





 <h1>Extreme Cold</h1> <p>A period of abnormally cold weather, which can be associated with severe winter conditions.</p>				<b>EXTENTS</b> <b>REGIONAL</b> <b>CONSEQUENCE</b>  <b>MODERATE</b>
TYPE	DURATION	SEASONALITY	WARNING TIME	LIKELIHOOD
 <b>CHRONIC / SHOCK</b>	 <b>DAYS-WEEKS</b>	 <b>WINTER</b>	 <b>DAYS-WEEKS</b>	 <b>LIKELY</b>

## About the Hazard

Extreme cold conditions can create snowstorms and blizzards. Extreme cold is primarily driven by the advection of very cold air masses within the local hydroclimate system. This is often linked with specific large-scale climate atmospheric pressure systems such as arctic outflows, and influenced by modes of climate variability such as ENSO and others. The localized intensity of the cold is modulated primarily by watershed physical characteristics. Higher elevations are generally colder; however, local topographic conditions can cause cold air masses to “pool” at lower elevations. Coastal environments moderate extreme temperature conditions.

## What We Assessed

We assessed and mapped a subset of temperature-based climate indices to understand changes in frequency, duration, and severity of extreme cold conditions. The climate indices were obtained from PCIC high-resolution (e.g. 800-m horizontal) climate modelling data available for the RSA. Our statistics and maps compared conditions of the recent past (1981-2010) and future (2050s).



## Challenges

- ▶ Global climate models (GCMs) are extremely complex and have large uncertainty, especially at smaller scales.
- ▶ The GCM data is “downscaled” to account for regional effects such as from the ocean and mountains; however, this process can introduce further uncertainty through biases in local observed data.
- ▶ Results are best interpreted in terms of understanding relative changes between recent past and future conditions.

## Mapping Results

Coldest temperatures generally occur at higher elevations in the RSA. This corresponds to the western (and least populated) area. The change in extreme cold severity is shown on the map in terms of freezing degree days, for the recent past and for the 2050s. The freezing degree days index is defined as the annual total of the number of degrees that a day’s average temperature is below 0°C.

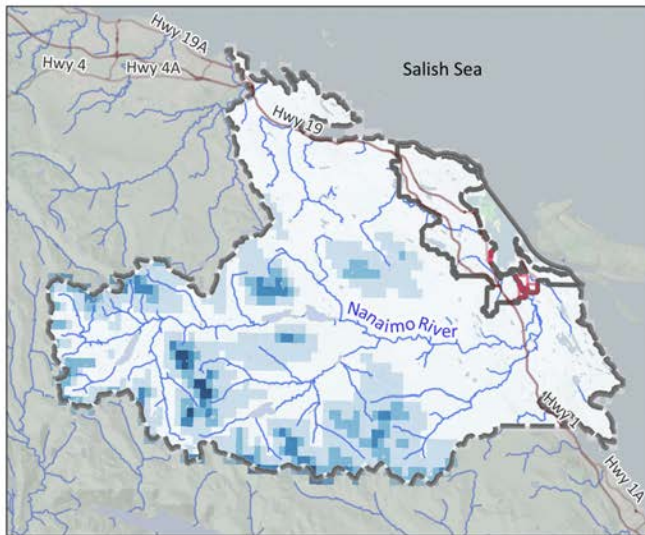
## Climate Change Projections (2050s)

Extreme cold conditions are projected to become weaker, especially in the lower elevation LSA, where many areas will cease to experience extreme cold conditions in the future. In the RSA compared to the recent past, in the future:

- ▶ The number of annual icing days will be reduced by 8.
- ▶ Cold spells are likely to last approximately one day instead of one week.
- ▶ The temperature of severe cold nights is likely to increase from less than -10°C to approximately -7°C.
- ▶ Fewer winter extreme cold conditions are likely to result in fewer blizzards, and less snowfall and snowpack in the upper watershed.

**In the next 5-10 years**, the above trends are likely to apply, meaning that this hazard is trending toward getting less extreme. This result is an exception for this project. However, by way of its influences on snowpack and hydrology, there are potential negative implications for water supply and environmental values (discussed in the drought hazard summary).

## Recent Past



## Future



### Legend

#### Background


 Reserve Lands

 Project Local Study Area


 Project Regional Study Area


 Lakes

 Rivers

 Highways

#### Extreme Cold Severity (°C-day)

 ≤ 100

 100 - 160

 160 - 220

 220 - 280

 > 280

Map Scale 1:700,000

 0 5 10 15 km



## Interactions with Other Hazards

Extreme cold frequently coincides with and determines the fraction of precipitation that falls as snow rather than rain.

It also often coincides with drought conditions and windstorms (like during Arctic outflow events).

Besides influencing precipitation type, no other interactions were identified between extreme cold and the other climate hazards assessed.

## Emergency Management Considerations

- ▶ Colder temperatures are linked to La Niña events, whose forecasting can be used to track upcoming hazard potential (see Provincial resource discussed in Section 9 Recommendations)<sup>23</sup>.
- ▶ Monitor Nanaimo weather forecast (see Federal resource discussed in Section 9 Recommendations)
- ▶ Prepare and plan for warming/shelter areas that can be rapidly opened or deployed.

<sup>23</sup> The ENSO index is based on long-term average conditions, and it does not mean that an extreme cold event cannot occur during an El Niño phase.