NWT CLIMATE TRENDS AND IMPACTS

NWTAC CLIMATE CHANGE FORUM AND CHARRETTE
YELLOWKNIFE OCT 29-31, 2018

CANADIAN CENTRE FOR CLIMATE SERVICES

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Northern Climate Services Liaison
CCCS-ECCC

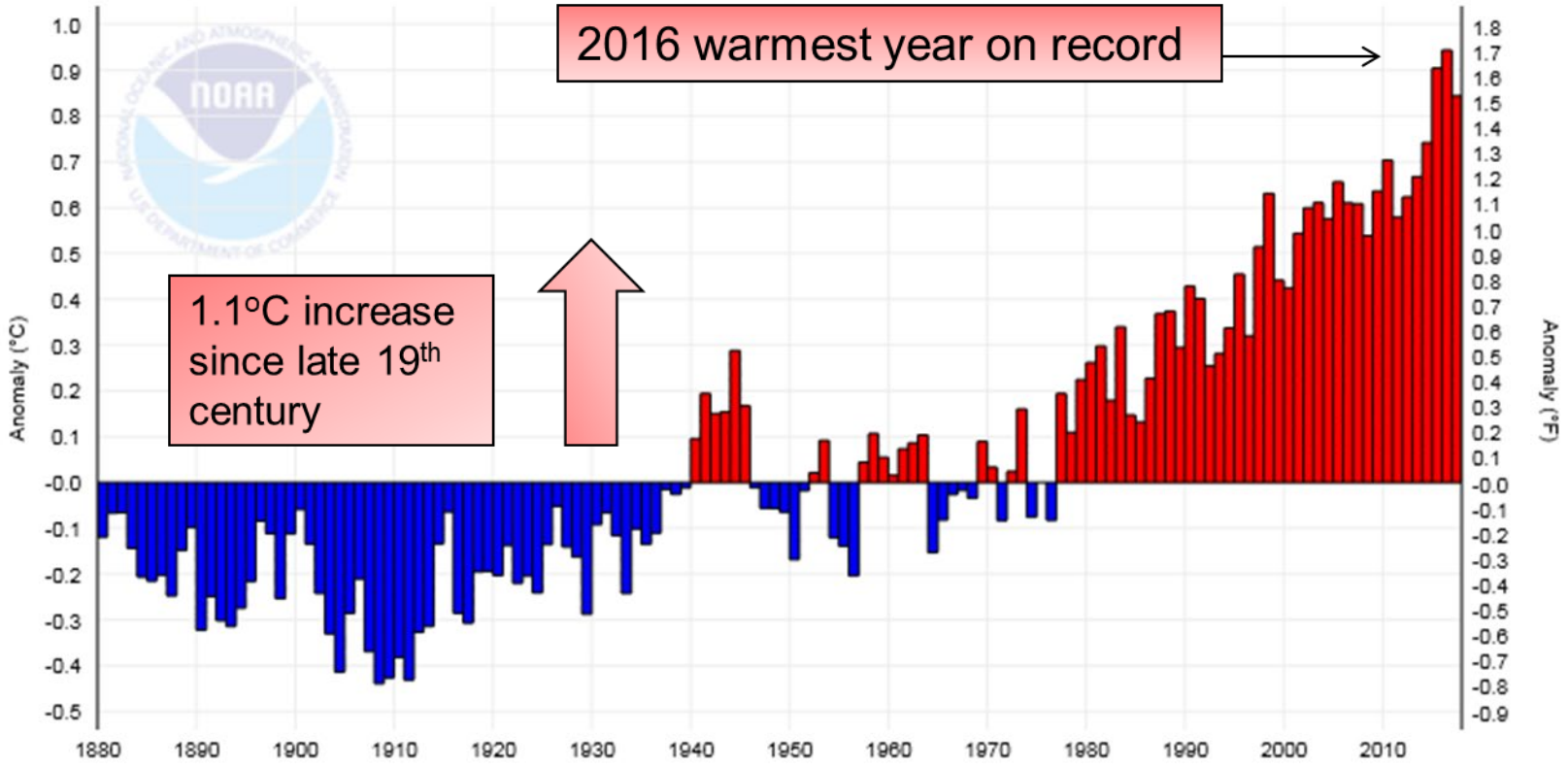
OUTLINE

1. TRENDS
2. IMPACTS
3. PROJECTIONS OF FUTURE

Trends

WARMING IS UNEQUIVOCAL

Global Land and Ocean Temperatures Anomalies
(January – December 1880-2017)

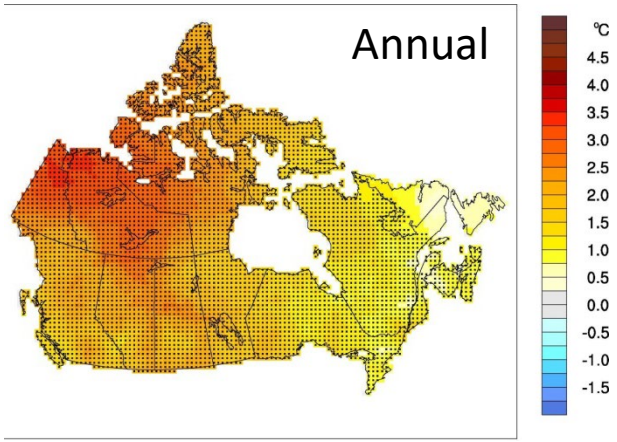


** IPCC Fifth Assessment*

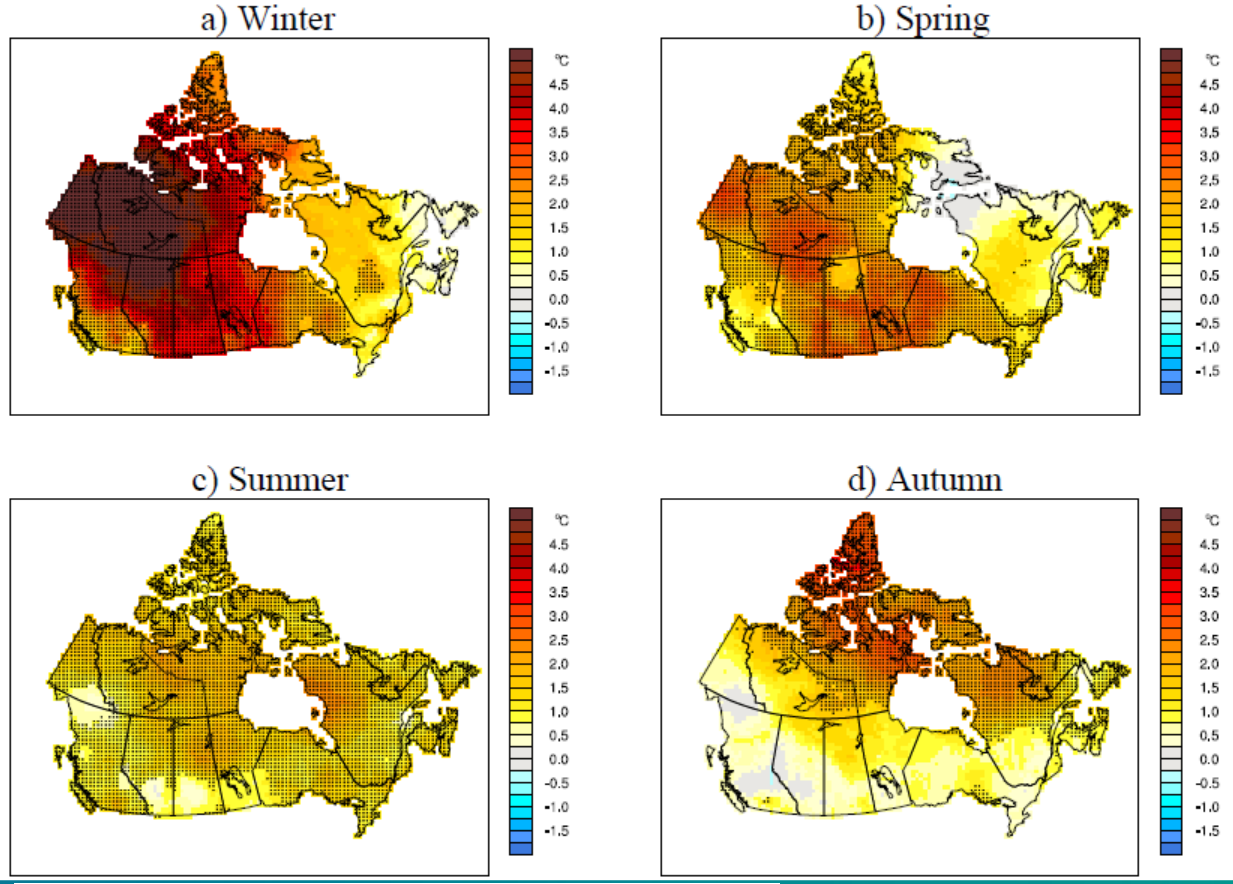
Northern Canada is warming faster than most other regions of the world

