COLORADO 2050

WHY WE NEED CLIMATE RESILIENCY TO PROTECT OUR COMMUNITIES AND WAY OF LIFE

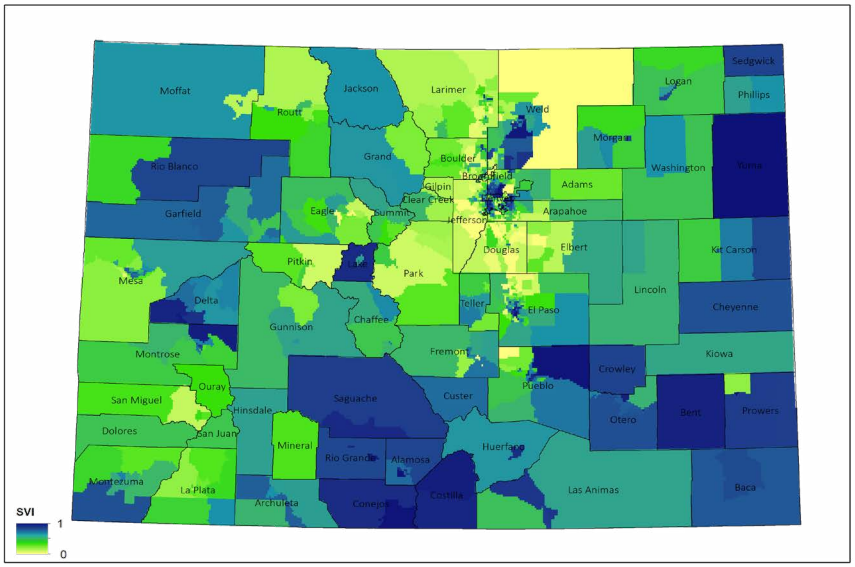
COLORADO NEEDS RESILIENCY

The goal of this research is to identify Colorado communities with the most barriers to overcoming the negative effects of climate change, and guide policymakers on potential climate mitigation investments and effective response strategies. In doing so, we can build resiliency to climate change in every part of the state.

UNDERSTANDING THE MAPS

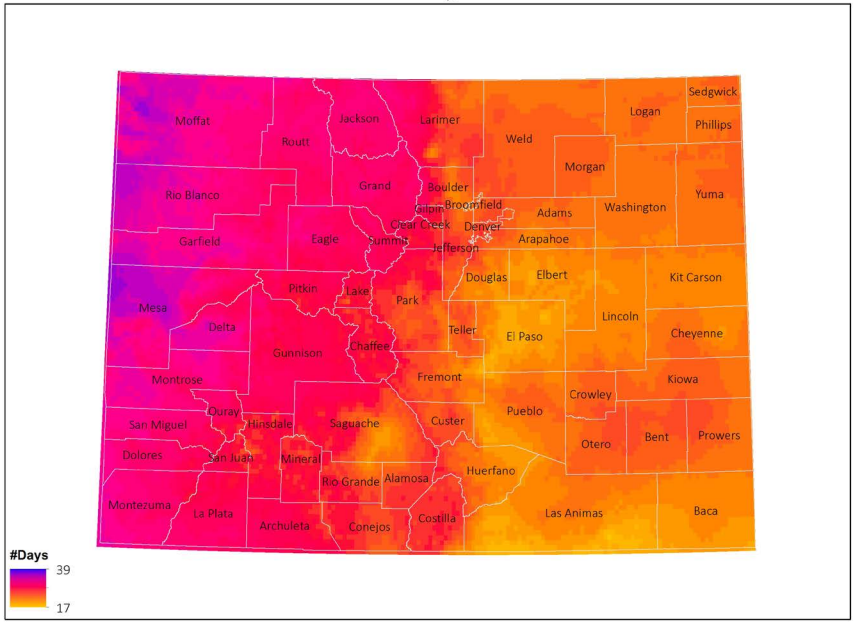
In this brief, you will see a variety of maps indicating differing levels of risk to climate change for different parts of the state. The index on the top right shows which census tracts our analysis showed faced the greatest risks. Each tract is rated on a scale between 0 and 1, with 1 indicating a greater threat faced by climate impacts in comparison to the rest of the state. The light green color indicates lower levels while dark blue areas face the greatest threats.

Social Vulnerability Index (SVI)



The map on the lower right indicates the county-level impacts of various climate change events (in this case, wildfire risk) as a result of emission levels. The darker colors indicate a higher number of days where fire danger is very high in a moderate emission scenario. You will see other maps relating to extreme heat, air pollution, and drought, and in each of those the darker colors indicate the highest risk.

Very High Fire Danger
Number of Days with 100-Hour Fuel Moisture Below 10th Percentile
Mid-Century, RCP4.5

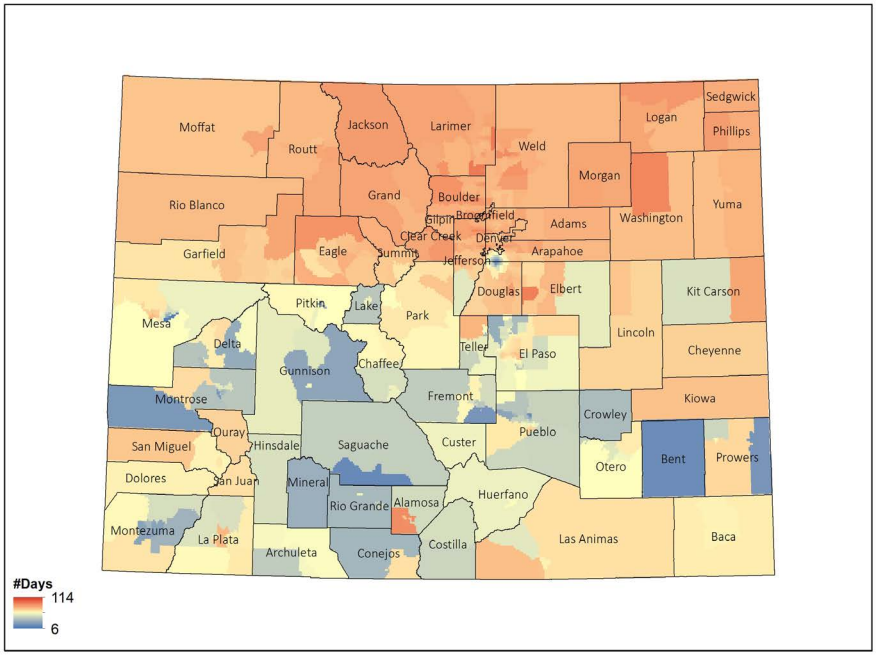


EXTREME HEAT SCENARIOS

The maps show the projected number of days temperatures will exceed the historic 95th percentile by mid-century under two emission scenarios. Under the moderate emission scenario, northern counties as well as the Denver Metro Area are projected to experience 75 days of extreme heat on average, while under the high-emission scenario, the average number of extreme heat days in the same region is projected to be 100 days. Across the state, in the moderate emission scenario, the median number of days above the 95th percentile historically is 76.5 days (so half of the census tracts experience at least 76.5 days with temperatures above their local historic extreme). In the high emission scenario, the median is 88.6 days each year with temperatures exceeding the local extreme.

