OVERVIEW:
COLUMBIA'S VULNERABILITY TO CLIMATE CHANGE IMPACTS

Background

As part of its Climate Action and Adaptation Planning process, the City of Columbia undertook a comprehensive effort to better understand local vulnerabilities and risks associated with projected changes in climate. A consultant team reviewed the best scientific information available about changes in temperature, precipitation, and other climate-related factors that Columbia may experience; those findings are available in the climate trends summary. That information was then applied to Columbia's unique social, economic, and environmental context with inputs from City staff and the Mayor's Task Force. The consultant team proposed vulnerability rankings based on this analysis, taking into account three key factors in relation to anticipated climate change impacts:

1. **Exposure:** the number of people and value of assets in harm's way or at risk due to their physical location.
2. **Sensitivity:** the severity of consequences of being exposed to these risks and the degree to which climate change exacerbated existing stressors.
3. **Adaptive capacity:** steps the City and community are already taking to prepare for climate change impacts and whether they have existing capacity to accelerate and/or expand those efforts, if needed.

The Climate Action Task Force reviewed and made adjustments to some of the vulnerability rankings based on their understanding of local issues and the projected changes in climate. This overview summarizes the findings of the vulnerability assessment. More detailed information about each focus area is provided in a series of four supplementary factsheets.

How is Columbia vulnerable?

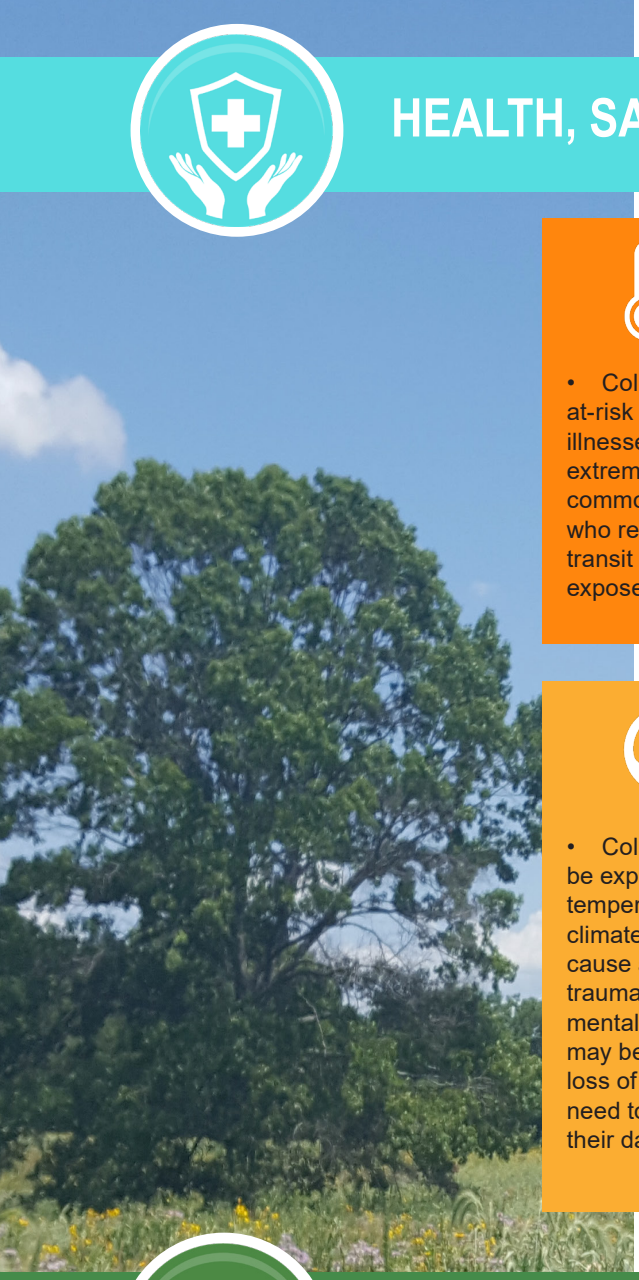
The table lists the categories by their relative vulnerability to climate change impacts. The subsequent sections provide more detailed descriptions of the vulnerability of each focus area.

Relative Vulnerability

HIGH	Heat stress, Air quality, Vector-borne diseases
MEDIUM-HIGH	Housing, Mental health
MEDIUM	Agriculture, Stormwater management
LOW-MEDIUM	Transportation, Surface water quality, Drinking water supply, Trees and open space
LOW	Solid waste, Energy, Drinking water quality

Equity and Climate Change

Some Columbia residents may be more vulnerable to climate change impacts. Low-income households may have fewer options to respond to and prepare for all types of impacts, such as paying higher energy bills for more air conditioning or repairing property damages after a flood event. Health-related impacts may disproportionately affect children, older adults, pregnant women, outdoor workers, and individuals with pre-existing illnesses or weak social ties. People with limited mobility or who rely on walking, biking, and public transportation may experience more difficulty in getting around during times of extreme heat or other severe weather.



HEALTH, SAFETY, AND WELL-BEING

Heat stress

- Columbia residents may be more at-risk of heat stress and heat-related illnesses as temperatures warm and extreme heat events become more common. Outdoor workers and people who rely on walking, biking, or public transit to get around may be more exposed to these impacts.

Vector-borne diseases

- Columbia currently has a low incidence of common vector-borne diseases, but increasing temperatures may support population growth of mosquitoes, ticks, and other vectors.

Mental health

- Columbia residents may be exposed to more extreme temperatures, severe weather, and climate-related disasters, which could cause anxiety, depression, post-traumatic stress disorder, and other mental health consequences. People may be more at risk if they experience loss of life, resources, or property, or need to make significant changes to their daily routine.