TEMPERATURE TRENDS ACROSS

Trends: 1948-2016



Trends: 1948-2012



Source: Vincent et al. *J. Climate,* 2015

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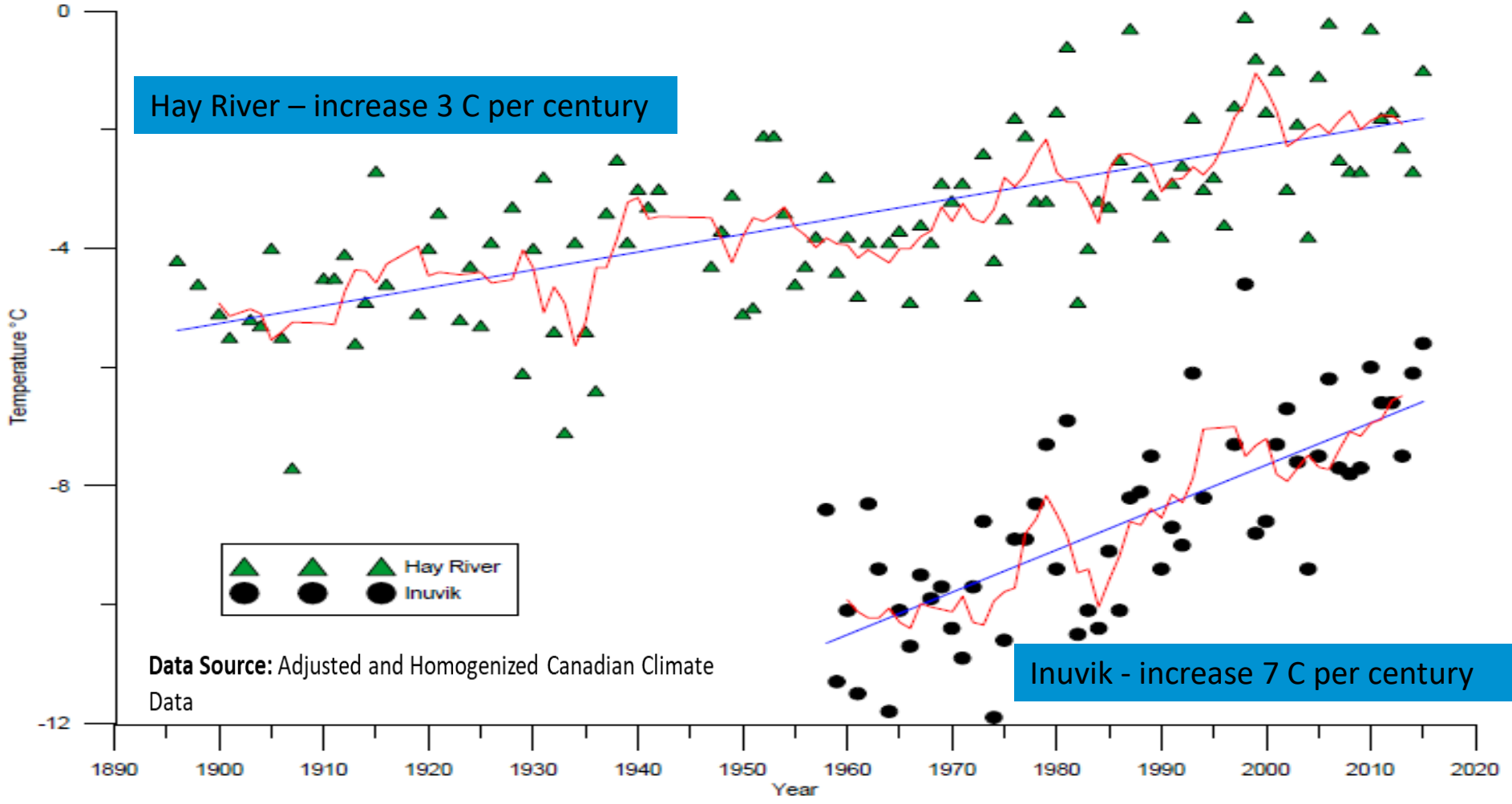
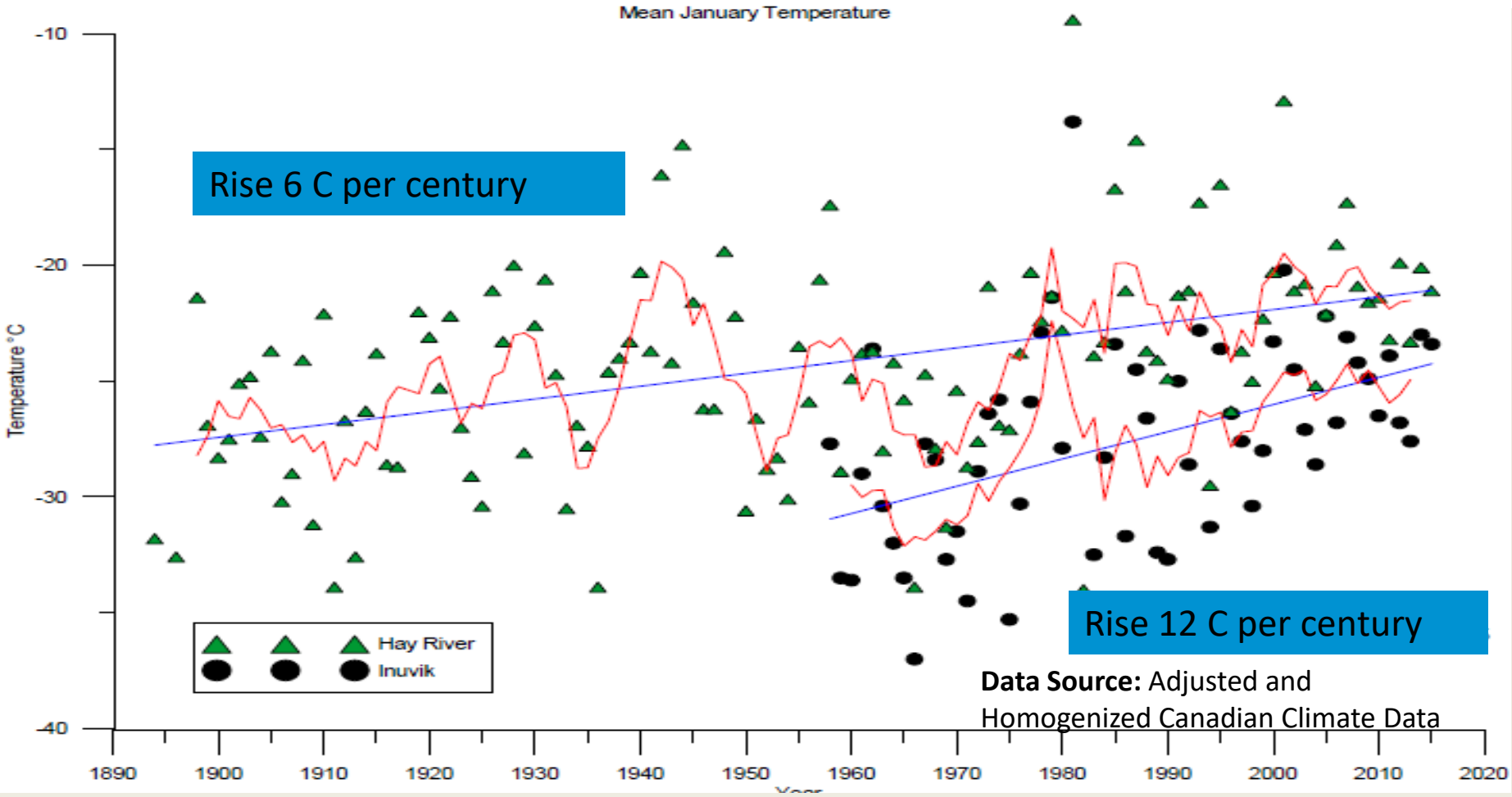
HAY RIVER & INUVIK MEAN ANNUAL TEMP



HAY RIVER & INUVIK MEAN JAN TEMP



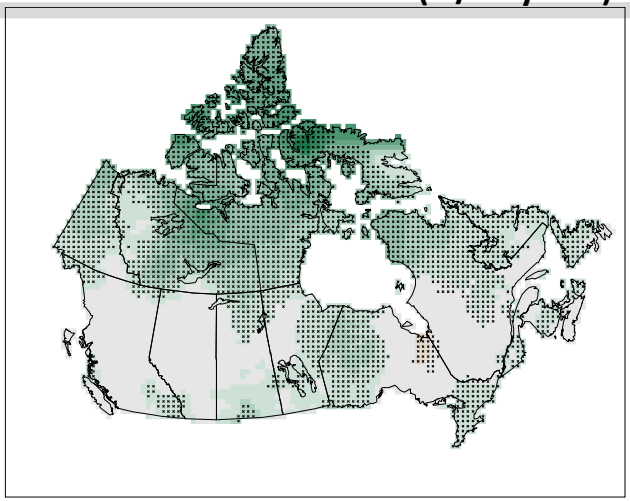
Rise 6 C per century

Rise 12 C per century

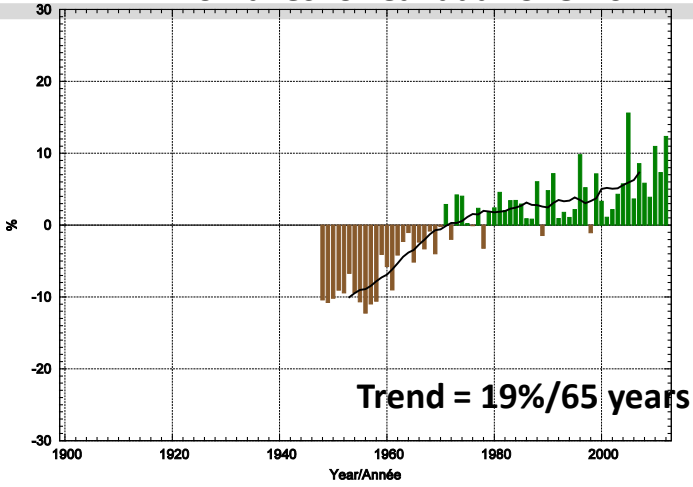
Data Source: Adjusted and Homogenized Canadian Climate Data

PRECIPITATION TRENDS ACROSS CANADA

Trends for 1948-2012 (%/65 years)



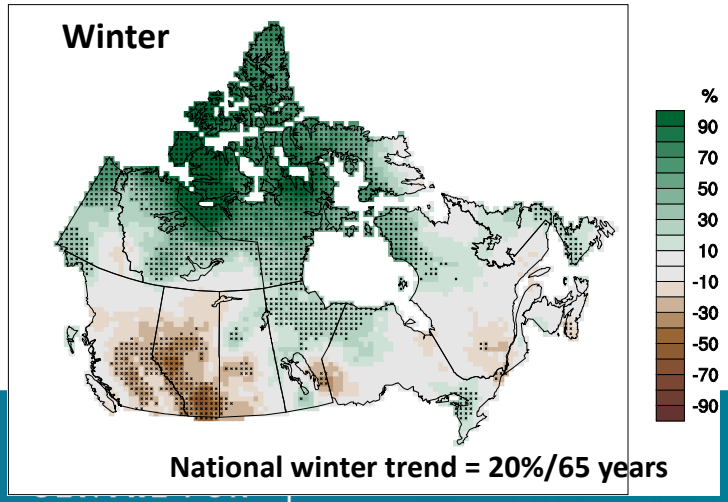
Anomalies for Canada 1948-2012



Grid squares with trend statistically significant at 5 % level are marked with a dot.

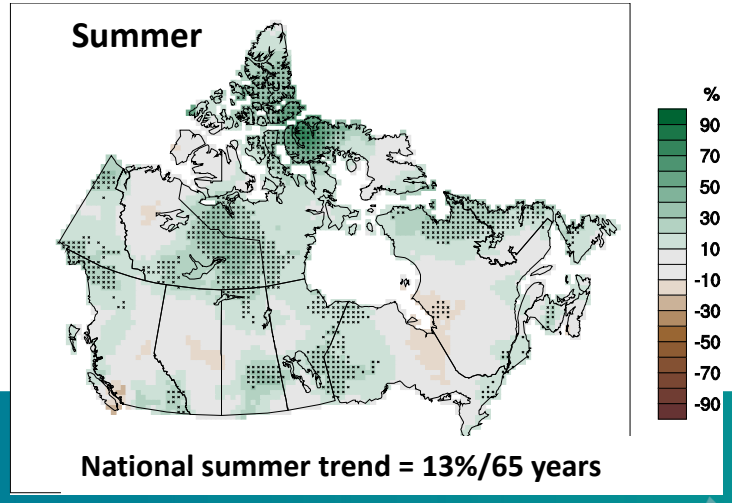
The percentage anomalies in the north represent much less precipitation than the same percentage in the south.