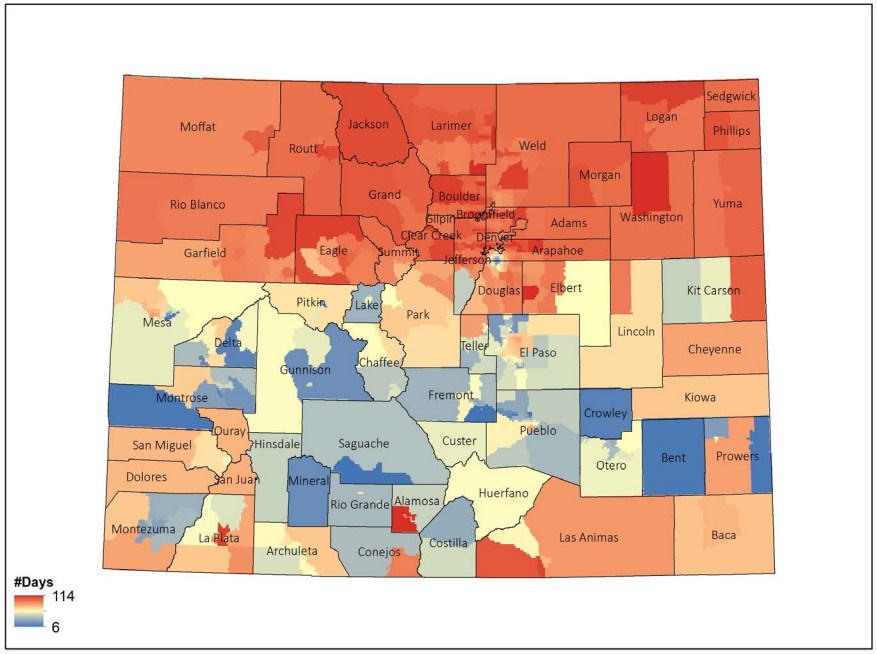
MODERATE EMISSION SCENARIO

Number of Days Exceeding the 95th Percentile Historic Maximum Daily Temperature
Mid-Century, RCP4.5



HIGH EMISSION SCENARIO

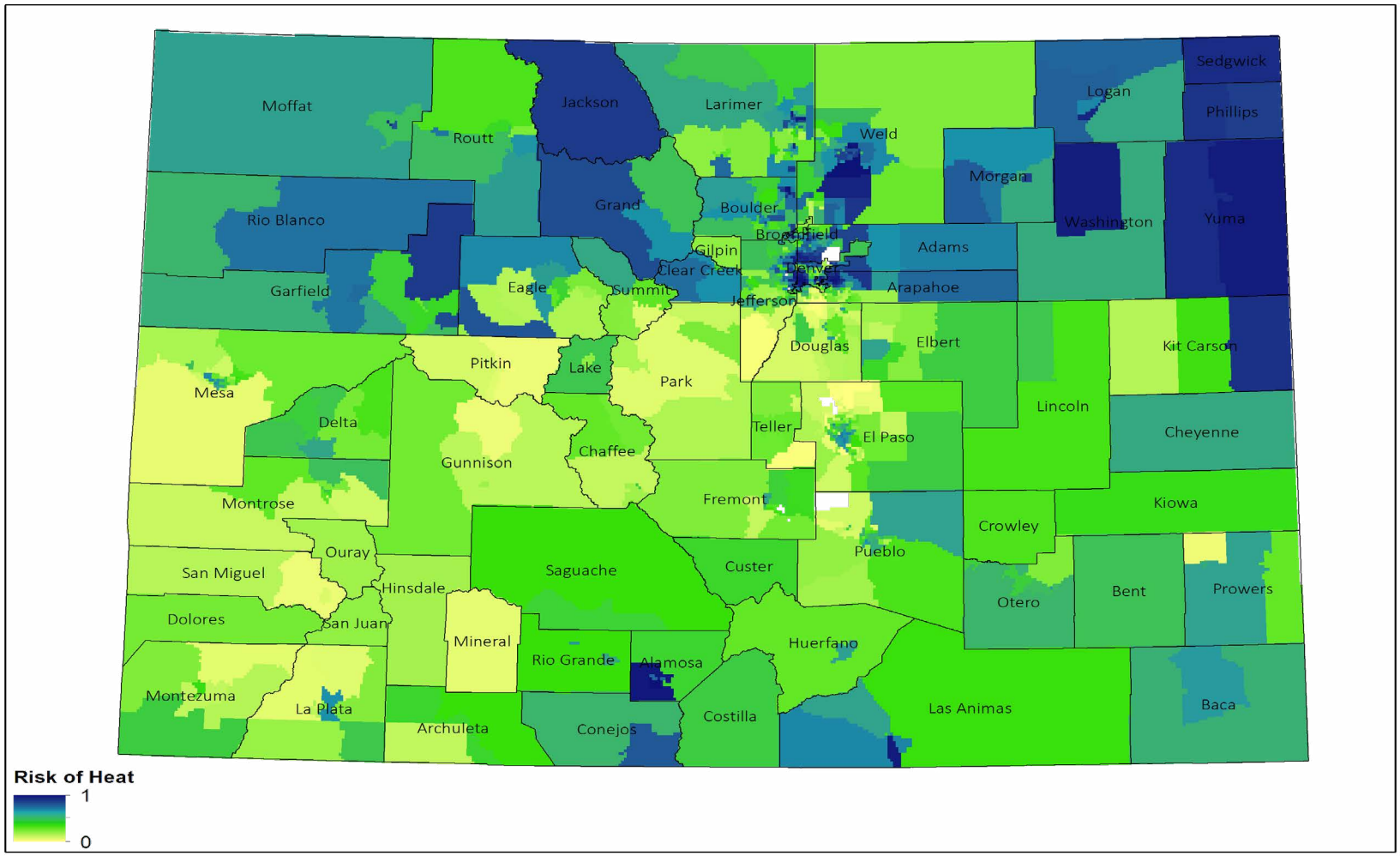
Number of Days Exceeding the 95th Percentile Historic Maximum Daily Temperature
Mid-Century, RCP8.5



EXTREME HEAT RISK

The map below shows the risk of extreme heat across Colorado. Areas colored in dark blue face the highest threats from extreme heat because they will be exposed to more hot days. The data shows Yuma, Sedgwick, Phillips, Jackson, Adams, Denver, and Arapahoe are the counties that will be most adversely affected by higher temperatures. People in Alamosa (Alamosa), Greeley (Weld), and Akron (Washington) will face the greatest threats to their health and well-being due to extreme heat.

