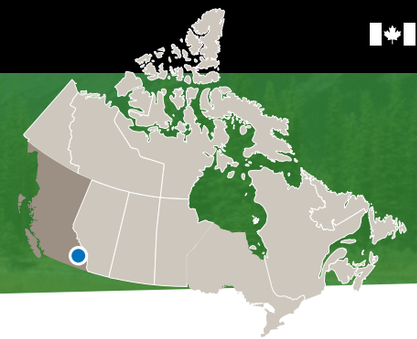
Parks Canada Parcs Canada

Canada

## Kootenay National Park

# Climate Summary



Elev. Range: 880 to 3,424 m
Area: 1,406 km²
Latitude: 50.9 °N
Longitude: 116.0 °W

### About Kootenay National Park

Kootenay National Park is located in southeast British Columbia and protects 1,406 km² of the Main and Western Ranges of the Rocky Mountains Natural Region. The park is within the traditionally used territory of the Ktunaxa and Secwépemc peoples and is a place of immense ecological, cultural, and historical significance. Kootenay's ecosystems support populations of iconic wildlife species characteristic of the region, including Rocky Mountain bighorn sheep, mountain goat, and grizzly bear. The park includes important subalpine habitat for the endangered whitebark pine, and open forest and grassland habitat for the endangered American badger. The Vermilion and upper Kootenay Rivers are excellent examples of broad, west-slope drainage systems and provide important habitat for aquatic species like westslope cutthroat trout. Culturally significant features of the park include 59 pre-contact Indigenous archeological sites, Ochre Creek, the Radium Hot Springs, and the Highway 93 South corridor.

### Changes in Temperature

Kootenay National Park, much like the rest of Canada, is warming faster than the global average. If emissions continue to increase at the current rate (see Future Scenarios on the back page), then by 2051-2080 the average annual temperature in the park is projected to increase by about 3 to 4 degrees relative to the recent past. The effects of a warming climate include hotter maximum temperatures, warmer minimum temperatures, shorter and less severe winters, and longer frost free seasons. Increasing air temperatures are expected to reduce the duration of the winter snowpack in Kootenay National Park and result in warmer summer stream temperatures that may threaten the persistence of cold-adapted fish species like westslope cutthroat trout.

Additionally, a warmer climate will likely intensify some weather extremes, increasing the severity of heatwaves, droughts, and wildfires.

### Changes in Precipitation and Water Availability

Within Kootenay, total annual precipitation is projected to increase by approximately 10% by 2051-2080. However, climate models suggest there is the potential for a decrease in precipitation during the summer months. Models also project an increase in precipitation extremes (e.g. heavy precipitation events) over that same time period. For example, the maximum amount of precipitation over a 1-day period is expected to increase by about 16% under a high-emission scenario, relative to the recent past. Seasonal changes in temperature and precipitation (see the *Climograph* on the back page) will likely combine to affect glaciers, snowpacks, stream flows, groundwater flows, and wetland and lake levels. For example, more precipitation in winter may fall as rain rather than snow leading to changes to both the snowpack and timing and magnitude of stream flows. As a result, future hydrology within Kootenay is likely to be characterized by higher winter flows, earlier spring peak flows, and reduced summer flows. Furthermore, increasingly intense rainfall events may lead to destructive debris flows that could threaten park infrastructure.

| Variable | Recent Past[1] 1961 to 1990 | Moderate Emission Future[2] 2051-2080 | High Emission Future[2] 2051-2080 |
|---|---|---|---|
| **Average annual temperature** | -0.5 °C (-0.7 to -0.4) | 2.5 °C (2.0 to 4.0) | 3.7 °C (2.9 to 5.6) |
| **Hottest day of the year** | 25.8 °C (25.1 to 26.2) | 29.6 °C (28.3 to 32.1) | 31.6 °C (29.9 to 34.7) |
| **Frost free season (days)[3]** | 55 (52 to 63) | 111 (96 to 135) | 130 (109 to 151) |
| **Days per year below zero** | 126 (125 to 129) | 99 (78 to 105) | 90 (62 to 97) |
| **Growing degree days (5°c)[4]** | 600 (560 to 623) | 1069 (954 to 1392) | 1293 (1134 to 1710) |
| **Total annual precipitation** | 740 mm (720 to 757) | 801 mm (742 to 843) | 825 mm (746 to 864) |
| **Wet days (> 10 mm)** | 14 (13 to 15) | 17 (14 to 19) | 18 (16 to 20) |
| **Maximum 1-day precipitation** | 23 mm (23 to 25) | 27 mm (26 to 29) | 28 mm (26 to 31) |

### Projected climate values for Kootenay National Park.

Larger values denote the median of an ensemble of 26 climate models; values in brackets denote the 10th and 90th percentile values. Values have been spatially averaged across the park and temporally averaged over two 30-year time periods (1961-1990 and 2051-2080).

[1] The recent past was computed using historical model simulations.

[2] The 'moderate emission future' refers to SSP2-4.5 and 'high emission future' refers to SSP5-8.5. SSP1-2.6 is another scenario that describes warming under much lower emissions.

