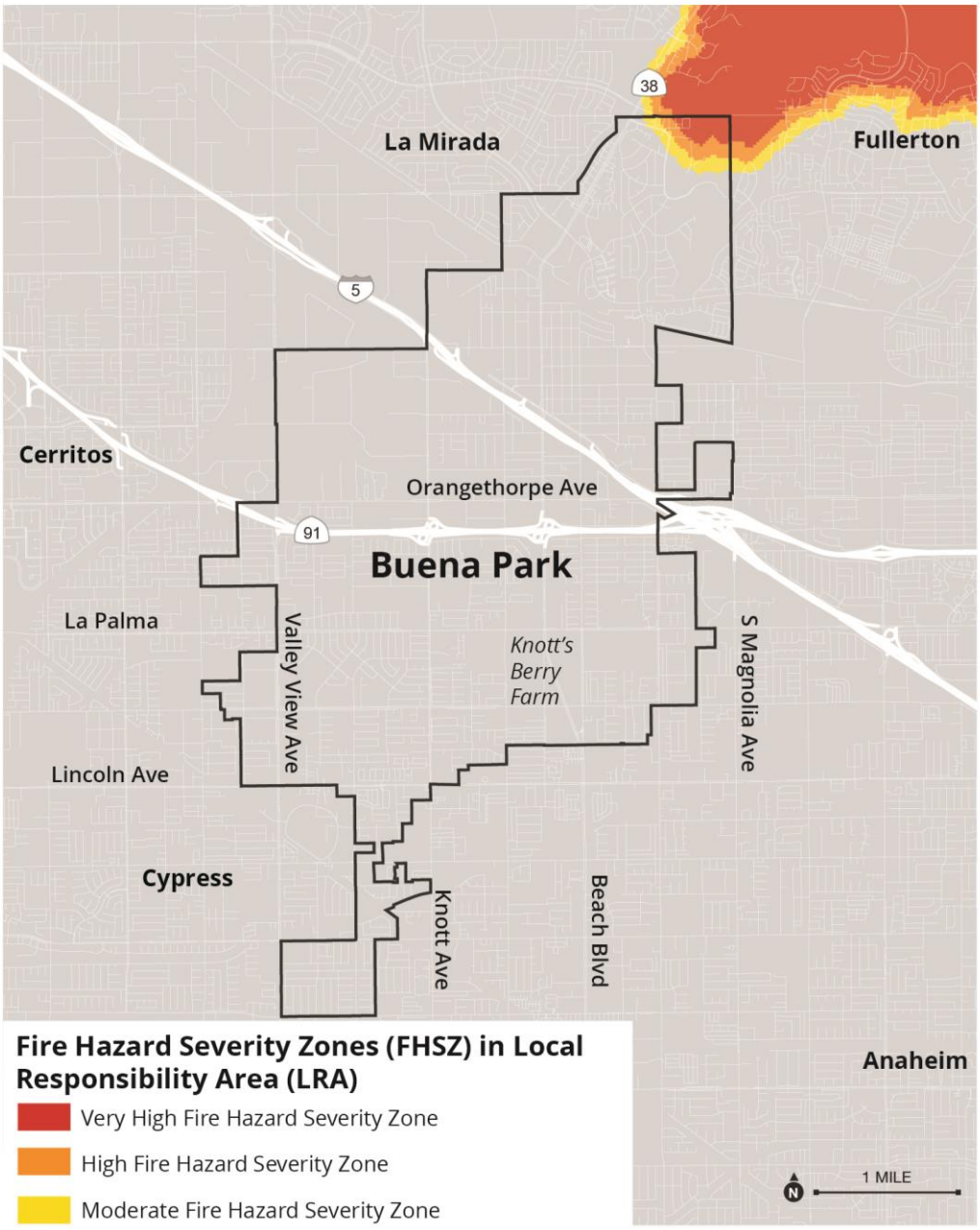
According to California's Fourth Climate Change Assessment, models projecting an increase in area burned by wildfire in California have a **medium-to-high degree of confidence**.[35]

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[34] Cal Matters (2024). Track California Wildfires. Accessed July 2, 2024. https://calmatters.org/california-wildfire-map-tracker/

[35] State of California. (2018c). "Statewide Summary Report" In California's Fourth Climate Change Assessment. Accessed December 1, 2023: https://climateassessment.ca.gov/state/index.html

Figure C-6. Fire Hazard Severity Zones



Source: California Department of Forestry and Fire Protection (2025). Local Responsibility Area Fire Hazard Severity Zones. https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones

Santa Ana Winds

Santa Ana winds are a unique climate feature in southern California referring to strong, hot winds that originate inland from high-pressure air masses. They primarily occur October to April and are most frequent in December. These winds carry very dry air that can be catalysts for wildfire outbreaks, such as the 90 mph winds that fueled the 2025 Palisades and Eaton Fires, which burned over 37,000 acres and forced 150,000+ evacuations.[36, 37] Orange County has also had major fires in recent history, including the Silverado Fire, which occurred in October 2020 during 80 mph winds. It burned over 12,000 acres and forced 70,000 evacuations.[38] In fact, 25% of wildfires in the region occur during Santa Ana events.[39]

Projections of the intensity and frequency of Santa Ana wind events are uncertain. Some global climate models show an increase in future Santa Ana events, but other studies have found that Santa Ana events may decrease by approximately 20% in the future as the weather system that drives the winds weakens due to greater warming over interior land masses.