Risk of Extreme Heat



EXTREME HEAT IMPACTS

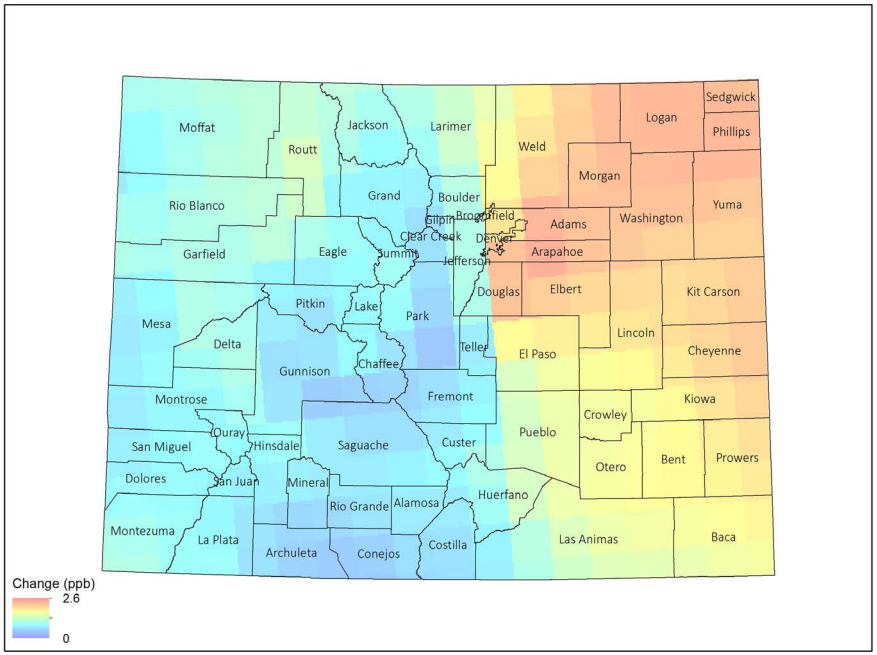
- Increases in mortality, especially for groups most likely to experience heat-related health issues (people who work outdoors, older adults, young children).
- Reductions in labor hours due to unsuitable working conditions.
- Higher energy usage and ozone pollution levels as a result of cooling needs.

OZONE POLLUTION SCENARIOS

In both scenarios, on average, ozone concentration levels increase by about 3 percent across the state compared to the baseline period (2000). Under both emission scenarios, the highest increase in ozone concentration levels are projected to occur in the Northern Front Range, Northern Plains, and Southern Plains. Some of the counties in these regions (Jefferson, Douglas, Denver, Adams, Arapahoe, Broomfield, Boulder) currently have significantly higher ozone concentrations compared to the rest of the state, which is caused by high proximity to highways and traffic as well as refineries and other factories.

MODERATE EMISSION SCENARIO

Change in Summer-Average Maximum Daily 8-Hour Ozone Concentration Compared to 2000
Mid-Century, RCP4.5



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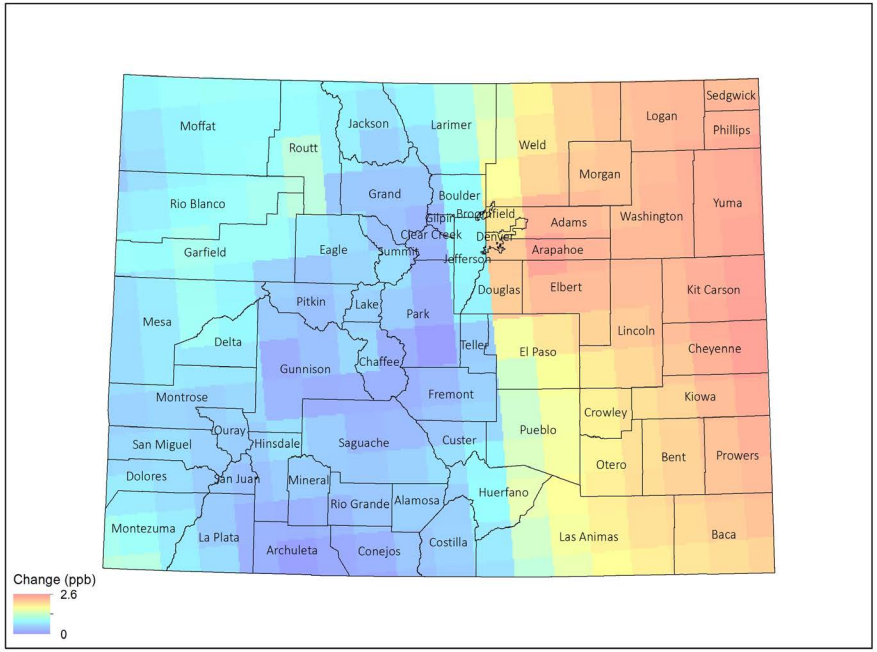
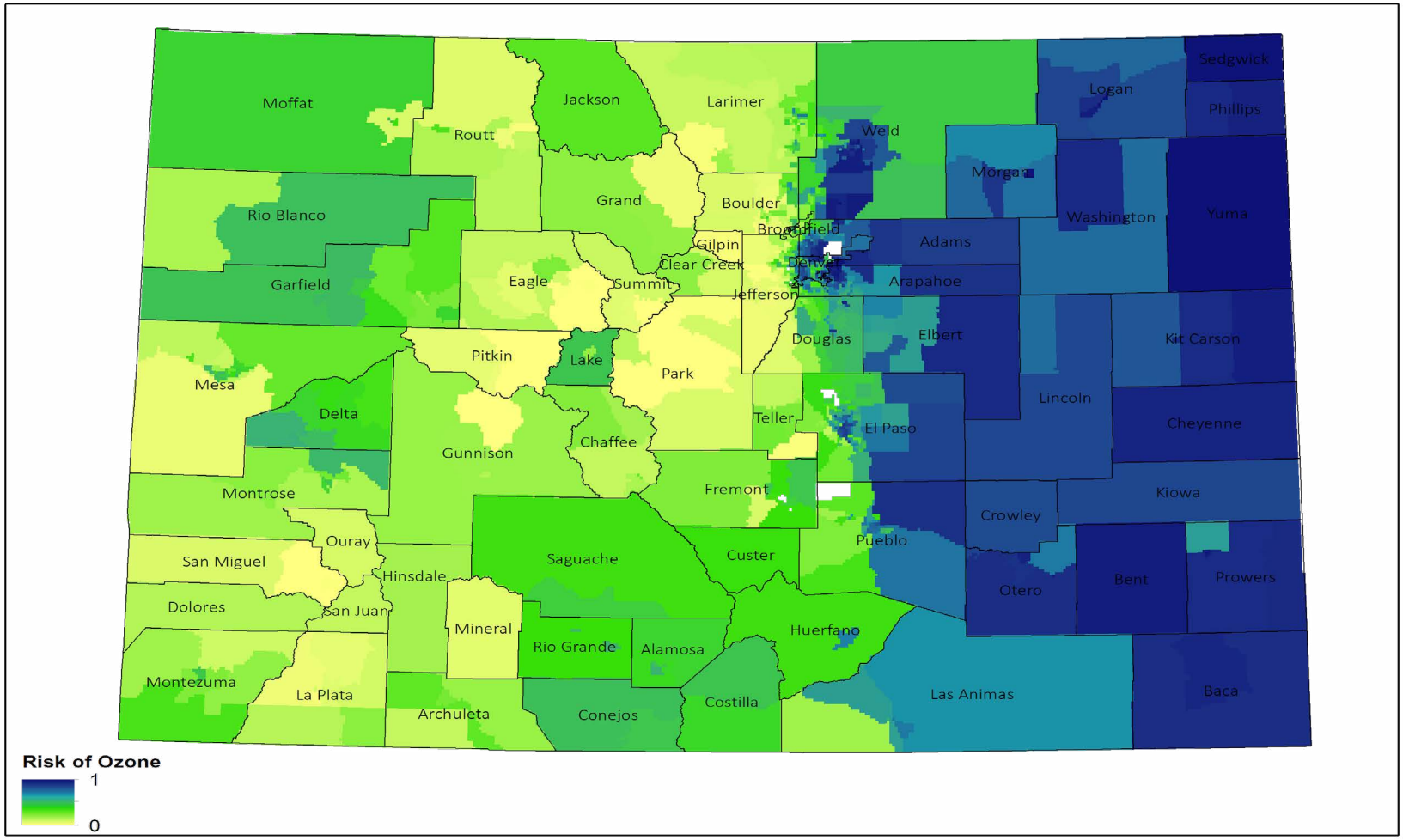


