BC has enormous gradients in temperature and precipitation, driven in part by:

- Distance from ocean
- Elevation
- Latitude
- Other climatic/geologic

Alpine

- Mountainous ecosystems. Generally above tree-line, but do contain some dwarf trees.
- *Tree-line*—elevation at which vegetation ceases to be dominated by trees.
- Depending on the location in BC (distance from the ocean and latitude), alpine occurs at >2250 m to >1000 m.

Climate

- Cold
    - As increase in elevation, it gets colder
        - 6.4 degrees C/1000 m; equivalent to distance of 1400 km
    - Short growing season
- Windy
- Snow—amount and extent of snow controls ecosystem dynamics

Dominant vegetation forms

- Shrubs—e.g., willows
- Grass, herbs, lichens
- *Krummholz*—stunted form of trees
- Or snow, rock, ice

CHALLENGES AND ADAPTATIONS TO ALPINE LIFE

Alpine life is challenging, organisms have a suite of behavioral, morphological, and physiological adaptations to the high life

Challenge	**Adaptation**	**Example**
Cold	Squat body shape	Pika
Windy	Ground-hugging	Trees
Desiccation	Thick leaves	Shrubs
Low/variable food	Caching food	Pika
Higher UV	Behavior	Alpine amphibians
Lower Oxygen	Physiology	People

Alpine ecosystems are relatively more protected from human land-use change

- Not great places for people to live
- Not great places to grow food
- More protected areas
- Trees not big or productive so aren't usually logged

Alpine ecosystems and climate change

- Warmer temperatures
- More precipitation (as rain)
- Reduced snowpack
    - Extent
    - Depth
    - Decreased water storage
    - Decreased summer soil water
- *Gradual (and small) changes in temperature can drive abrupt ecosystem shifts*
    - Water to ice
    - Tree-less to tree

Alpine biotic responses to climate change

- Range shifts upward
    - Tree-line moving up
        - Size of trees
        - Abundance (recruitment)

- If cold-adapted, alpine organisms may not be able to keep going up (top of mountain)
    - E.g., Pika (discussion paper to come)

- Phenology

- Population increase or decrease