Overall burned area is projected to increase over 60% for Santa Ana-based fires (and 75% for non-Santa Ana fires), despite uncertainty about the future Santa Ana wind trends. This translates to a potential increase of over 2,000 hectares of burned area by 2050.[40]

Impacts on Buena Park

Community Members

Fire hazard within the northeastern portion of Buena Park threatens the safety and property of residents and businesses within that area. Fire mitigation and management activities are possible to limit the potential for impacts to occur.

Additionally, exposure to wildfire smoke is a relevant public health hazard due to fires in the surrounding region. Wildfire smoke can exacerbate asthma and increase the risk of heart attack. During the severe 2015 fire season, researchers found a 42% increase in risk of heart attacks 1 day

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36 CAL FIRE. (2025). "Palisades Fire" Accessed February 2, 2025: https://www.fire.ca.gov/incidents/2025/1/7/palisades-fire

37 CAL FIRE. (2025). "Eaton Fire" Accessed February 2, 2025: https://www.fire.ca.gov/incidents/2025/1/7/eaton-fire

38 CAL FIRE. (2022). "Silverado Fire" Accessed July 12, 2024: https://www.fire.ca.gov/incidents/2020/10/26/silverado-fire/

39 State of California (2018a). "Los Angeles Region Report" In California's Fourth Climate Change Assessment. Accessed July 1, 2024: https://climateassessment.ca.gov/regions/

40 State of California (2018a). "Los Angeles Region Report" In California's Fourth Climate Change Assessment. Accessed July 1, 2024: https://climateassessment.ca.gov/regions/

after exposure to dense smoke among adults aged 65 and older.[41] While no sensitive groups are especially prevalent in Buena Park, it is still important to engage and educate residents on days when wildfire smoke is present.

CLIMATE MIGRATION

Long-term climate migration, or people relocating because of climate-related hazards, is anticipated to occur in the region as a result of sea-level rise causing shoreline retreat and more regular inundation, and wildfires creating areas that are less likely to be insured and rebuilt.

Orange County is one of the most at-risk counties in the nation in terms of total population and percentage of population at-risk of sea-level rise, with 65,336 people at-risk under a 3-foot increase in sea-level and 225,720 people at-risk under a 6-foot-increase in sea-level. While the population at risk is high, the probability of this amount of sea-level rise remains uncertain. Although 6 feet of sea-level rise is possible by as early as 2090, the more likely scenario is 3 feet of sea-level rise by 2100. Neighboring counties are also at-risk, but to a much lesser degree due to topography and buildout. Orange County has approximately five times the population at-risk of sea-level rise compared to San Diego County and Los Angeles County.[42]

Sea-level Rise Probabilities

In the Los Angeles region, which includes Orange County, 3 feet of sea-level rise has a 66% probability (the likely range) of occurring by 2140 under a low-emissions scenario or by 2090 under a high-emissions scenario, but it has a 0.5% probability of occurring as soon as 2070, even with a low-emissions scenario. 6 feet of sea-level rise has a 0.5% probability of occurring by 2110 under a low-emissions scenario or after 2090 under a high-emissions scenario.[43]

Beyond sea-level rise, wildfires may be another reason for climate migration. In Orange County, approximately 2,600 structures, or 0.3% of all structures, are located within a fire hazard severity

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41 Wettstein, Z. S., Hoshiko, S., Fahimi, J., Harrison, R. J., Cascio, W. E., Rappold, A. G., & Mott, J. A. (2018). Cardiovascular and cerebrovascular emergency department visits associated with wildfire smoke exposure in California in 2015. Journal of the American Heart Association, 7(8), e007492. http://jaha.ahajournals.org/content/7/8/e007492.long

42 Hauer, M., Evans, J., and Mishra D. (2016) "Millions projected to be at risk from sea-level rise in the continental United States" https://mathewhauer.github.io/papers/2016-NCLIMHauer.pdf

43 State of California (2018b). "Sea-Level Rise Guidance." Appendix 3: Sea-Level Rise Projections for All 12 Tide Gauges. Accessed July 12, 2024: https://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf

zone.[44,45] While many of these structures may never experience damage from fire, it is likely that some will burn and may not be rebuilt. Further, the 2025 Eaton and Palisades fires show the extensive fire risk present in neighboring counties which are expected to result in both temporary and permanent climate migration in the region.