OZONE POLLUTION RISK

The map below shows the risk of ozone pollution across the state. Dark blue indicates a higher risk of ozone pollution relative to rest of the state. The Northern Plains and Southern Plains are the areas most likely to experience climate-related threats from ozone pollution because they have higher populations of children, older Coloradans, people with health complications like asthma, and people who work and play outdoors. Like their rural counterparts, urban areas like Adams, Arapahoe, and Denver counties are also among the areas that will see worse ozone pollution by mid-century.

Risk of Ozone Pollution

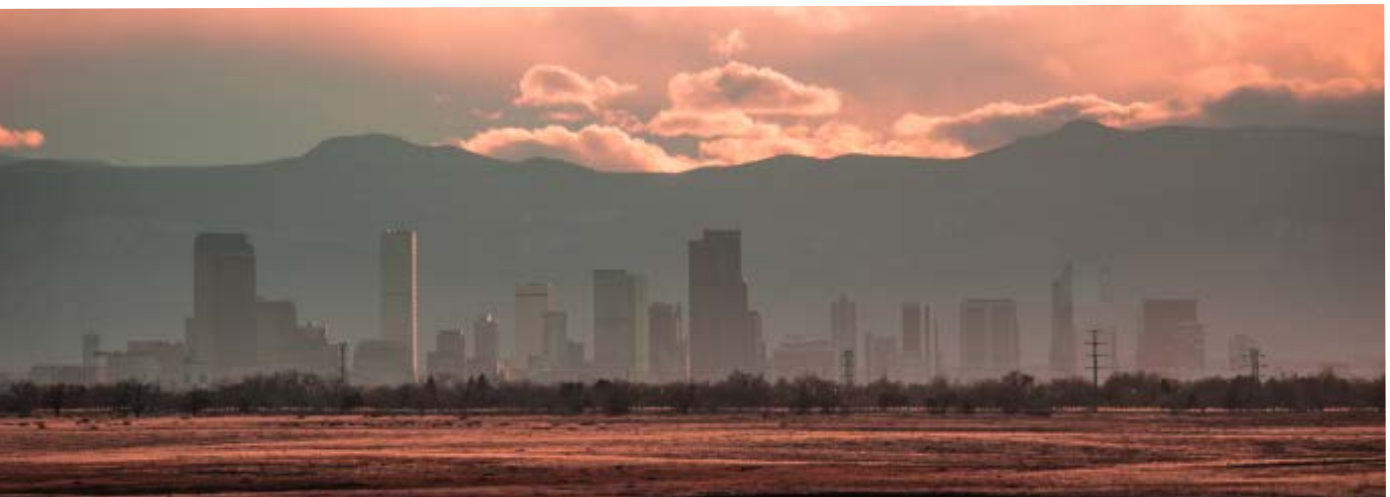


OZONE POLLUTION IMPACTS

- People exposed to increased ozone pollution face inflammation and damage to airways and aggravated lung diseases such as asthma, emphysema, and chronic bronchitis.

- Increased risk of death from illness including COVID-19. State public health data shows that Denver, El Paso, Jefferson, Arapahoe, and Adams counties rank in the top five counties in deaths from COVID-19 cases. These counties also have high levels of air pollution exposure.

In 2019, the EPA reclassified the Denver Metro/North Front Range ozone nonattainment area from "moderate" to "serious" nonattainment. A 2020 study by the American Lung Association ranks Denver in the top 10 of their list of most-polluted cities in the country for ozone pollution. According to a 2017 study by the National Center for Atmospheric Research (NCAR), the major contributors to the North Front Range's ozone pollution were emissions from oil and gas operations, as well as traffic.

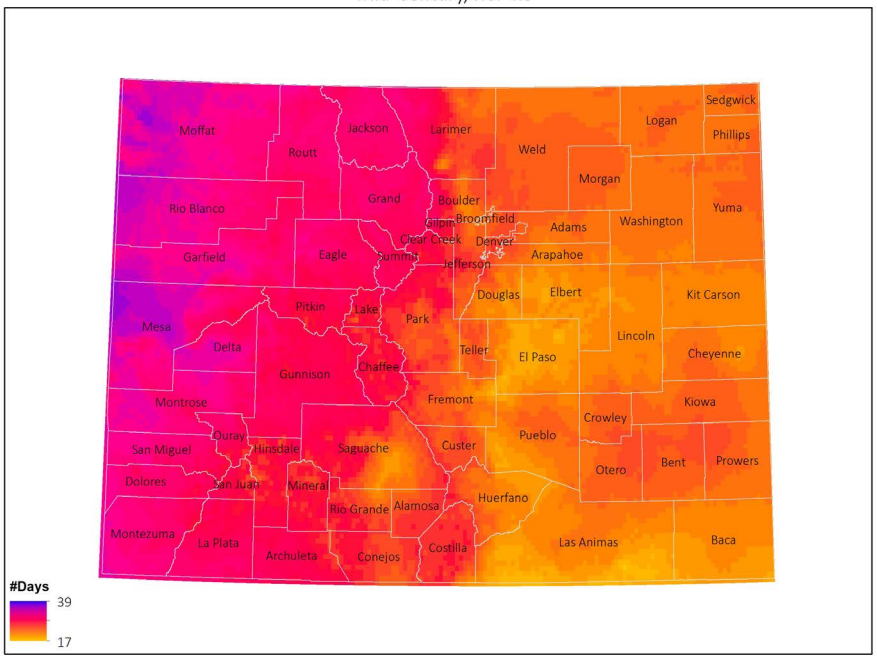


WILDFIRE SCENARIOS

Western counties, especially those in the Grand Valley, northern mountains, and Western San Juan Mountains regions face the most risks, especially Mesa, Rio Blanco, and Moffat counties, which are projected to face up to 39 days of high summer fire danger by mid-century. This is about eight days higher than the historical average (1971-2000) for this area. Prowers, Bent, and Otero counties have fewer projected days with very high fire danger (23 to 25 days), but the change from historical values is higher (they are projected to experience 9-10 extra days with very high fire danger compared to the baseline period).