Winter



National winter trend = 20%/65 years

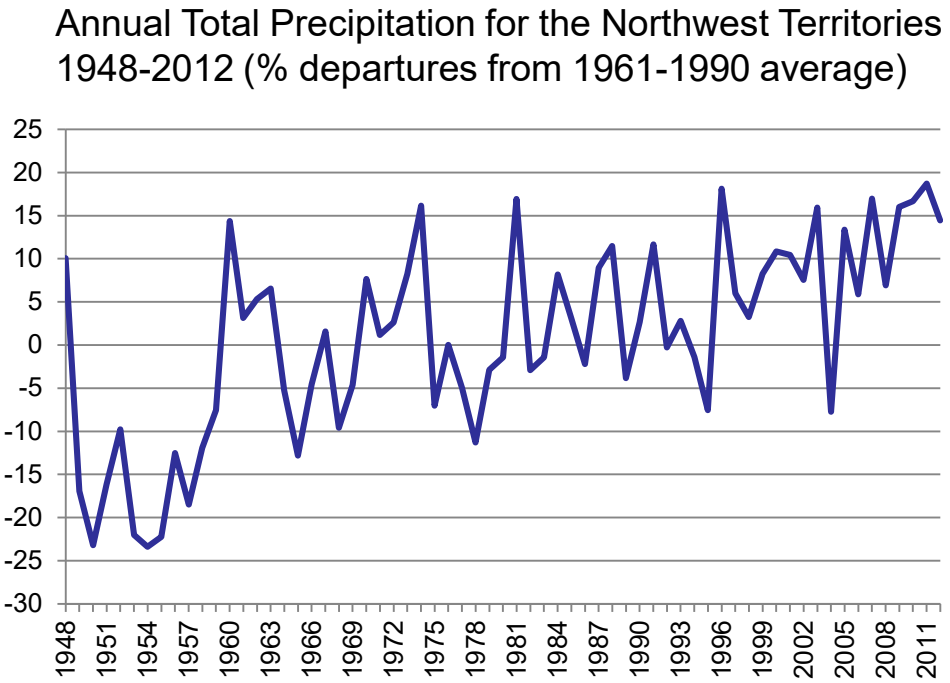
Summer



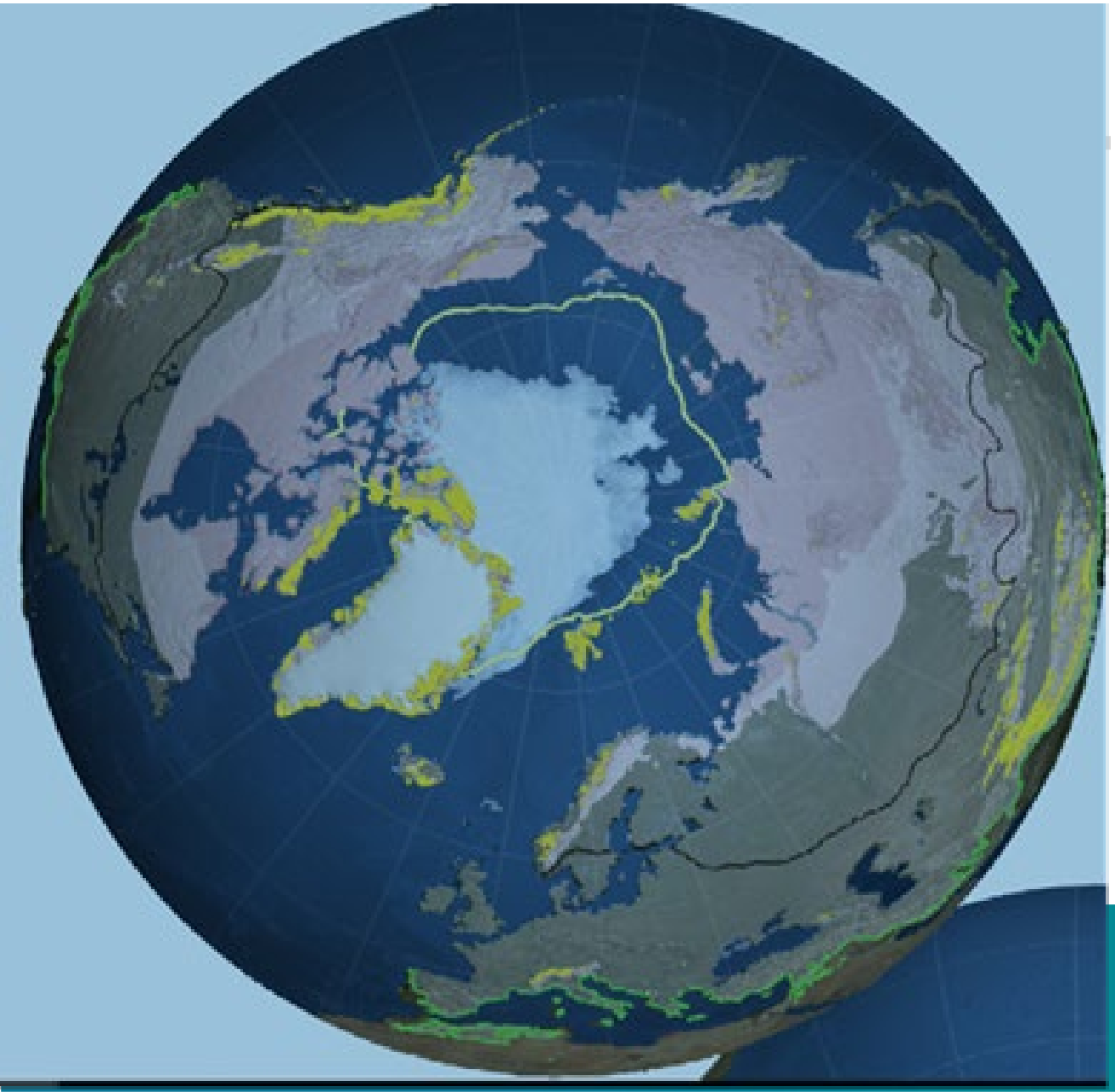
National summer trend = 13%/65 years

PRECIPITATION – NORTHWEST TERRITORIES

NWT shows significant inter-annual variability with a marked trend of increased precipitation