Impacts on Buena Park

Community Members

Studies of past climate migration have found the majority of migrants move nearby, often to more resilient nearby cities or neighboring counties.[46] Local economic conditions like unemployment rate and wages factor into where people choose to move as well; lower unemployment and higher wage areas are more likely to become permanent resettlements for migrants.[47] Based on its economic characteristics, Buena Park may be less likely to experience significant climate migration, but may also attract migrants due to its relatively low exposure to wildfire, extreme heat, and flooding hazards. Housing affordability issues discussed earlier in the Housing Characteristics Section outline constraints that exist in Buena Park and the region as climate migration occurs.

DROUGHT

Droughts lasting several years to decades occur naturally in California.[48] Global climate models project significantly drier soils in the future and an 80% chance of a multi-decadal drought during 2050–2099 under a high-emissions scenario. However, the frequency of wet and dry extreme events is also projected to increase between 25% and 100%, with limited changes in mean precipitation totals, indicating both intensified droughts and rainfall events.[49]

According to California's Fourth Climate Change Assessment, models projecting an increase in the frequency of drought have a **medium-to-high degree of confidence**.[50]

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44 Microsoft. (2018) "US Building Footprints" Access July 19, 2024: https://github.com/Microsoft/USBuildingFootprints/

45 CAL FIRE. (2024) "Fire Hazard Severity Zones" Accessed July 19, 2024: https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones

46 Eyer, Dinterman, Miller, Rose, 2018. "The Effect of Disasters on Migration Destinations: Evidence from Hurricane Katrina," Economics of Disasters and Climate Change, Springer, vol. 2(1), pages 91-106, April.

47 Wolsko, C. and Marino E. (2016) "Disasters, migrations, and the unintended consequences of urbanization: What's the harm in getting out of harm's way?" https://www.researchgate.net/publication/282891635

48 Ingram and Malamud-Roam (2013) "The West without Water: What Past Floods, Droughts, and Other Climatic Clues Tell Us about Tomorrow." Univ of California Press.

49 Swain et. al. (2018) "Increasing precipitation volatility in twenty-first-century California. Nature Climate Change 8: 427-433.

50 State of California. (2018c). "Statewide Summary Report" In California's Fourth Climate Change Assessment. Accessed December 1, 2023: https://climateassessment.ca.gov/state/index.html

Impacts on Buena Park

Infrastructure and City Programs

While drought is a regional event, its impact on water quantity and quality depends on the water provider and their sources. MWDOC utilizes local groundwater and imported water. In the short term, drought greatly affects surface water levels. Groundwater is also impacted, as reduced recharge occurs during drought and it is often used to compensate for limited surface water availability.

Changes in precipitation patterns are expected to result in less surface water storage, including loss of snowpack, which retains water in the mountains and slowly releases it as snowpack melts seasonally. This may result in earlier and heavier stormwater runoff, which decrease the amount of rainwater captured, instead conveying it to the ocean. Additionally, the Colorado River Basin has undergone a drying trend that is projected to continue, and State Water Project water supplies have reduced due to the declining ecosystem in the Sacramento–San Joaquin River Delta.

Based on the current UWMP, the City is projected to meet full-service demands through 2045 for all scenarios. OCWD and MWDOC continue to regularly update their Urban Water Management Plan and Water Shortage Contingency Plan, improve water management, and monitor water supply and contaminants to ensure Buena Park's water is safe and reliable. Refer to the earlier Water Section for more information on the City's water provider and sources.

CONCLUSION

Hazards are projected to worsen throughout much of California, including Buena Park. Air pollution is a chronic hazard primarily related to transportation emissions, but worsening extreme heat, flooding, and regional wildfires each contribute to worse air pollution. Flooding is an issue in acute locations within the City, and extreme precipitation is projected to increase in both magnitude and frequency. However, the most pressing hazard in Buena Park is extreme heat, which is projected to more than triple in frequency by 2050. Though Buena Park is not expected to experience temperatures like those seen in more inland cities, even modest heat waves can lead to serious public health impacts. Locally certain demographic groups have seen higher rates of emergency room visits for extreme heat, including African Americans, males, older adults, and young adults. Much of the City's built environment has limited shade, and its older homes and cost-burdened households may need to choose between running air conditioning and paying for other necessary costs.

The City has several existing plans and programs to mitigate risks, prepare residents, and plan for response and recovery. Local public facilities, such as parks, water features, and community centers, offer residents access to resilience, such as air conditioning or shade. In addition, regional agencies, utilities, transportation authorities, and neighboring jurisdictions influence hazards within the City, and communication and partnerships with these agencies and organizations can aid in building further resilience. The CAAP will build on the findings of this assessment to generate strategies that adapt the City to changing hazards.

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