MODERATE EMISSION SCENARIO

Very High Fire Danger
Number of Days with 100-Hour Fuel Moisture Below 10th Percentile
Mid-Century, RCP4.5



HIGH EMISSION SCENARIO

Very High Fire Danger
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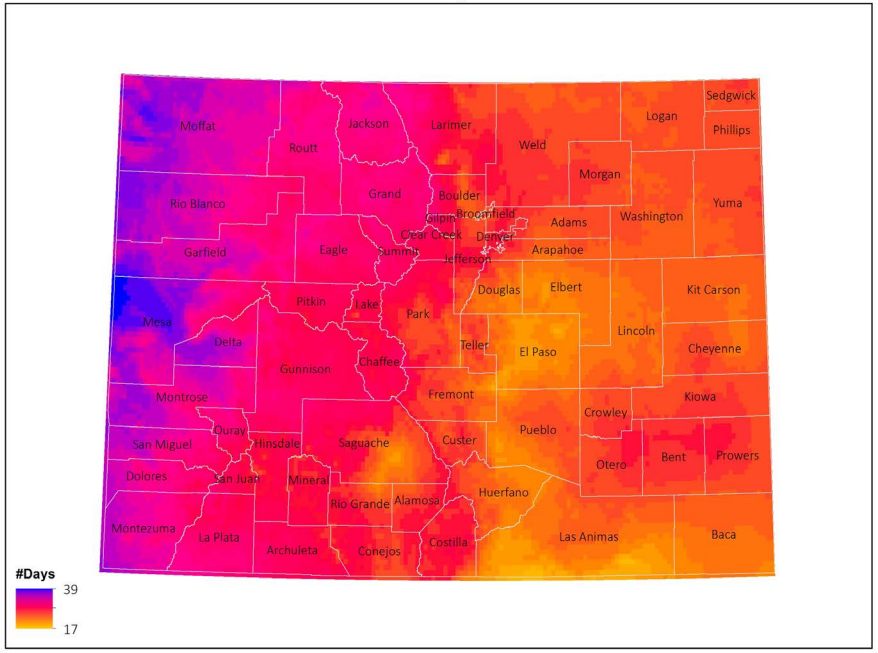
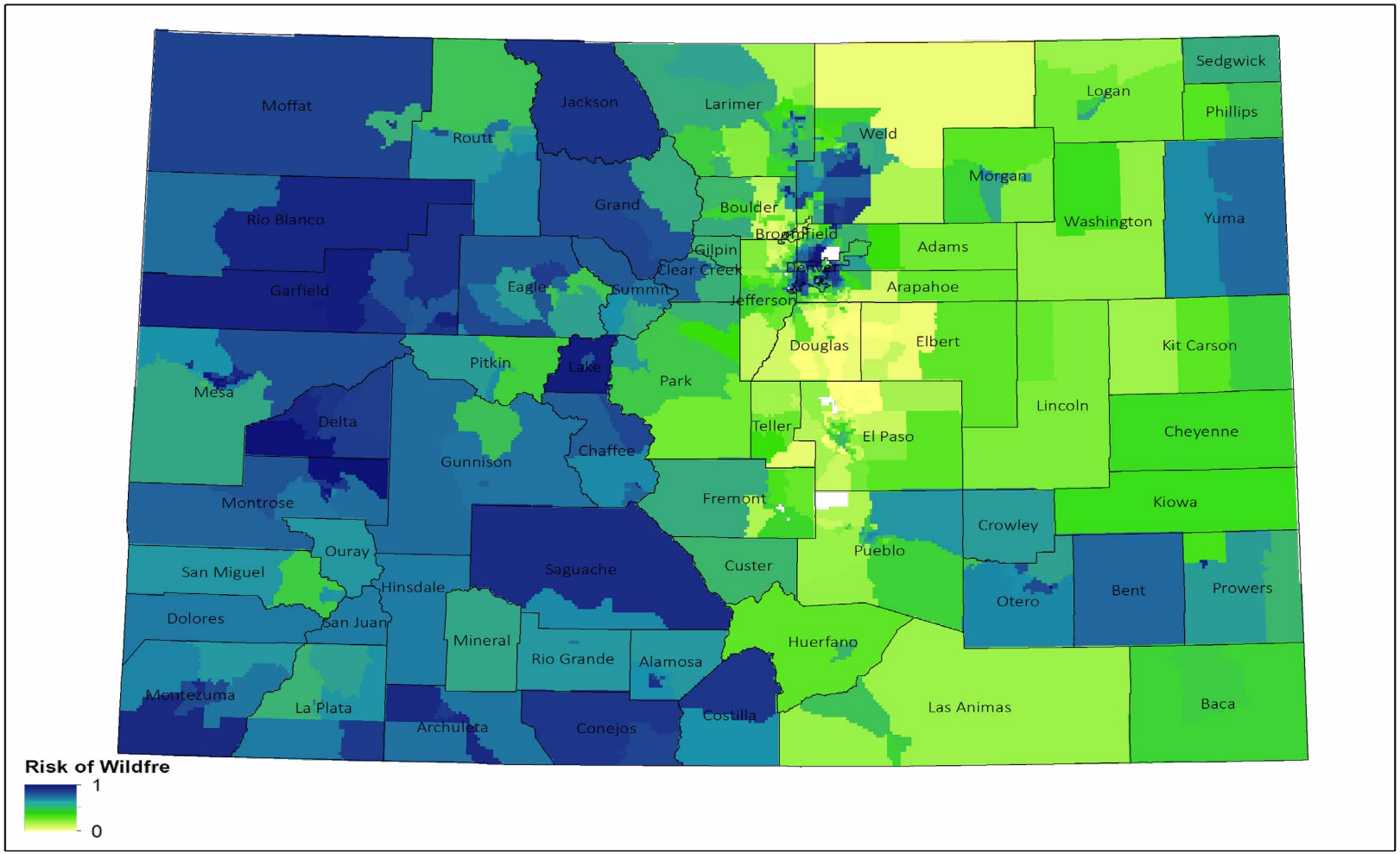
Mid-Century, RCP8.5



WILDFIRE RISK

The map below shows risk of wildfires, which is an overlay of the weighted social vulnerability index, wildland-urban interface (WUI), and fire danger by mid-century. The Northern and Central Mountains areas, Grand Valley, and Western San Juan Mountains have the highest vulnerability to wildfires. Moreover, Jefferson and Denver counties and some areas of Weld and Larimer counties are at high risk of wildfires as well.

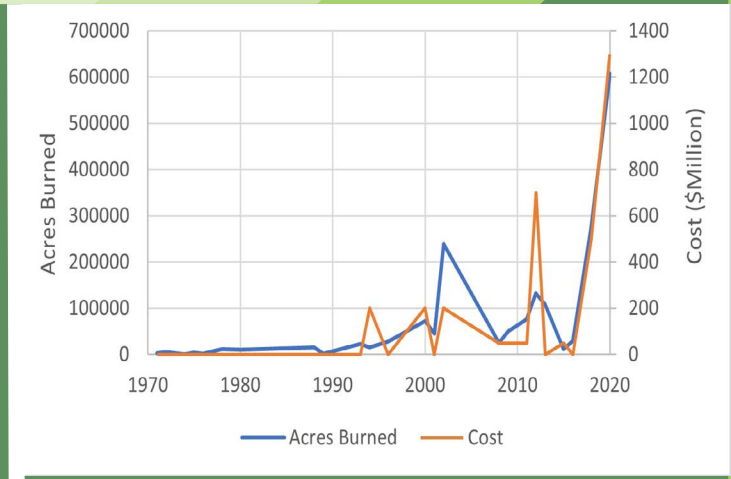
Risk of Wildfires



WILDFIRE IMPACTS

- Between January 2000 and October 2020, Colorado suffered total statewide wildfire-related damages to property and crops of about $1.8 billion, as well as seven deaths and 17 injuries.