DECREASING SEA ICE

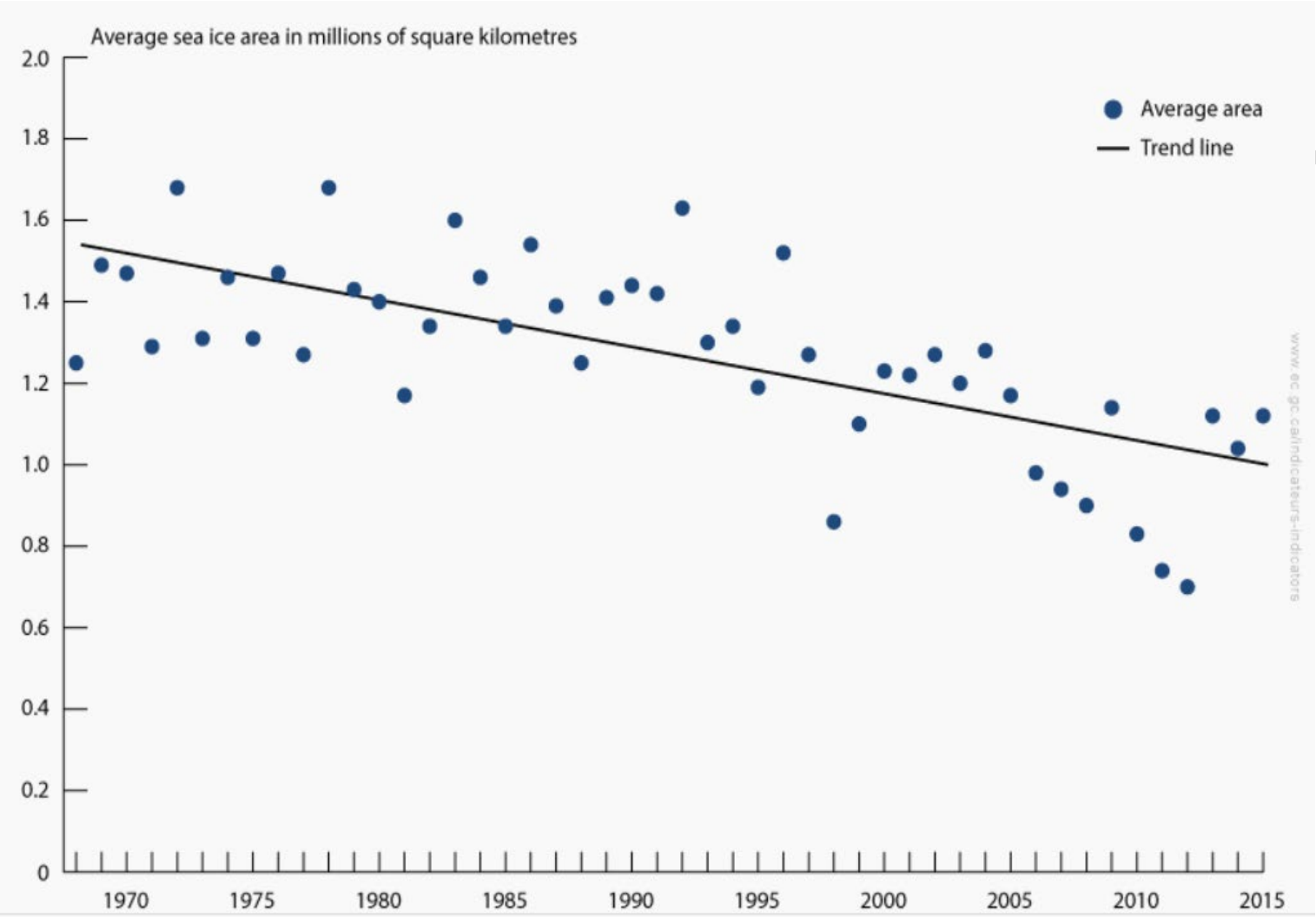


Sea Ice Extent

Sept 2012

Source: IPCC
5th Assessment Report

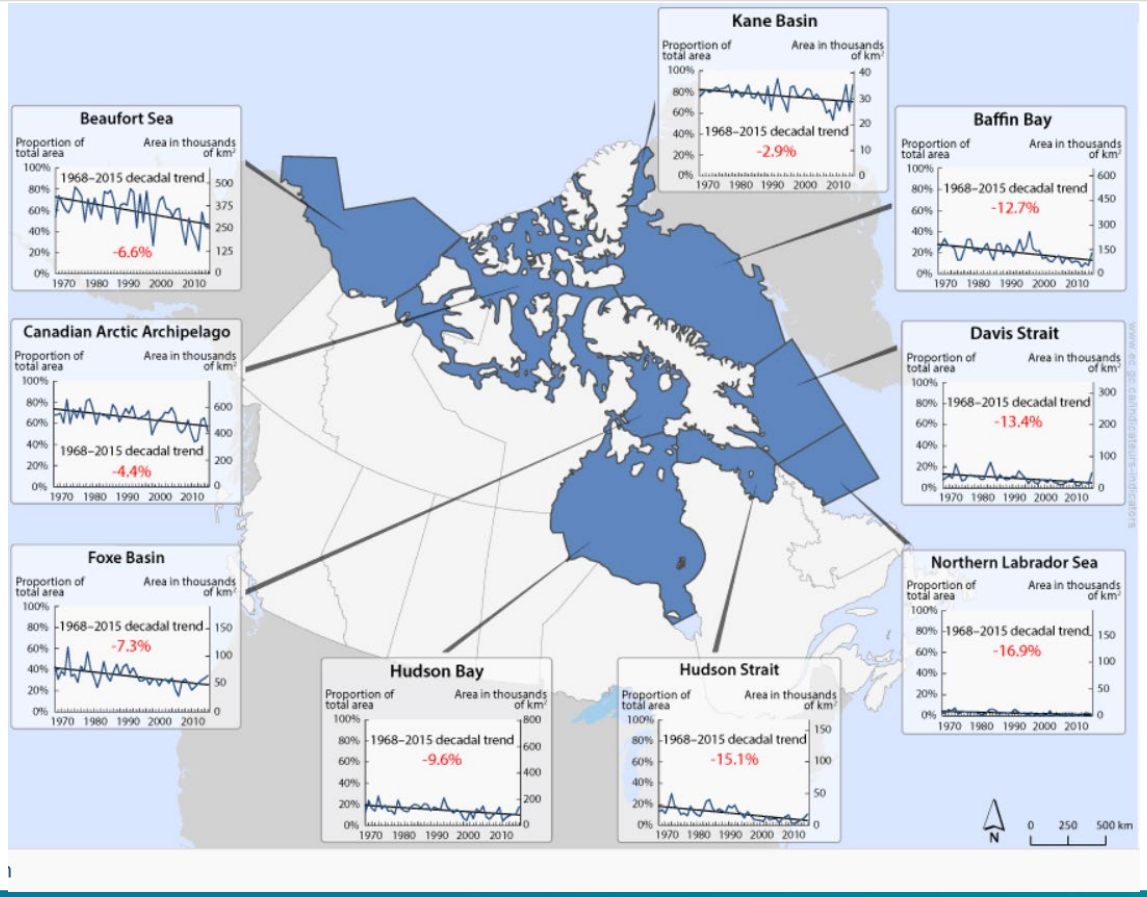
SEA ICE IN CANADA



Decreasing trend of 6.9% per decade in multi-year sea ice area between 1968 and 2015

Source: Government of Canada Environmental Indicators

SEA ICE



Decreasing trends in sea ice area for each of the nine sub-regions in Northern Canadian waters between 1968 and 2015