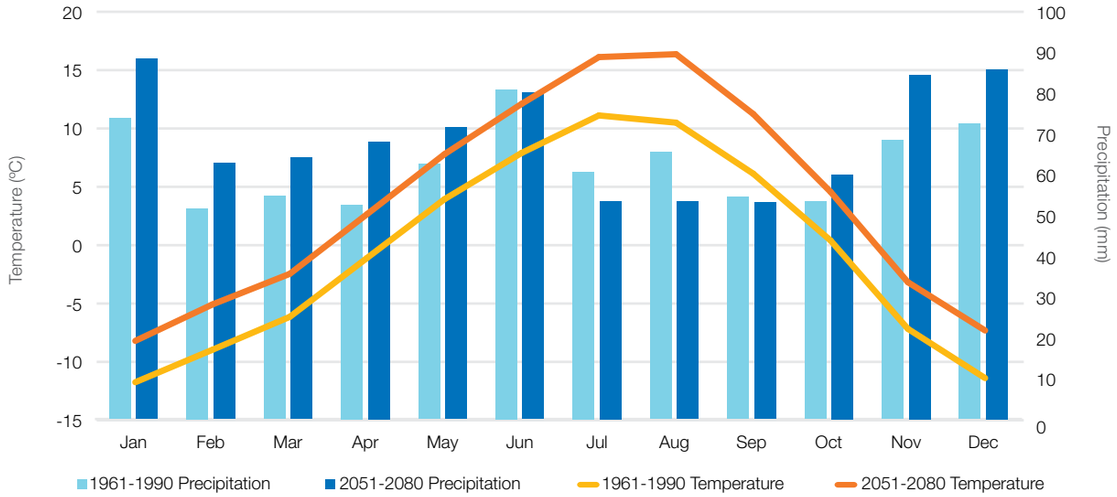
[3] The number of days between the last spring frost (last day with a mean temperature below 0 °C) and the first fall frost (first day with a mean temperature below 0 °C).

[4] Growing degree days (GDD) provide an index of the amount of heat available for the growth of plants and insects. GDDs accumulate whenever the daily mean temperature is above 5 °C.

### Spotlight on Impacts: Wildfire

Wildfire is one of the main ecosystem drivers in Kootenay National Park as it plays a significant role in shaping the types of vegetation and wildlife species within the park. However, climate change is impacting wildfire regimes in western Canada. Earlier spring snow melt, later fall frosts, hotter and drier summers, and increased severity and frequency of extreme temperatures and drought conditions associated with a warming climate are resulting in larger, more frequent, and more intense wildfires. Park staff are using prescribed fire as a strategy to restore and maintain ecosystem health while at the same time reducing the risk of future catastrophic wildfires.

Vermillion River Area During The 2003 Wildfires.




Climograph showing projected monthly temperature and precipitation values for the past (1961-1990) and future high emission scenario (SSP5-8.5; 2051-2080). Values represent the mean of a 26 climate model ensemble averaged across Kootenay National Park. Note: This graph only shows the mean value of the ensemble and does not display the range of individual model projections.

## Looking Toward the Future

The amount of warming we experience in the future depends on the concentration of greenhouse gases in the atmosphere. To account for future emissions uncertainty, climate models are run using different scenarios, called Shared Socioeconomic Pathways (SSPs). SSP1-2.6 is a low emission scenario characterized by rapid emissions reductions and policy focused on sustainable development. In this scenario, emissions peak around 2020 and decline to zero near mid-century. In the moderate SSP2-4.5 scenario, socioeconomic development continues to follow current patterns and emissions peak around 2050 then decline. SSP5-8.5 represents a very high emission scenario characterized by further fossil-fuel driven economic development. In this scenario, emissions rise throughout the century.

## About the Data

As per standard practice, the data in this report comes from an ensemble of 26 CMIP6 global climate models that have been downscaled to 6 km by 10 km using the BCCAQv2 method. Values have been spatially averaged across the park and temporally averaged over two 30-year time periods (1961-1990 and 2051-2080). The summary table on the reverse page displays the median, 10th and 90th percentile values of the climate model ensemble, which helps demonstrate the range in model projections. For a full description of the data and modeling methodology, and to download additional data, visit ClimateData.ca.



## Potential Climate Change Impacts and Adaptation Responses

Climate change will affect all programs under Parks Canada's mandate. There are many likely impacts associated with projected future climate conditions at Kootenay National Park. The table below outlines some examples of these projected conditions and impacts, as well as potential options for adaptation responses. Parks Canada works with Indigenous partners to develop and implement climate change adaptation responses. Parks Canada uses information like this, along with Indigenous knowledge, to better manage operations in national historic sites, national parks, and national marine conservation areas, and the services offered to visitors.

| Parks Canada Program Area | Future Climate Condition | Example of Likely Impact | Example of Potential Adaptation Response |
|---|---|---|---|
| **Natural Heritage** | Warmer temperatures | Upward migration of treeline/reduction in alpine tundra habitat | Continue with current 5-needle pine restoration efforts and identify new planting sites unlikely to be impacted by range expansion of lower elevation plant species. |
| **Cultural Heritage** | More frequent and intense rainfall events | Increased flooding and erosion threatening pre-contact archaeological sites | Identify sites most at risk of loss, document important resources, and monitor sites regularly for impacts. |
| **Visitor Experience** | Warmer temperatures | Extended summer season | Adapt camping opportunities and guidance for hiking, backpacking and mountaineering to reflect the extended summer season. |
| **Health, Safety & Wellness** | Higher maximum temperatures | Increased risk of heat-related medical issues | Develop communication tools that educate visitors and staff about the risks, symptoms, and treatment of heat-related illness. |
| **Built Assets** | More frequent and intense rainfall events | Increasingly frequent and destructive debris flows | Review mitigation plans and infrastructure design for valley-bottom assets to address potential damage from changing debris flow frequency and magnitude. |

## Working Together

The Canadian Centre for Climate Services (CCCS) provides access to data and information as well as offers training and support on how to use climate information to support decisions that increase resilience to the impacts of climate change. Parks Canada works with CCCS to develop site-specific climate change summaries that inform and support adaptation planning at Parks Canada-administered places.

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