- More than $295 million of these damages and three of the largest wildfires in Colorado happened in 2020 (Cameron peak, 208,663 Acres; East Troublesome, 193,812 Acres; and Pine Gulch, 139,007 Acres). The cost of wildland fire suppression in Colorado has grown significantly with the increased occurrence of large fires.



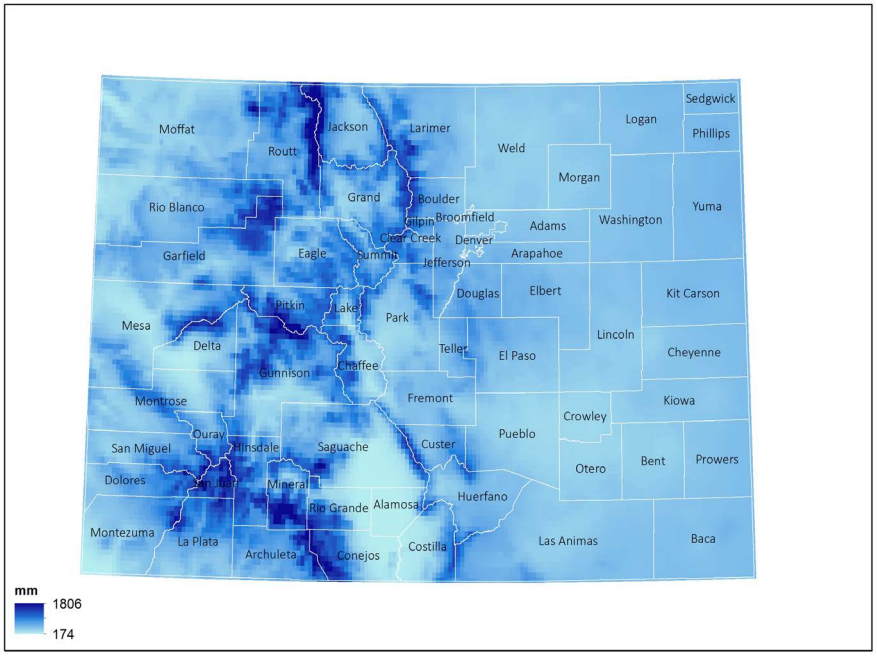
The graph above shows NOAA's estimate of the area burned by wildfires and their estimated cost over the past five decades. Estimated costs include physical damage to residential, commercial, and government or municipal buildings; material assets within a building; time element losses like business interruption; damage to vehicles and boats; offshore energy platforms; public infrastructure like roads, bridges, and buildings; agricultural assets like crops, livestock, and timber; disaster restoration and wildfire suppression costs.

DROUGHT SCENARIOS

The highest decreases in precipitation are projected to occur in the Central Mountains and Western San Juan Mountains regions, where rain and snowfall will decrease by as much as 62 percent. While some counties in the Southern Plains region, especially Bent, Crowley, Otero, Kiowa, and Lincoln as well as some areas in the Southern Front Range region (Pueblo, El Paso, Fremont) are in fact projected to experience significant increases in precipitation, the model does not distinguish between snow and rainfall. Climate change can shift precipitation from snow to rain and increase the frequency of heavy rainfall. It is estimated that heavy rain has increased in Colorado by 5 percent between 1958 and 2012. An increase in heavy rainfall will increase the risk of flooding, which can destroy homes and roads and damage crops.

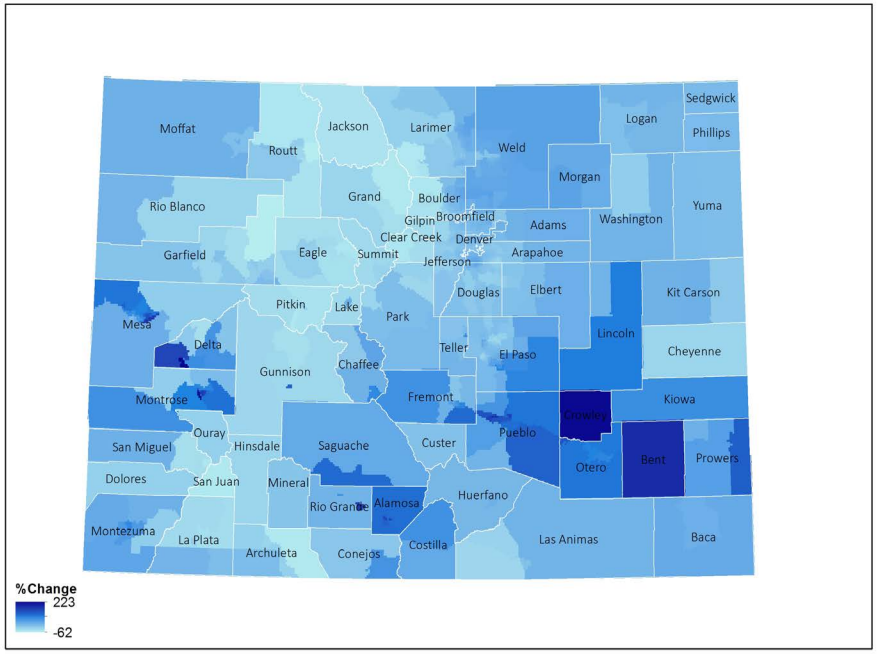
AVERAGE PRECIPITATION

Average Annual 30-Year (1980-2010) Precipitation (mm)



