Natural Hazards: What about the future?

V. Wittrock[1], E. Wheaton[2], R. Halliday[3], M. Johnston[1]

Saskatchewan Flood and Natural Hazard Risk Assessment - Workshop

[1]Saskatchewan Research Council,

[2]University of Saskatchewan & Saskatchewan Research Council, [3]R.Halliday & Associates

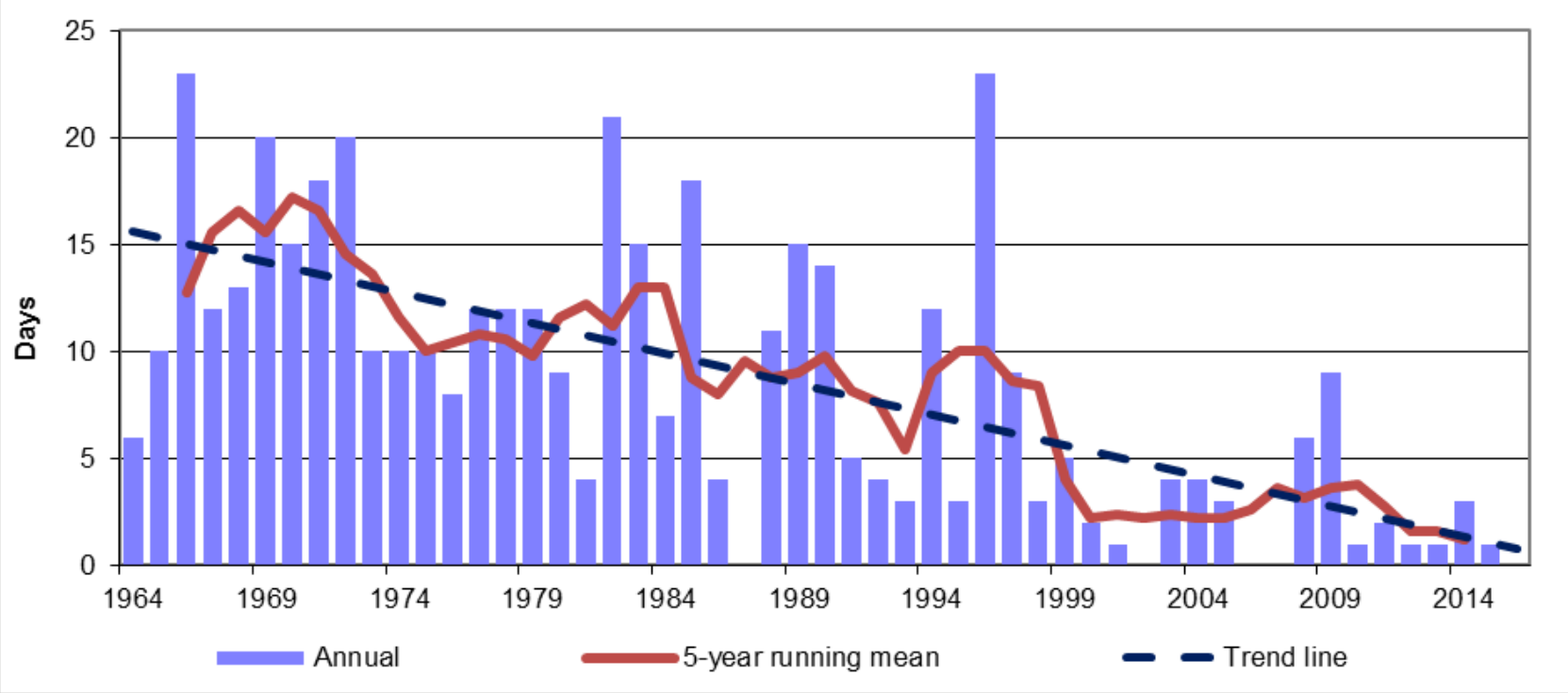
May 2017

SRC Pub No. 13113-3D17

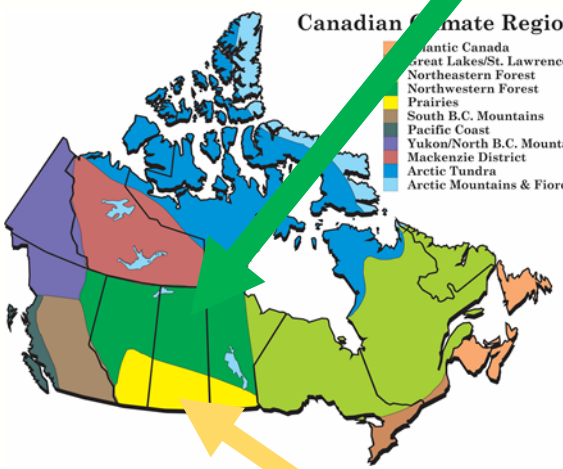
We know….

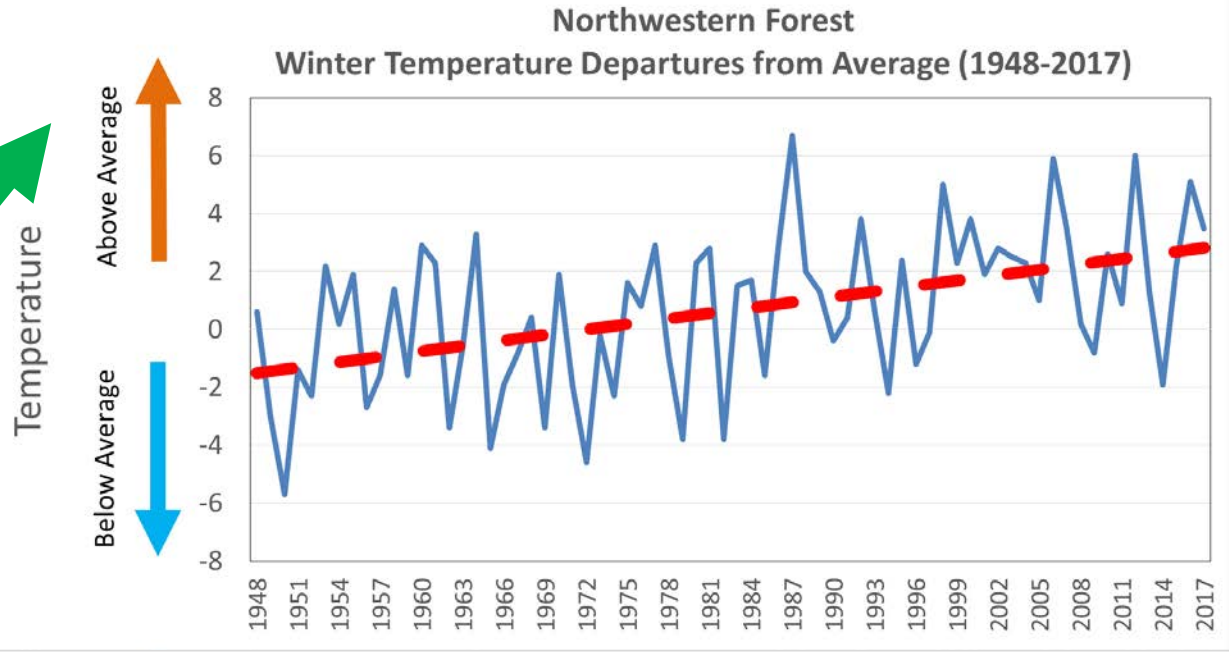
Temperatures are increasing and will continue to increase.