Air quality

- Warmer temperatures in Columbia may lengthen the pollen season and cause more ozone smog pollution, which lowers outdoor as well as indoor air quality. Heavy rain events and higher humidity may also create favorable conditions for mold, dust, and other indoor air contaminants.
- These negative impacts on air quality may worsen asthma, allergies, and other respiratory health conditions.

OPEN SPACE AND AGRICULTURE

Trees and open space

- Warmer temperatures and increasing drought will likely stress trees and shrubs in Columbia, making it more difficult for new plantings to survive and increasing the risk of disease, pests, and invasive species infestations.
- The range of species will likely shift, altering the composition of trees and shrubs suitable for Columbia's climate—for better or worse.

Agriculture

- Heavier rains in the spring may challenge crop establishment and increase their susceptibility to fungal and bacterial disease.
- Increasing summer drought and warmer temperatures may stress livestock and crops. More stress on crops from climate change impacts can lower their defenses against pests and disease.

Vulnerability Ranking

LOW | LOW-MEDIUM | MEDIUM | MEDIUM-HIGH | HIGH

BUILT ENVIRONMENT

Housing

- With warmer temperatures, especially in the summer, there will be more demand for air conditioning and cooling features that offer relief from heat. Energy costs will likely increase as a result.
- More heavy rainfall may increase the risk of local flooding, potentially exposing over 1,000 residential structures, including five public housing communities, to flooding impacts that could include sanitary sewer backups.

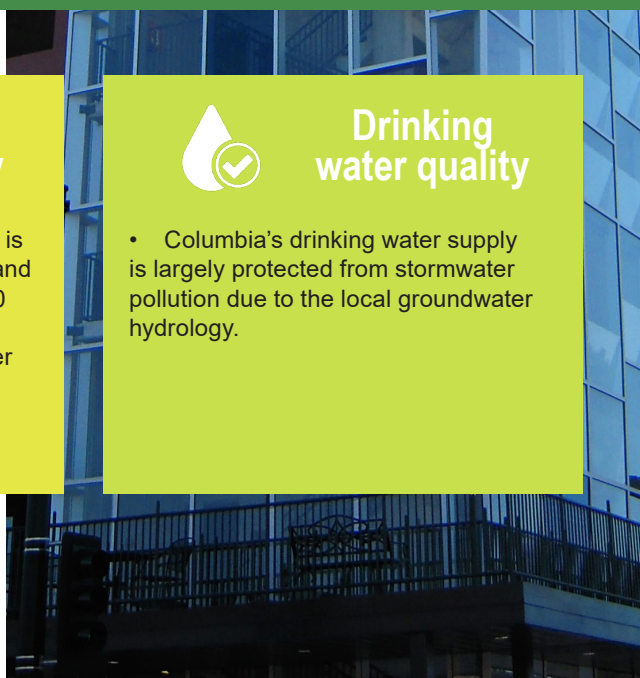
Stormwater management

- The city's stormwater infrastructure may not be able to handle the amount of runoff that is expected in the future, and considerable resources would be needed to make needed upgrades.

Transportation

- Flooding is not a significant concern for Columbia now, but more heavy rain events in the future may increase the risk of local flooding, potentially blocking roadways and trails. The high reliance on personal vehicles and limited transit services across the metro area limits residents' options for getting around, especially during times of extreme events.

WATER SUPPLY AND QUALITY



Surface water quality

- Several of Columbia's streams have existing water quality concerns. More heavy rain events will increase stormwater runoff, which can negatively impact water quality in Columbia's streams and lakes. In turn, this could harm habitats and limit recreational opportunities.

Drinking water supply

- Columbia's drinking water supply is currently reliable, but the city's demand is expected to nearly double by 2040 due to population growth. Warmer temperatures and increasing summer drought may also increase demand during the summer.

Drinking water quality

- Columbia's drinking water supply is largely protected from stormwater pollution due to the local groundwater hydrology.

Vulnerability Ranking

LOW | LOW-MEDIUM | MEDIUM | MEDIUM-HIGH | HIGH

ENERGY, MATERIALS, AND WASTE

Energy

- Columbia's electricity service is most vulnerable to more frequent extreme weather events in the future. Columbia Water & Light, the City's electric utility, operates 8 substations throughout the service territory with 62 distribution circuits that serve customers at the 13.8-kilovolt (kV) level. The system has ample capacity to meet customers' electric needs during normal operating conditions. However, during emergency situations, there is not enough redundancy within the system to ensure service to all customers. More frequent extreme weather events may increase the risk of longer, sustained power outages for the City's electric customers.

Solid waste

- The greatest area of vulnerability in Columbia's solid waste management system is access to the Columbia Landfill. Currently, Peabody Road is the only vehicular access route to the landfill. The road crosses a bridge over Hinkson Creek, which is designed to pass a 100-year flood event. This access route has not previously been impassable from flooding, but as climate change impacts increase heavy rain events, access may be hindered if the bridge is damaged. While Rogers Road may offer an alternative route, it is an unimproved gravel road and would also likely be flooded where it crosses Hinkson Creek to the north.

Vulnerability Ranking

LOW | LOW-MEDIUM | MEDIUM | MEDIUM-HIGH | HIGH

Next Steps to Increasing Columbia's Resilience

The outcomes of this vulnerability assessment are being used to inform the development of strategies to prepare for and adapt to anticipated climate change impacts. The Climate Action and Adaptation Plan will specifically address and prioritize the areas of highest vulnerability. Where vulnerability is ranked low, the Task Force and City may still include adaptation strategies in the current CAAP, or may instead choose to monitor the situation over time and consider adding adaptation strategies if needed during a future CAAP update.