Source: Government of Canada Environmental Indicators

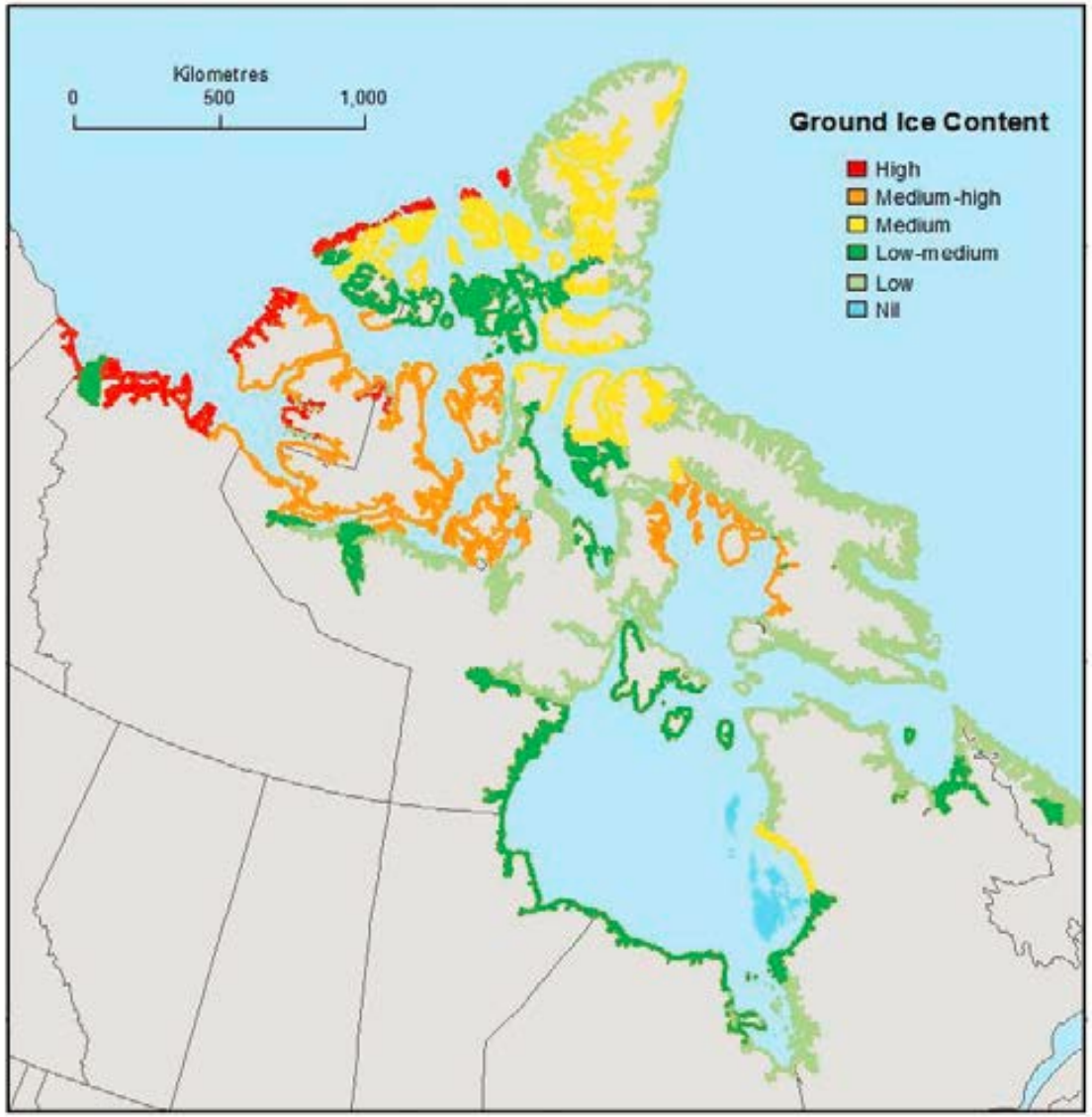
Impacts

COASTAL EROSION

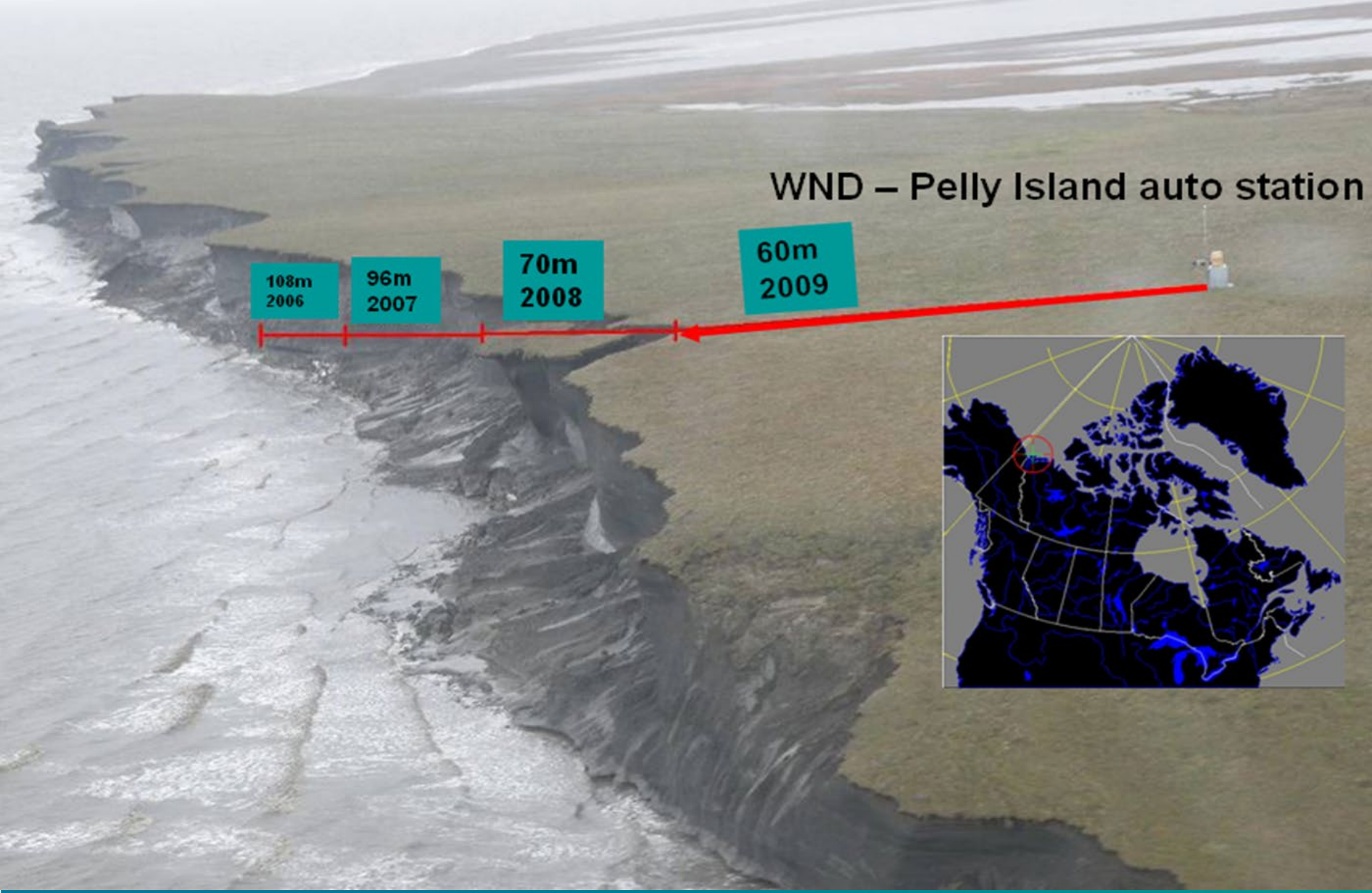
Photo Credit: Hamlet of Tuktoyaktuk

19 July 2016

GROUND ICE CONTENT



Source: NRCan
Canada's Marine Coasts in a Changing Climate



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COASTAL EROSION AND SEA LEVEL RISE: BIODIVERSITY

Hairy Braya – NWT species at risk: threatened

First NWT Species at Risk Recovery Strategy Released

Erosion of up to 10 meters per year

WARMER TEMPERATURES DEGRADE ICE AND SHORTEN ICE ROAD SEASON

PERMAFROST THAW

PERMAFROST THAW

West of Fort McPherson

Scott Zolkos, University of Alberta, 2016

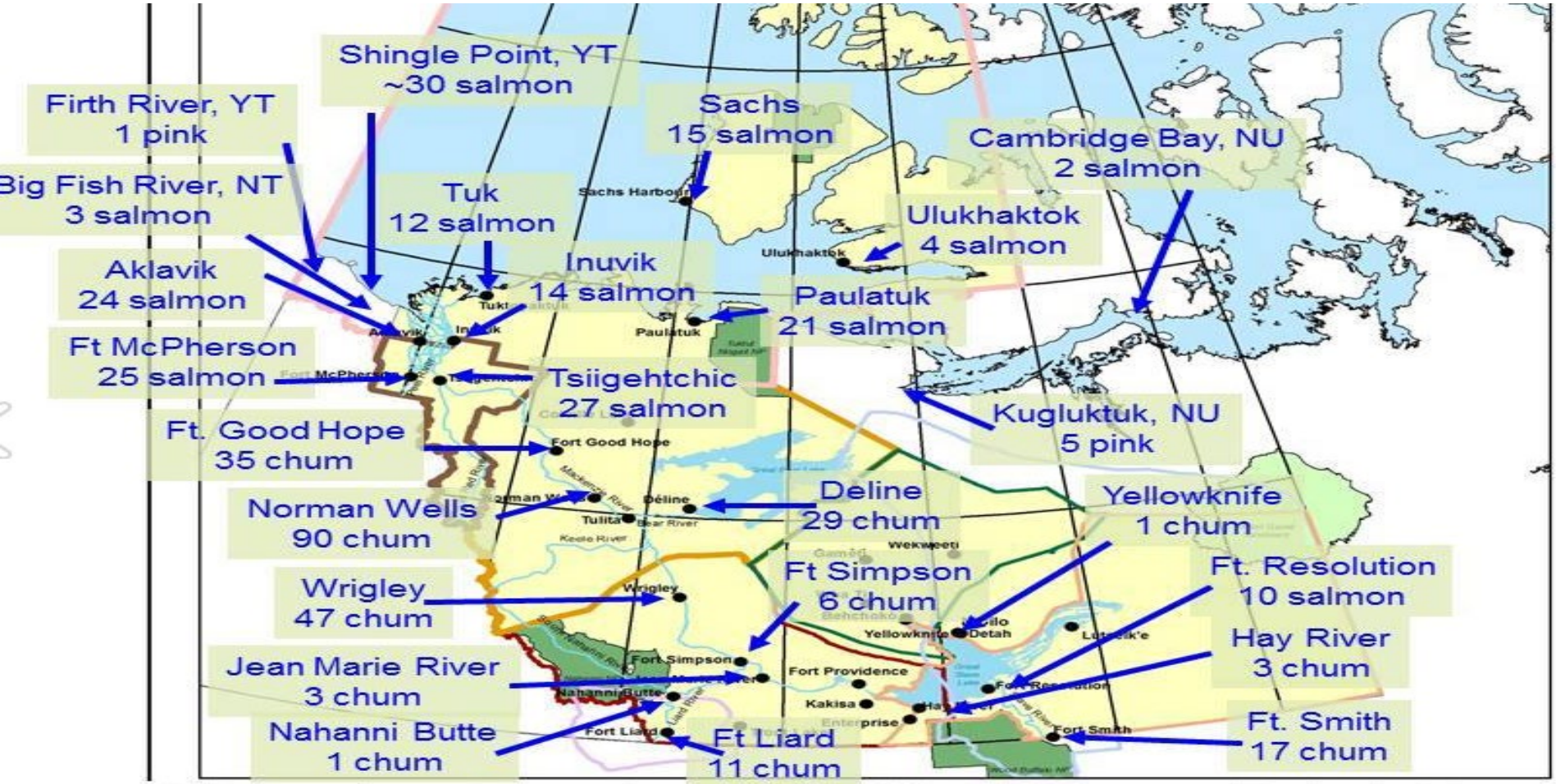
WINTER OVERLAND FLOW: IMPACT ON WINTER ROADS

15 km East of Gordon Lake

2015

Peter Morse, GSC, NRCan

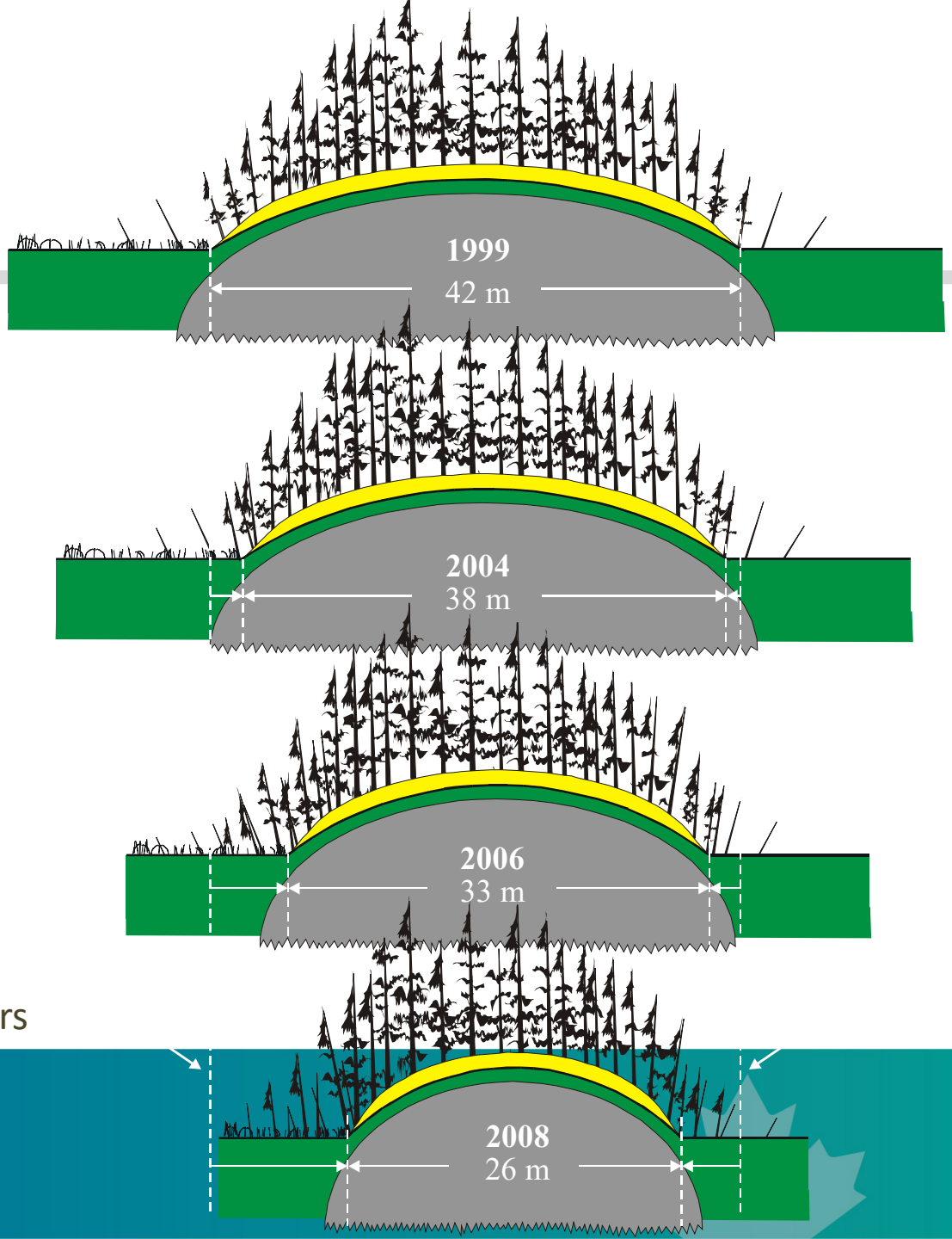
OPPORTUNISTIC SPECIES



Preliminary data on harvested salmon in the NWT in 2016 as part of the Arctic Salmon community-based monitoring program. This information is used to track the distribution

Source: Karen Dunmall, U Manitoba. www.arcticsalmon.ca

PLATEAU SHRINKAGE



Masaki Hayashi, U of C

Bill Quinton, WLU

Approximately 40 % decrease in discontinuous permafrost over 60 years

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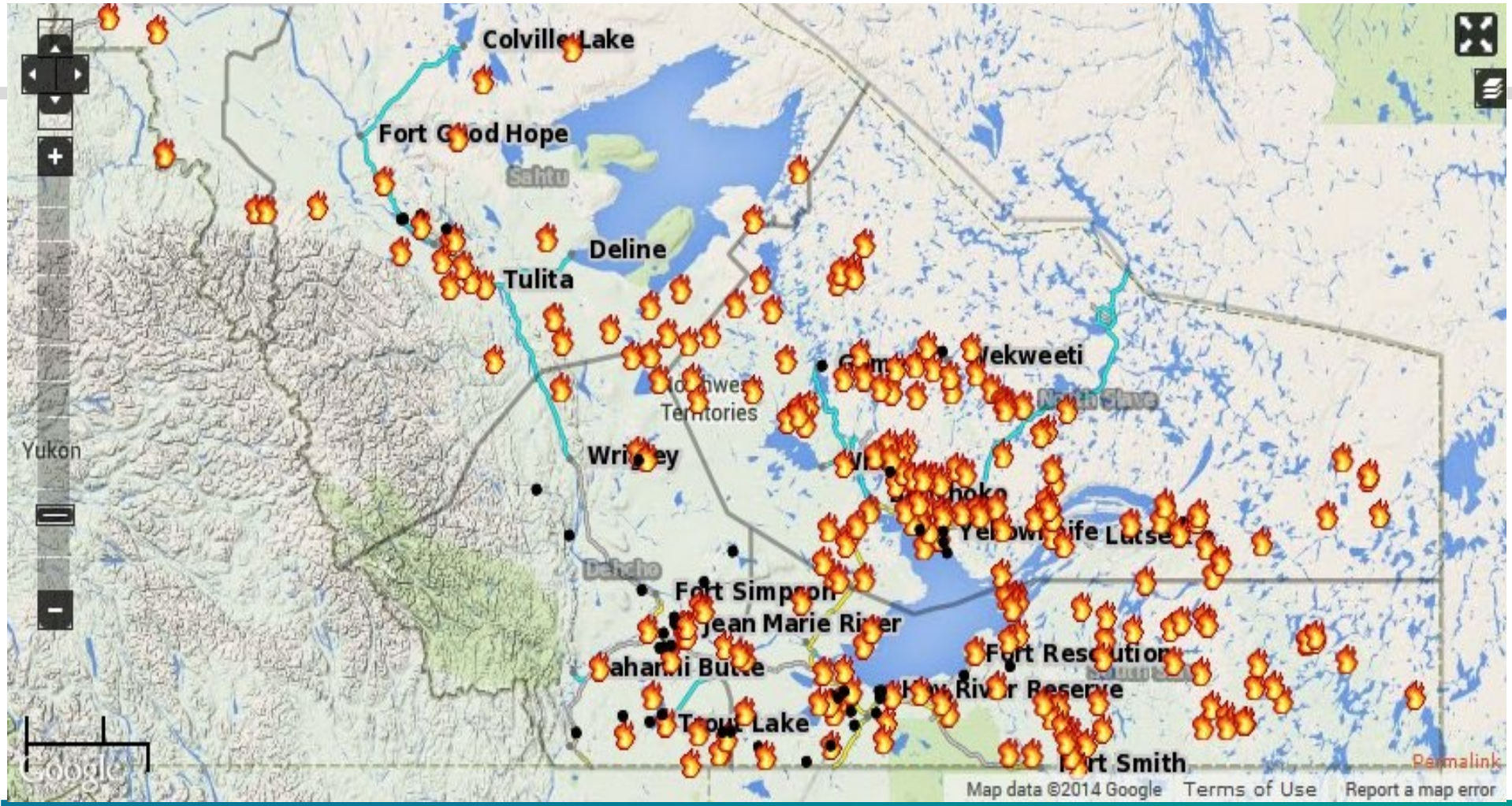
WARMER, WETTER, HEAVIER SNOW