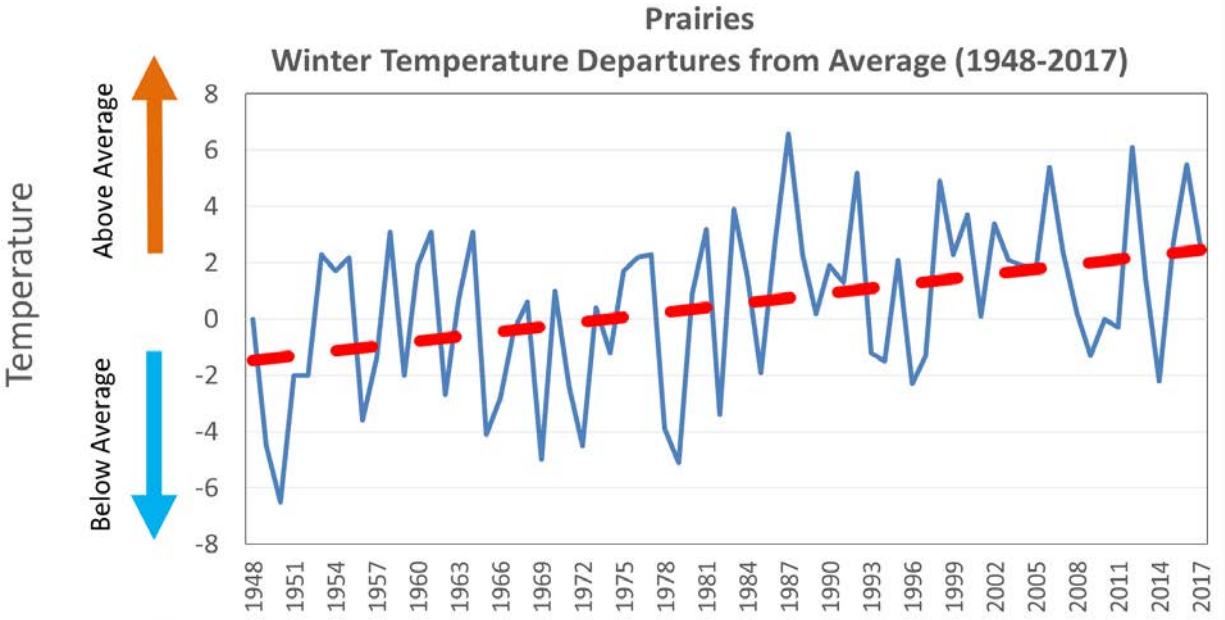
Extreme low winter temperatures are vanishing