HIGH EMISSION SCENARIO

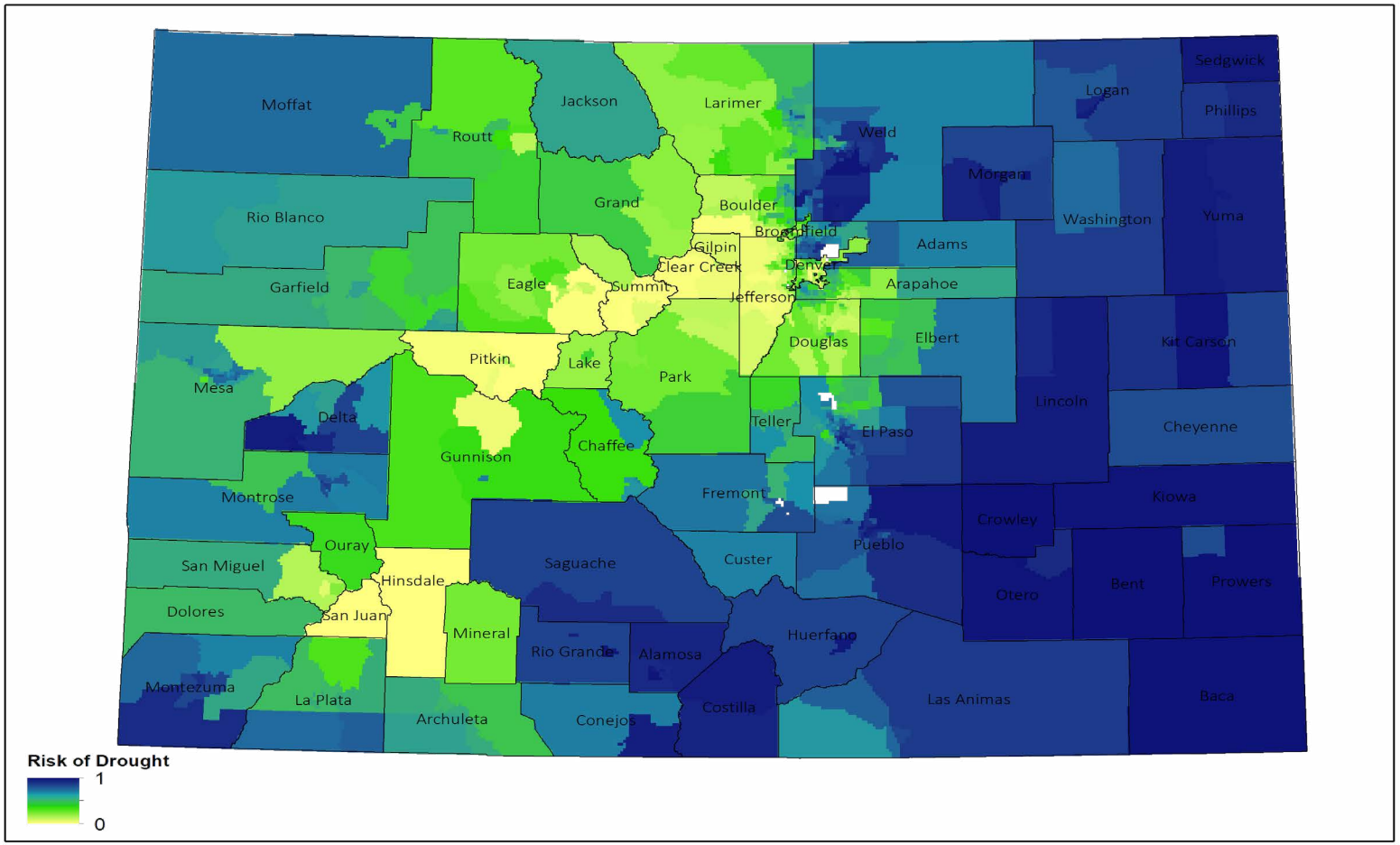
Percent Change in Precipitation Compared to Historic Average (1980-2010)
Mid-Century, RCp 8.5



DROUGHT RISK

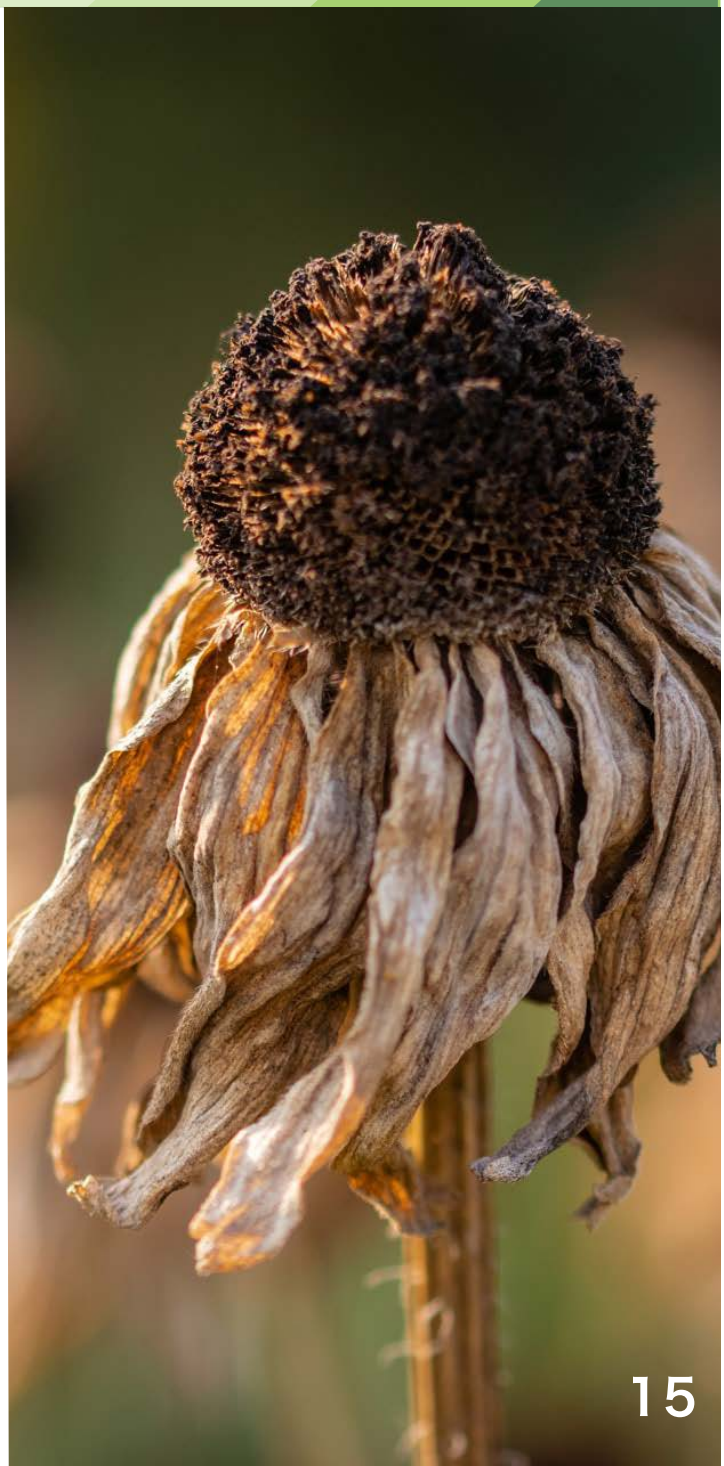
The map below shows the risk of drought across the state. We can see the effects of drought have a widespread impact: the Northern and Southern Plains, San Luis Valley area, and parts of the Front Range Region face greater drought threats due to their high percentage of farmlands as well as agricultural jobs in these counties. Even the Southwest and Northern Mountains must become resilient to drought since ski resorts will be affected and these areas will experience the highest reductions in precipitation due to climate change.