2004, foyer roof collapsed of Samuel Hearne Secondary School in Inuvik

ACTIVE FIRES JULY 30, 2014



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INCREASING FOREST FIRES

Air Quality
Yellowknife,
August 16, 2014

WHATI, SUMMER 2014

SNARE RESERVOIR, JUNE 2015

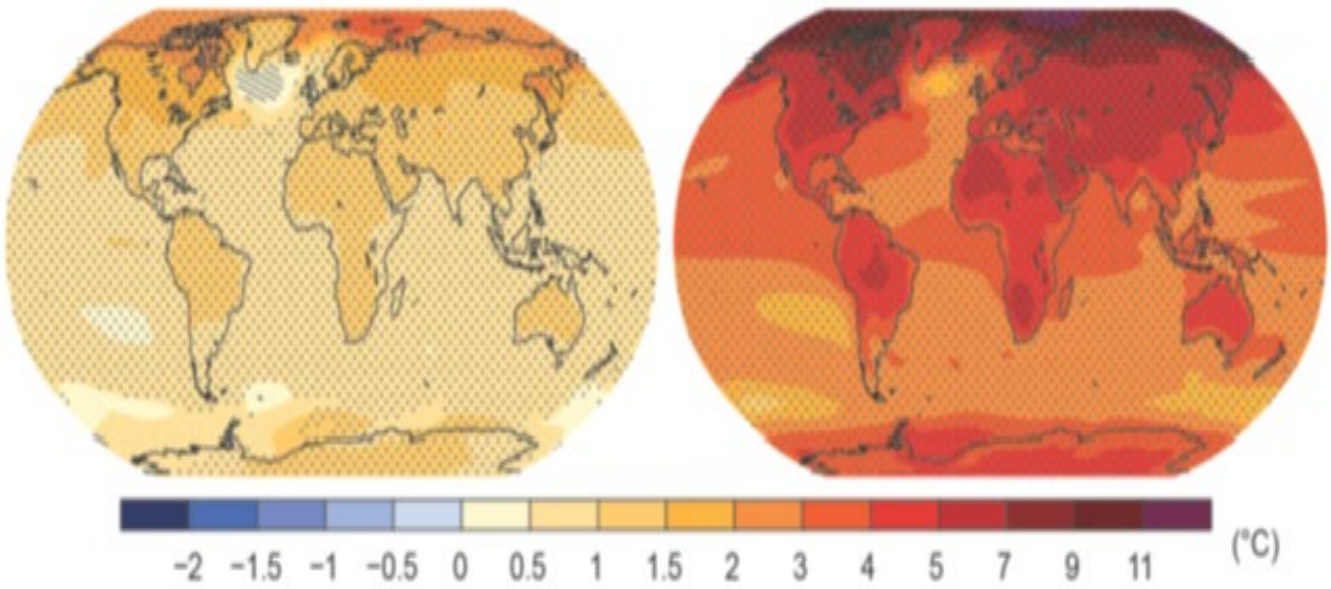
SNARE RAPIDS HEAD GATE AND INTAKE, JUNE 2015

Projections of the Future

THE STORY OF TEMPERATURE - GLOBAL

Change in Average Surface Temperature For 2081-2100 (compared to 1986-2005)

Low Emissions (RCP 2.6) | **High Emissions (RCP 8.5)**



Global: +1.0°C (RCP2.6) Global: +3.7°C (RCP8.5)

- Temperature change is not uniform.
- Projected warming is higher at **high northern latitudes**, and greater over land surfaces than oceans.

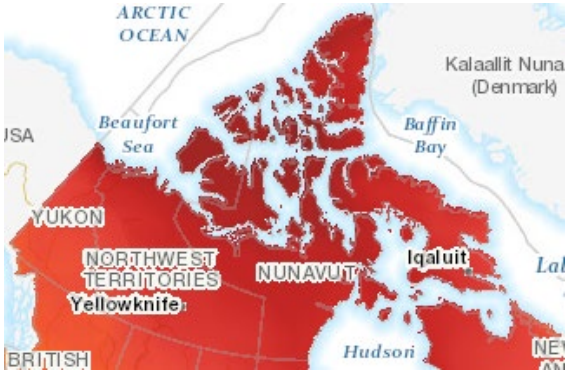
FUTURE PICTURE OF WINTER TEMPERATURE – NWT

HIGH EMISSIONS SCENARIO

2021-2040

2041-2060

2061-2080



2081-2100

FUTURE PICTURE OF TEMPERATURE – NWT

Projected warming is higher at high northern latitudes

End of century (2081-2100)

Average annual change	RCP2.6	RCP4.5	RCP8.5
NWT	+2.3°C	+4.1°C	+8.4°C
Canada	+1.8°C	+3.2°C	+6.3°C

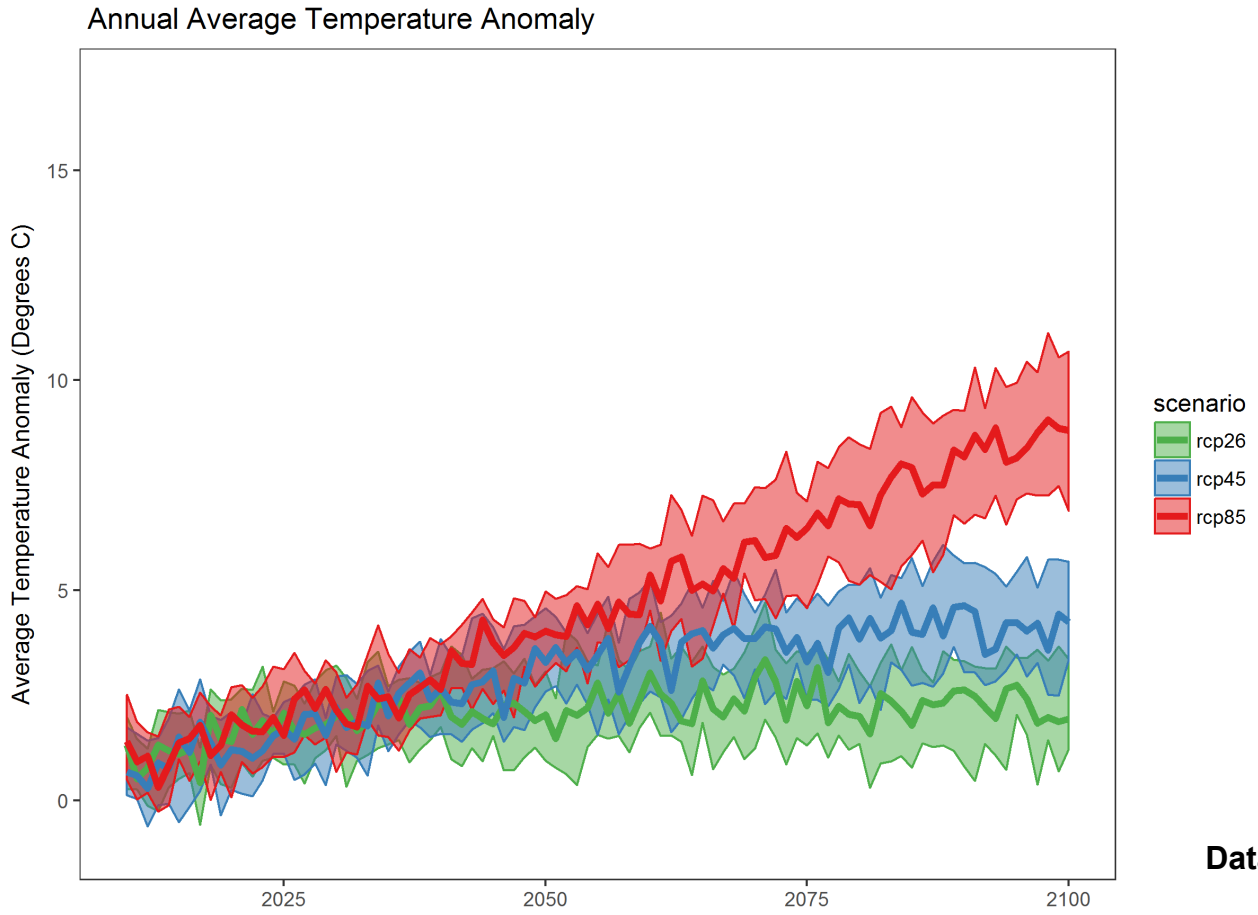
(Average annual change compared to 1986-2005, based on 50th percentile)

End of century (2081-2100)

Average winter change	RCP2.6	RCP4.5	RCP8.5
NWT	+3.1°C	+5.4°C	+12.3°C
Canada	+2.4°C	+4.2°C	+8.2°C

(Average winter change compared to 1986-2005, based on 50th percentile)