Saskatoon SRC CRS 1964-2016 days with minimum temperatures -32.5C or less



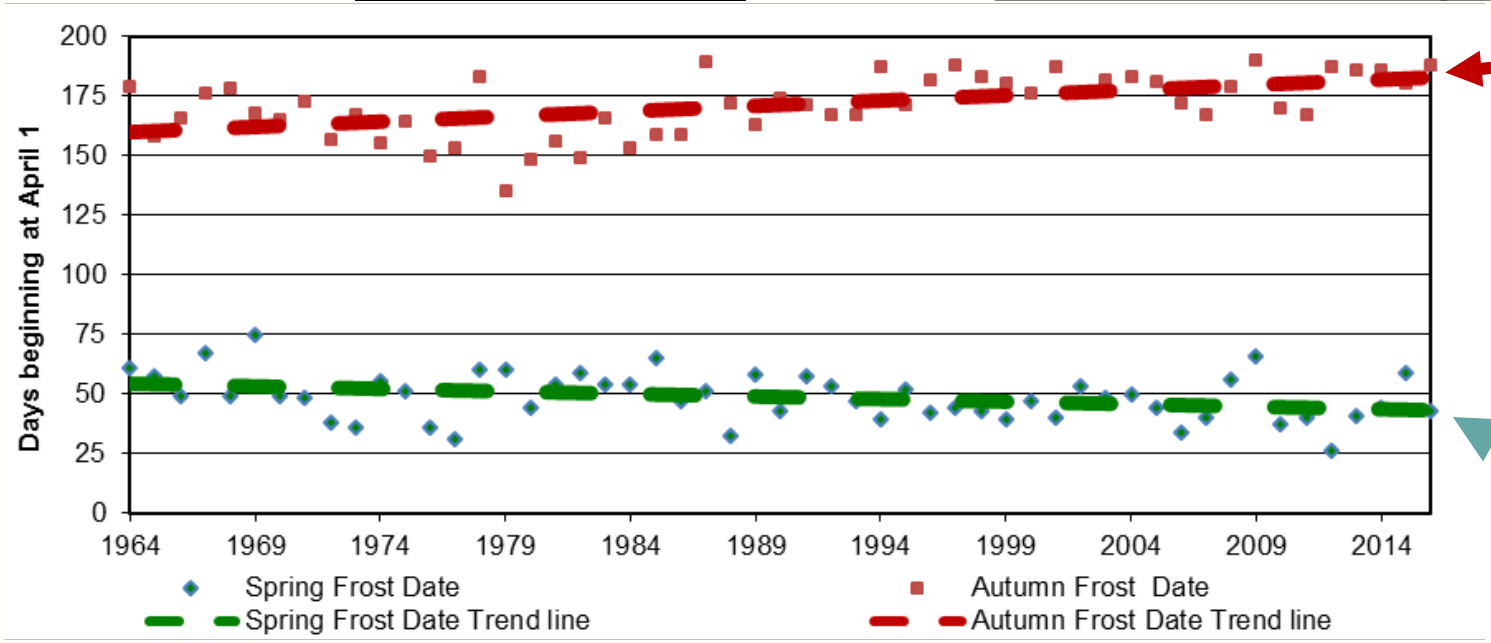




Data Source: ECCC 2017

Frost-free season is lengthening

1981-2010 average season is 6 days longer than 1971-1990 average and 13 days longer than the 1964-1990 average



