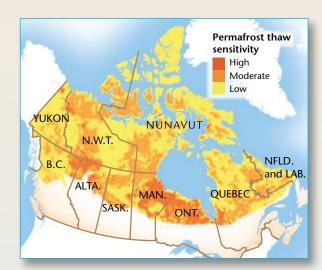




# A Changing Climate

Widespread impacts, some positive, most negative, are expected across Canada as climate change brings increasing temperatures and changing moisture levels



### IMPACTS IN THE NORTH

- Changes in permafrost, sea ice, lake ice and snow cover affect infrastructure.
- New transportation options linked to navigable Arctic waters and expanded port and road networks.
- Biodiversity decreases. Polar bears, beluga and caribou are among the most vulnerable species.
- Challenges to maintaining traditional ways of life in Aboriginal Arctic communities.

Some northern populations with limited capacity to adapt are particularly vulnerable.



### IMPACTS IN BRITISH COLUMBIA

- Increasing water shortages and competition for water.

  More frequent and sustained drought.
- Critical facilities, networks and services threatened by extreme weather and natural hazards.
- Forests vulnerable to pest infestations and wildfire.Stresses on fisheries increase. Pacific salmon
- Stresses on fisheries increase. Pacific salmon especially vulnerable.

Integrating climate change adaptation into decisionmaking enhances resilience and reduces long-term costs and impacts.



### IMPACTS ON THE PRAIRIES

- Increased water scarcity.
   Drought wildfire and severe floods more
- Drought, wildfire and severe floods more frequent, with economic impacts in the billions of dollars.
- Warmer winters mean more pests and diseases, more difficult access to remote communities via winter roads resulting in challenges for the forestry and energy sectors.
  Ecosystems affected by shifts in fire and insect
- Ecosystems affected by shifts in fire and insect disturbances, stressed aquatic habitats and introduction of non-native species.
- Capacity to adapt varies greatly within the region, with an important role for governance institutions and civil society to turn capacity into action.

# Degrees of Change

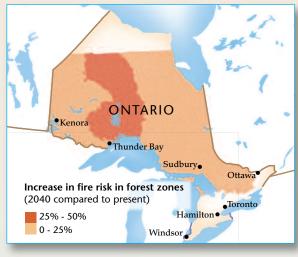
A summary of the impacts of climate change expected in Canada over the 21st century GLOBAL AVERAGE TEMPERATURE RISE 2°C 4°C 5°C OVER PRE-INDUSTRIAL LEVELS ICE, SNOW AND SEA Summer Arctic sea ice extent declining Earlier spring snow melt in much of Canada Western mountain glaciers shrinking Western mountain glaciers lose 50% of volume and some disappear Permafrost thaw depth increases 15-40% in the Mackenzie Valley Summer Arctic sea ice Deeper snow cover in the high Arctic Sea levels rise one metre Marine plants and animals affected by warmer and more acidic oceans **ECOSYSTEMS** Resident populations of killer whales in B.C. increasingly threatened Terrestrial habitats shifting northward and upslope Polar bear subpopulations at risk of extinction Biodiversity of protected areas and parks significantly altered Great Lakes ecology disrupted by lower oxygen levels Area burned in western wildfires increases two to four times Risk of losing over 20% of boreal forest and over 10% of tundra **WATER RESOURCES** Runoff changes occur due to variations in snowpack accumulations and melting mountain glaciers Frequency of prairie drought doubles Risk of desertification in Runoff in Northern and eastern Canada increasing Water quality compromised by reduced quantity in some regions Increasing competition over domestic and transboundary water access and use in parts of southern Canada Runoff in South Saskatchewan River basin significantly reduced Risk to people and property from weather extremes increasing **HUMAN HEALTH** Exposure to vector-borne diseases increasing Increased risk of water-borne disease outbreaks Heat wave deaths double in Cardio-respiratory deaths and illnesses from poorer air quality on the rise Lyme disease range expanded 1,000 km **COMMUNITIES AND** People and property at increasing risk from . . sea level rise and storm surges INFRASTRUCTURE Livelihoods of some resource-dependent communities at risk Less winter heating and more air conditioning Livelihoods and safety of northern indigenous peoples at risk Increasing cost of providing community services Extreme rain events double in frequency **RESOURCE INDUSTRIES** Hydro generation potential increasing in central Quebec, declining in parts of B.C. and Ontario Crop yield potential increases by 40% or more for increasing with longer growing seasons . declines for some crops Farm income at increasing risk from .. agricultural pests and disease Timber lost to pest outbreaks and wildfires Range of Arctic char restricted Increased abundance of Atlantic to northeastern Canada cod north of 60° Pacific salmon fishery Atlantic salmon loses habitat in Gulf threatened in southern B.C. of St. Lawrence and tail of Grand Bank Timber gains from enhanced tree growth in some northerly locations Greater access to northern oil, gas and mineral resources Winter recreation constrained for parts of southern Canada **SERVICE INDUSTRIES** Arctic tourism increasing with ice-free access More costly shipping through Great Lakes and St. Lawrence Seaway due to lowering water levels Cruise voyage potential increases by 50% Ski season reduced by 15 to 25%, golf season increased by 7 to 20% in parts of southeastern Canada Northwest Passage opens to commercial shipping Security and resource-claim issues heightening in the Arctic **SECURITY AND TRADE** Increasing demand for humanitarian and foreign aid due to additional populations affected by climate-related natural disasters Comparative advantage for agriculture and forest products shifting Increasing demands on peacekeeping and diplomatic resources from conflicts over water and food scarcity in parts of the world 1°C 3°C 4°C 5°C