PROJECTED *CHANGE* IN MEAN ANNUAL AIR TEMPERATURE: INUVIK REGION, NWT



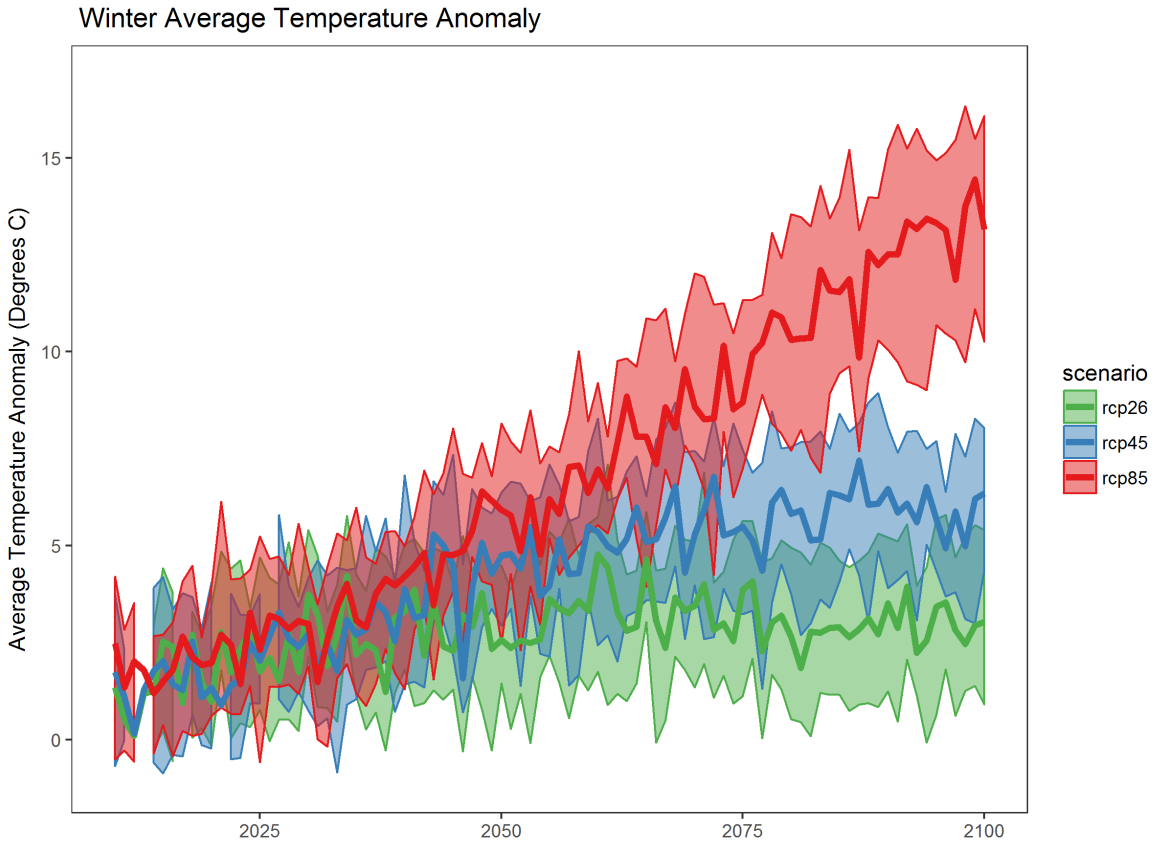
Key messages:

Across scenarios, total median change ranges from ~ 2°C to ~ 5°C by 2050, and from ~ 2°C to ~ 8°C by 2100.

Inter-model variability relatively low

Data Source: CMIP5 ensemble

PROJECTED *CHANGE* IN MEAN WINTER AIR TEMPERATURE: INUVIK REGION, NWT



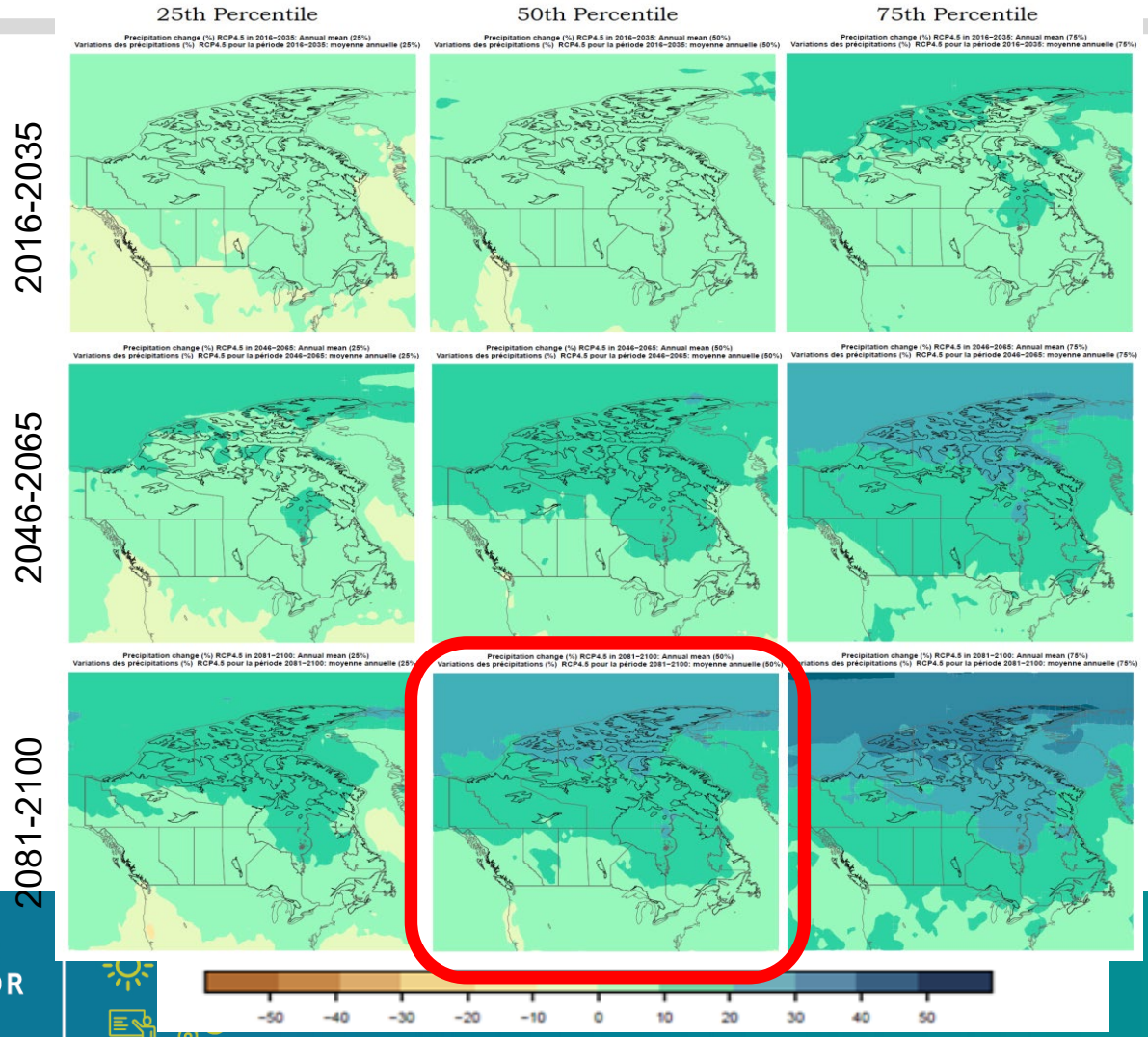
Data Source: CMIP5 ensemble

Key messages:

Wintertime warming could be much more pronounced than annual warming

Across scenarios, total median change ranges from ~ 2°C to ~ 6°C by 2050, and from ~ 2°C to ~ 13°C by 2100.

FUTURE PICTURE OF PRECIPITATION – CANADA (MID EMISSONS RCP 4.5)