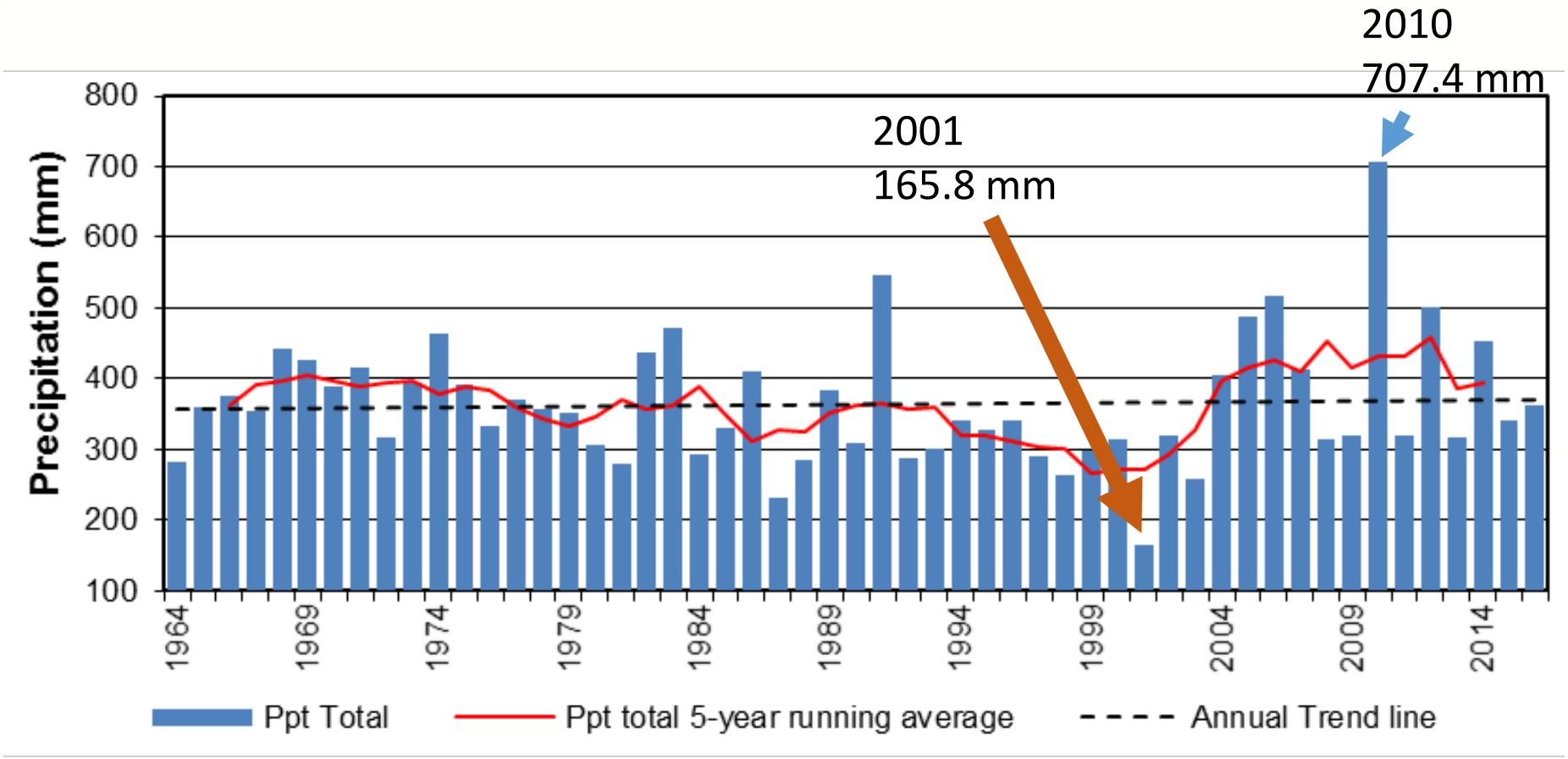
Last spring frost

First fall frost

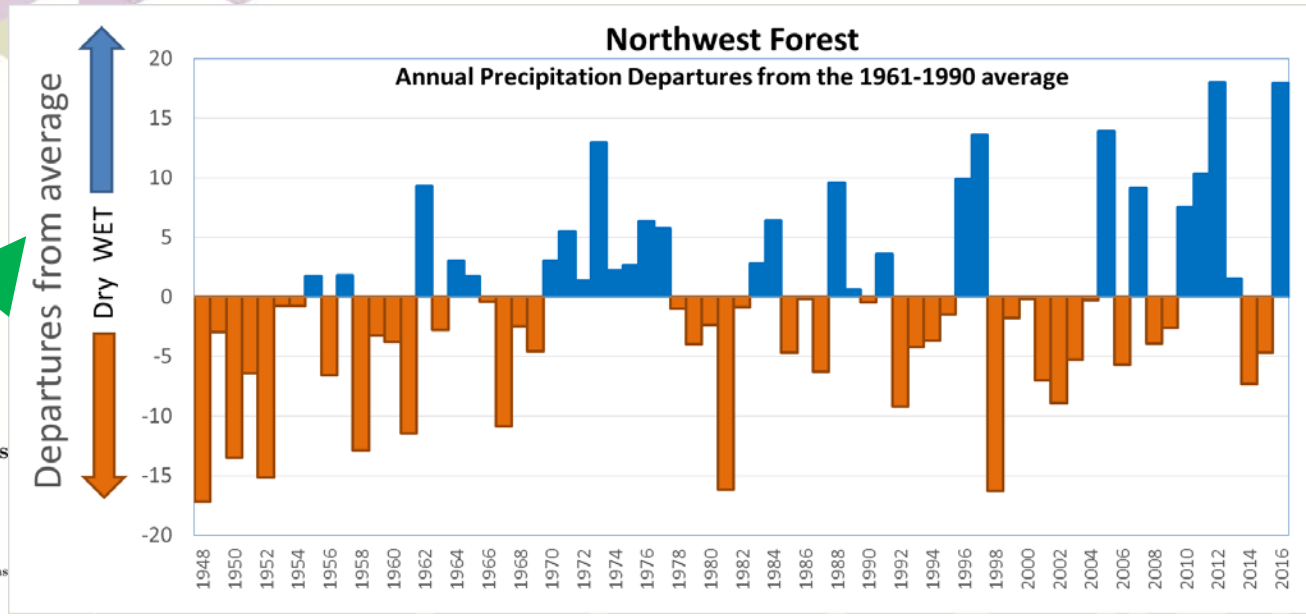
1965 May 27-Sept 05
1975 May 21-Sept 11
1985 June 04-Sept 06
1995 May 22-Sept 18
2005 May 14-Sept 28
2015 May 29-Sept 27