Risk of Drought

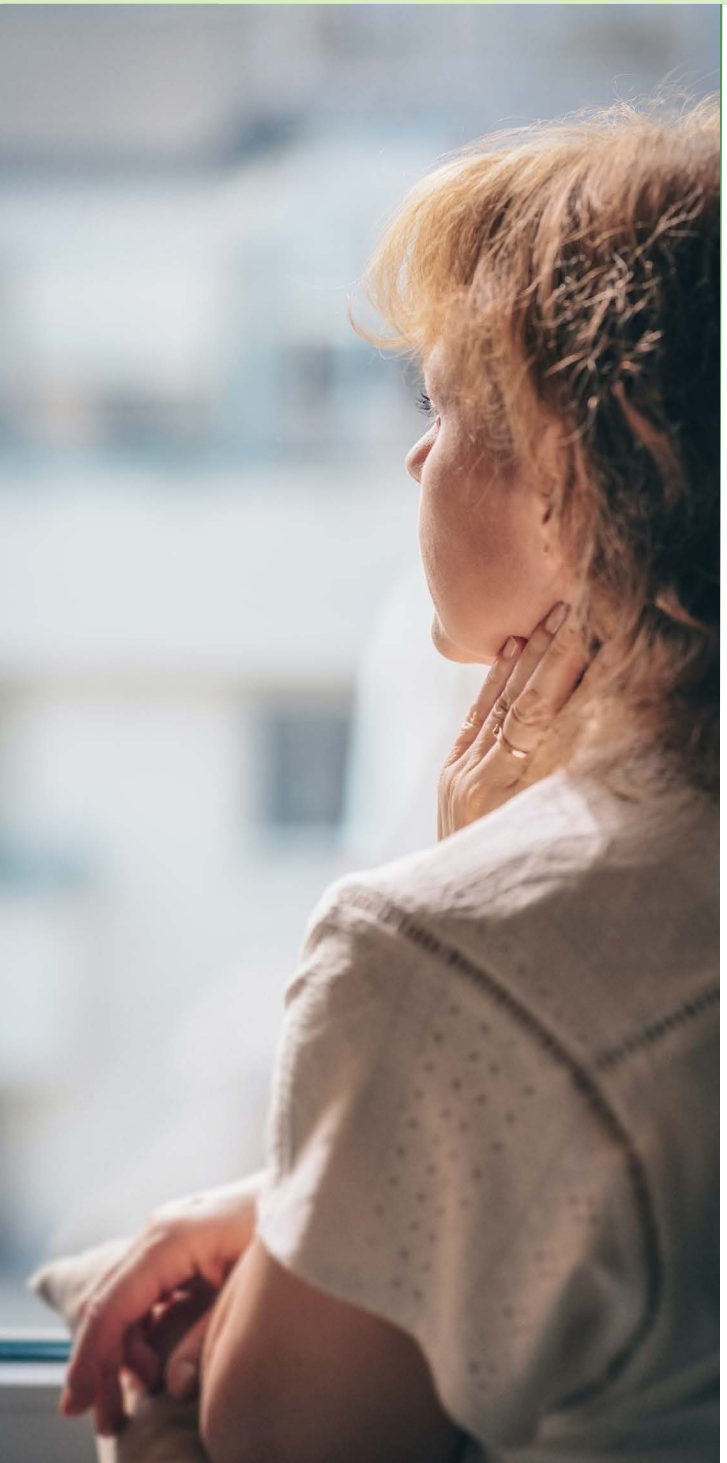


DROUGHT IMPACTS

- Warming temperatures and decreased precipitation in Colorado will negatively impact water and snow-based recreation industries, agriculture, and fish and wildlife populations.
- Drought can exacerbate fire season since dry vegetation provides fuel for wildfires and fire can spread easily over dry soil.
- Diminishing snowpack will shorten the ski season and skiing in Colorado will become less reliable, leading to climate-related economic losses



BUILDING RESILIENCE



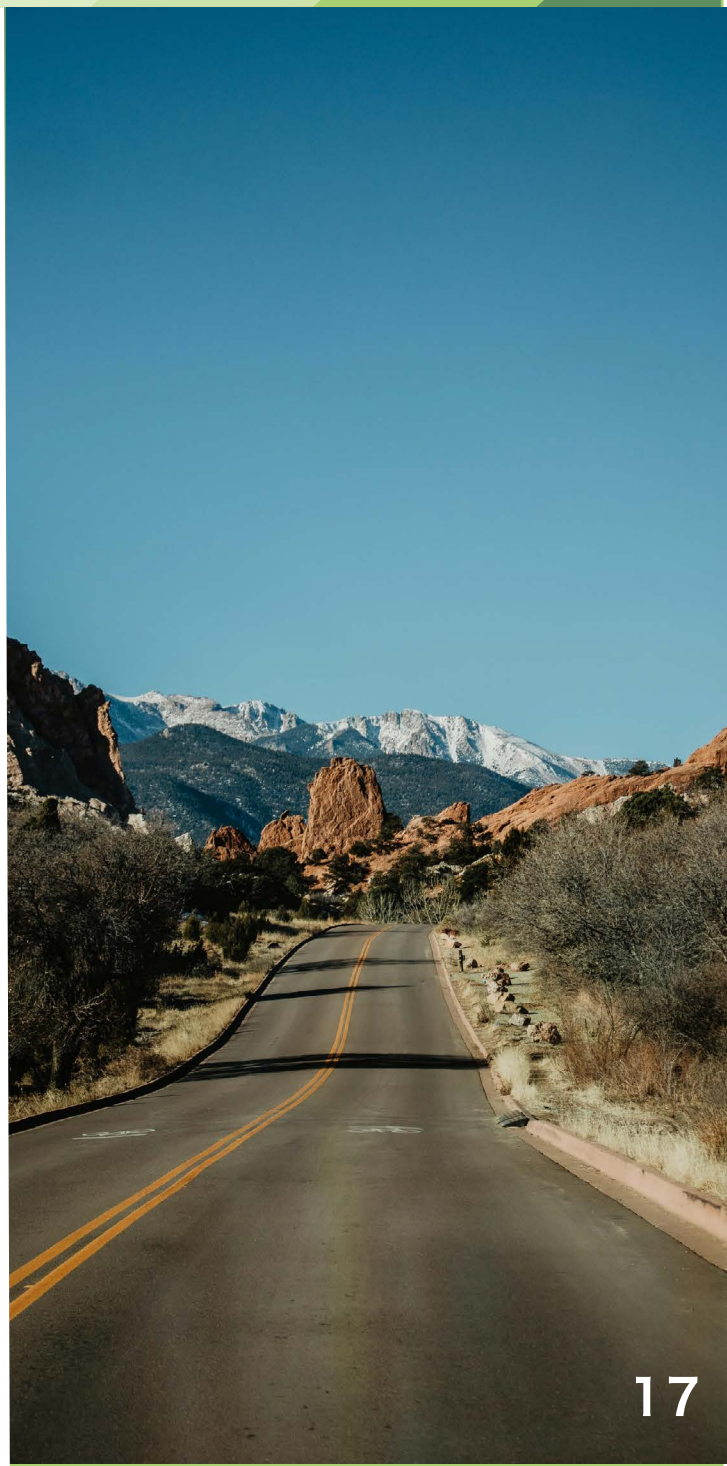
BARRIERS

Climate change will exacerbate exposure to environmental hazards. Climate change is also expected to exacerbate existing barriers and inequalities, which in turn will deepen intergenerational inequity by creating even more barriers for communities to overcome in order to access natural and financial resources.

SOLUTIONS

To mitigate these damages in the future, Colorado needs to accelerate our transition away from coal and other fossil fuels, raise funds to invest in mitigation projects and renewable energy, invest in communities that will be disproportionately affected by climate change—whether due to geography or historical and structural inequities—and prepare a just transition to renewable energy for fossil-fuel dependent communities.

BUILDING RESILIENCE

IDENTIFYING COMMUNITIES FACING THE GREATEST IMPACTS

- Farmers and agricultural workers.
- Workers who earn low incomes and communities of color who have historically been systematically kept from sources of well-being and prosperity like education and health care.
- People with pre-existing health conditions who are more likely to be negatively affected by climate change.