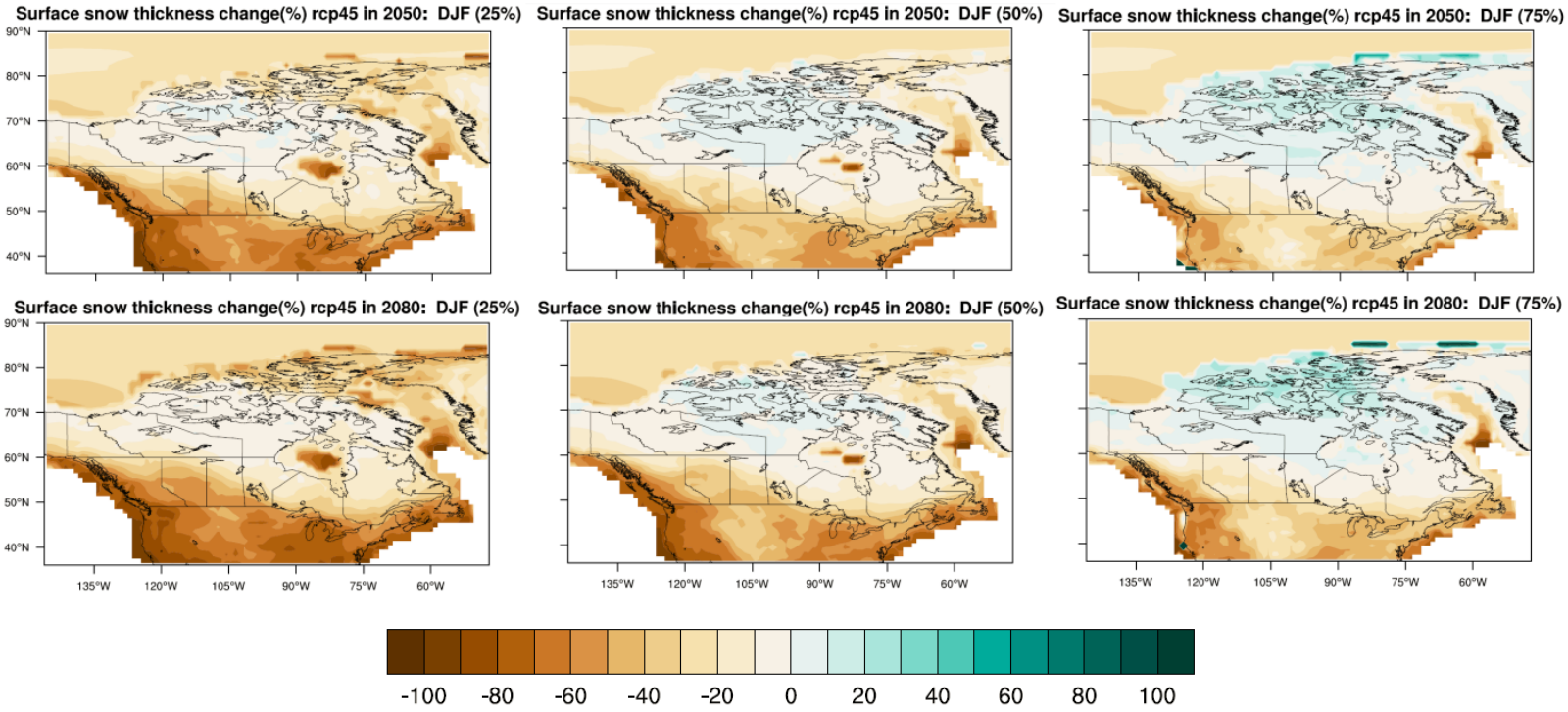


FUTURE PICTURE OF SNOW DEPTH - CANADA

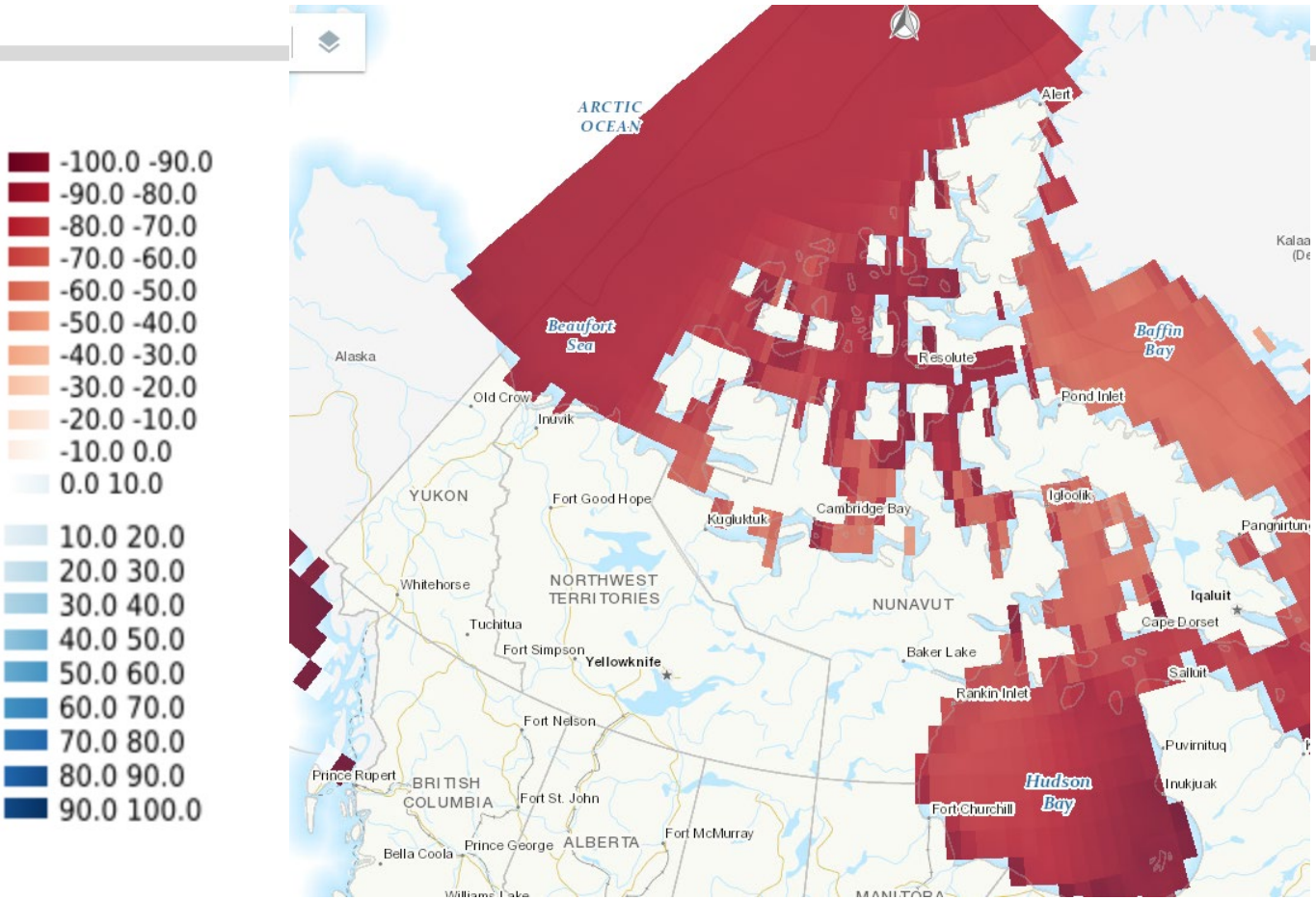
Surface snow thickness percent (%) change, RCP4.5 for Winter (DJF)

2046-2065

2081-2100



FUTURE PICTURE OF SEA ICE- CANADA



Annual sea ice thickness % change under a high emissions scenario 2081-2100

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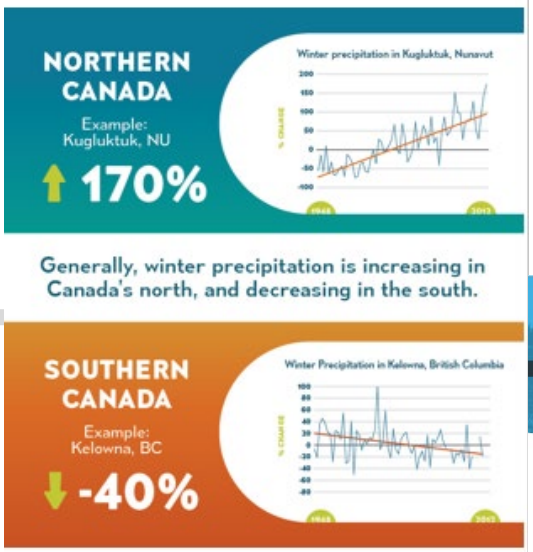
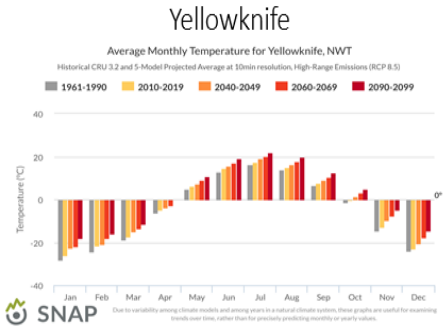
Examples of Climate Visual Products

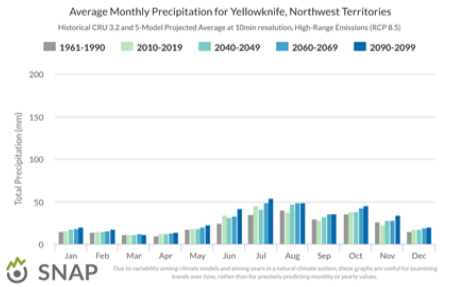
(on wall to vote on)



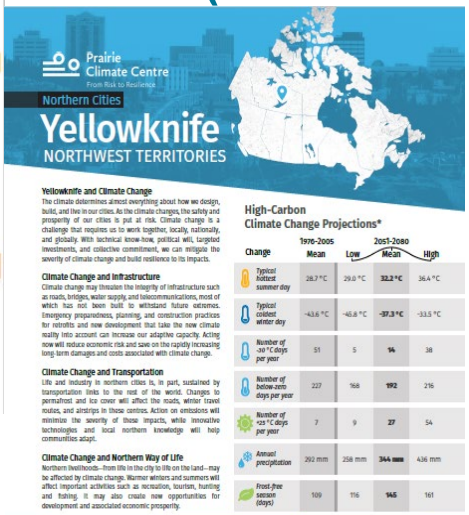
Product Type: High-level message using specific example (with stylized graph)

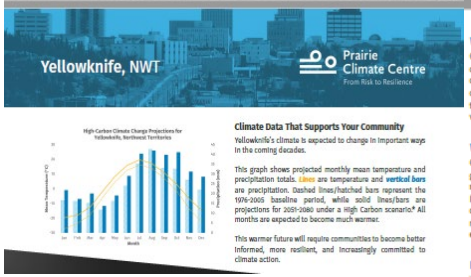


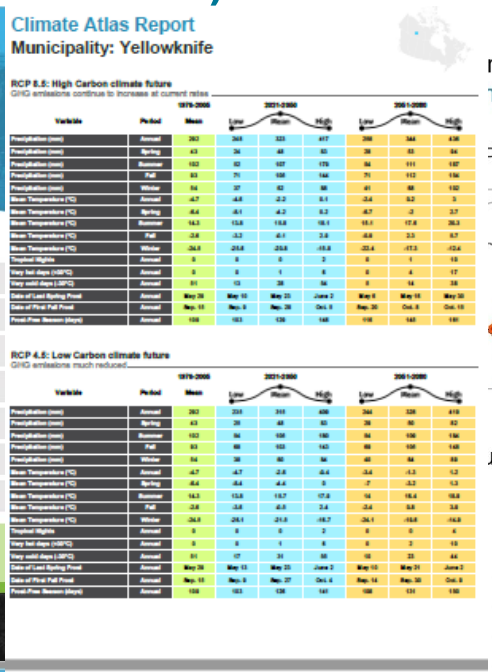
average historical mean monthly temperature from 1961-1990 (grey), and modelled mean nthly temperatures (yellow, orange and red) under a high CO_2 emission scenario (RCP 8.5) for the nmunity of Yellowknife extending to the decade 2090-2099.

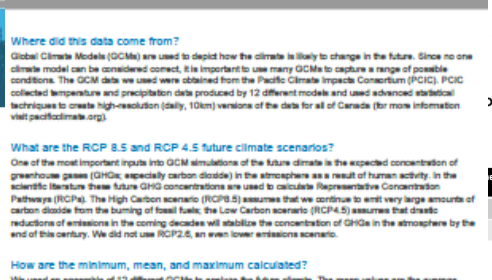


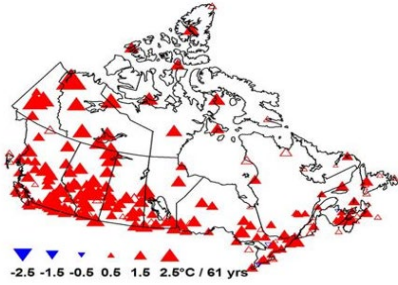
average historical monthly precipitation from 1961-1990 (grey), and modelled precipitation



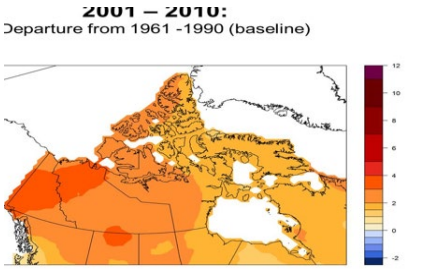




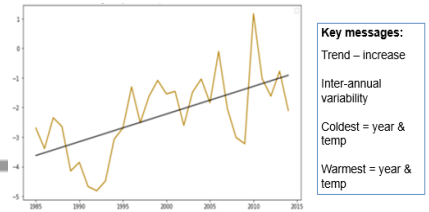




roduct Type: Map with arrows (up/down) to ow trend



uct Type: Map showing change by colour



roduct Type: Graph with key messages

er change	Low emissions (RCP2.6) 2081-2100	High emissions (RCP8.5) 2081-2100
	+2.3°C	+8.4°C
	+1.8°C	+6.3°C

based on 50th percentile

change	Low emissions (RCP2.6) 2081 -2100	High emissions (RCP8.5) 2081-2100
	+3.1°C	+12.3°C
	+2.4°C	+8.2°C

(compared to 1986-2005)

based on 50th percentile

ct Type: Table (summary of data)

CCCS IS LOOKING FOR FEEDBACK ON POSSIBLE CLIMATE INFO PRODUCTS

Sample formats of climate information that could help you in your planning are on the wall at back of room

- Please tell us which ones you like
- Comment on what you like and dislike
- Share your role and why you need climate information

TOMORROW AT LUNCH WILL PROVIDE A TOUR OF OUR NEW WEBSITE

MERCI / THANK YOU

For more information:

www.canada.ca/climate-services

Brian Sieben Northern Climate Services Liaison brian.sieben@canada.ca **(867) 446-3062**	**CCCS Support Desk** info.ccsc-cccs@canada.ca **1-833-517-0376**