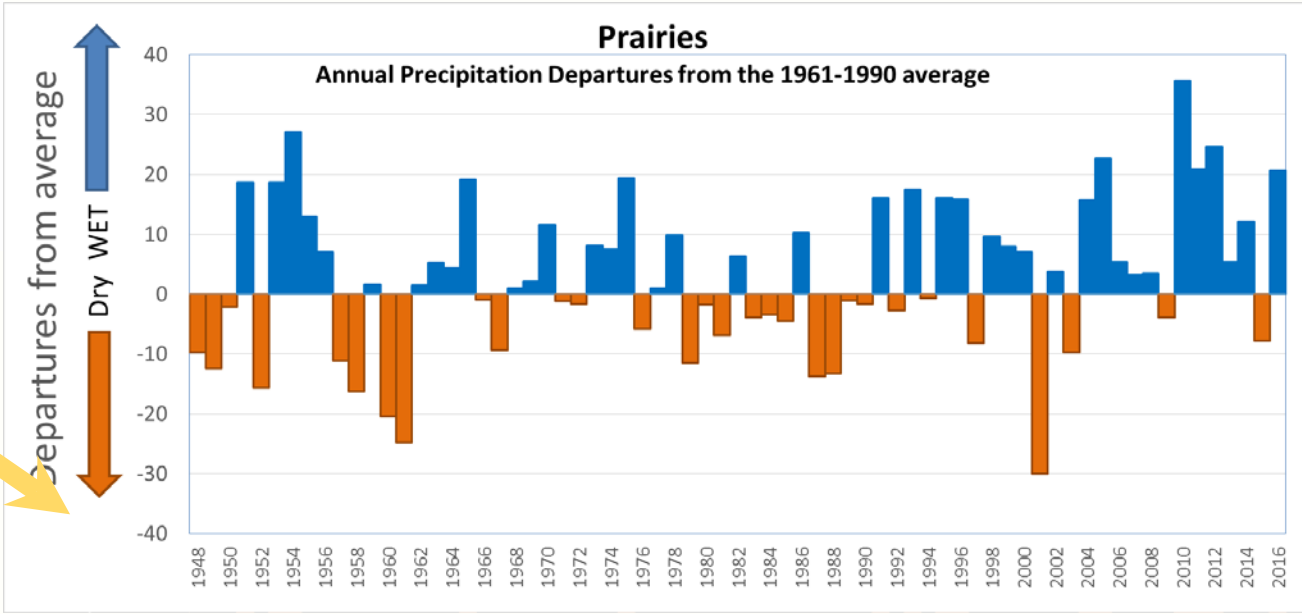
Saskatoon SRC CRS 1964-2016 days when the temperatures remained above 0C

Precipitation is highly variable



Saskatoon SRC CRS 1964-2016





Data Source: ECCC 2017

So from looking at the recent past …what does the future hold?