The beginning of each colour bar indicates the temperature at which each impact is expected to begin

Forecast within indicated range Forecast to continue indefinitely

The NRTEE's *Degrees of Change* diagram (ABOVE) is a summary of the impacts of climate change expected in Canada over the 21st century. It shows both risks and opportunities for Canada from different levels of global warming above pre-industrial levels. Each category in the diagram is an important part of our country's environment and economy, and only contains climate change impacts that we are confident could occur, as documented in scientific literature. Each regional map takes a climate change impact and illustrates what it

might look like across that specific region. Not all expected impacts of climate change are shown here. Nor is the diagram a prediction. It does not account for time lags between global temperature change and the response of our physical environment. Even if actions limit global temperature increases to just 2°C by 2050, climate change impacts will continue to build up for decades due to the slow response of Earth systems. Adapting to these impacts to reduce or avoid harm is not shown on the diagram but would lessen their effects.

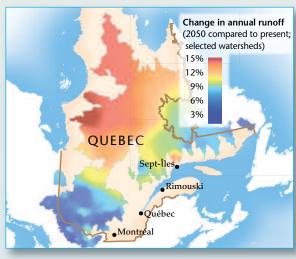


#### IMPACTS IN ONTARIO

- More frequent disruptions to water treatment/
- distribution and energy generation/transmission.

   Increased water shortages in southern Ontario.
- Increased summer temperatures and evaporation rates.
  Increased health risks related to extreme weather, heat,
- smog and food-, water- and vector-borne diseases.
- Remote communities affected by evacuations, transportation disruptions and stressed forest-based economies.

Ontario's capacity to adapt is high, but it is not uniform across the region and between sectors.



### IMPACTS IN QUEBEC

- Northern communities face challenges with critical infrastructure, natural hazards and maintaining traditional ways of life.
- Ecosystem health declines, with significant
- consequences for natural resource economies.
- Possible benefits for hydroelectricity and forestry.Shoreline erosion along the St. Lawrence River estuary.
- More extreme weather conditions in southern Quebec.

  Quebec's knowledge economy carries a high degree of
- Quebec's knowledge economy carries a high degree of adaptive capacity, but little is known about the costs and limitations of adaptation.



## IMPACTS IN ATLANTIC CANADA

- More storms and ocean surges. Sea levels rise.
- Coastal erosion and flooding.
- Increased pressure on water resources.Marine fisheries face changes in fish species, threats
- to infrastructure, occupational health and safety risks.
- Agriculture and forestry may benefit, but also vulnerable to disturbances and moisture stress.
- Vulnerability of Atlantic communities can be reduced through careful planning.