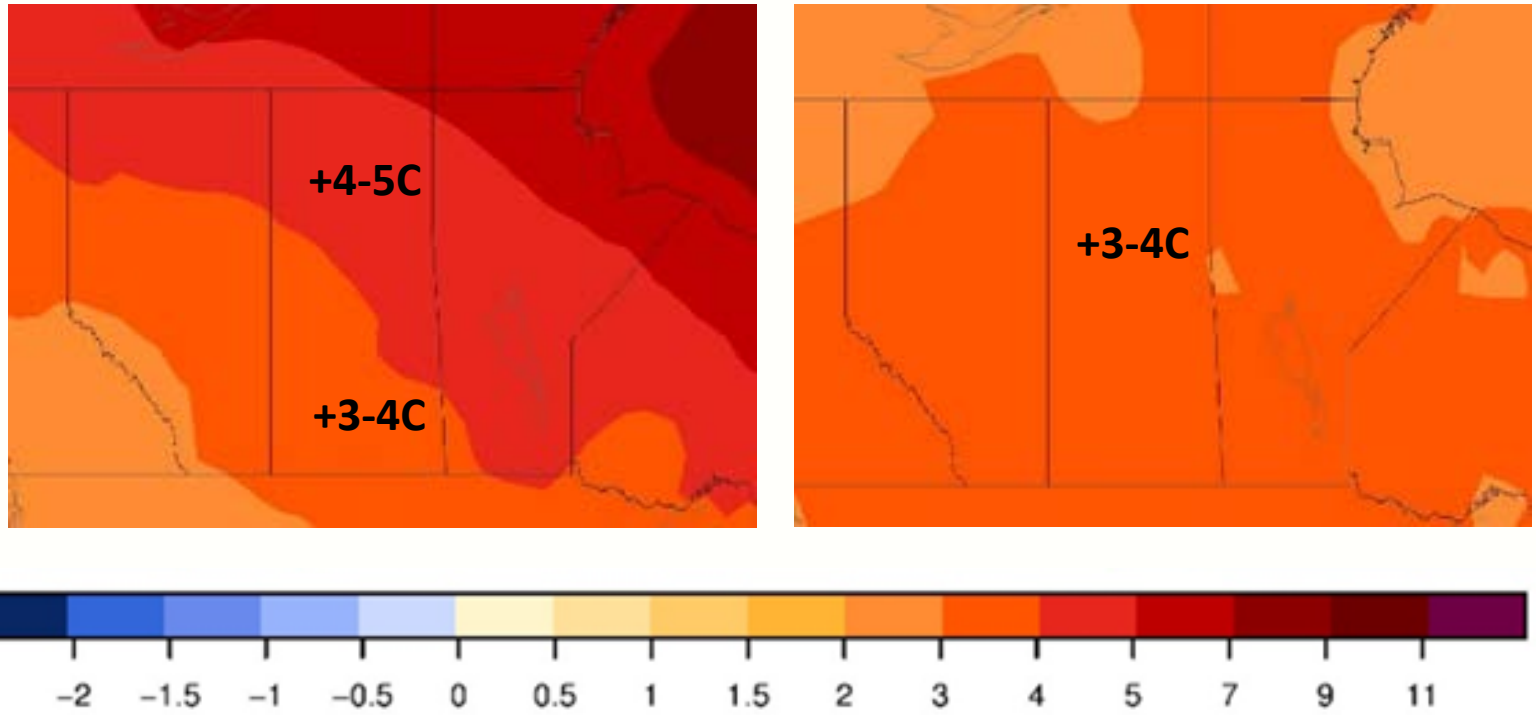
These <u>past trends</u> are expected to <u>continue</u> and <u>be enhanced</u>, in some cases

Campbell-Stokes Bright Sunshine Recorder. CRS Saskatoon, c 1993 photo credit CR Beaulieu

Temperatures are warming

Seasonal Temperature Change (2050s)

Winter **Summer**

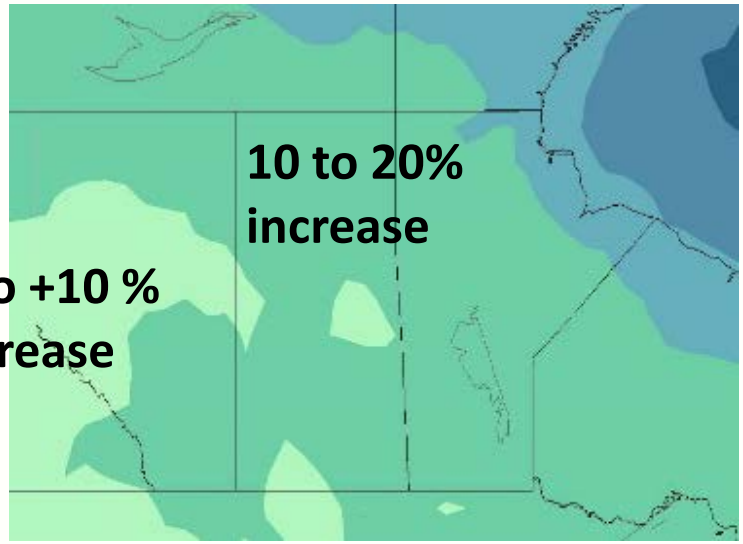


Temperature change RCP8.5 in 2046–2065: (50th percentile) Source: CCDS 2015

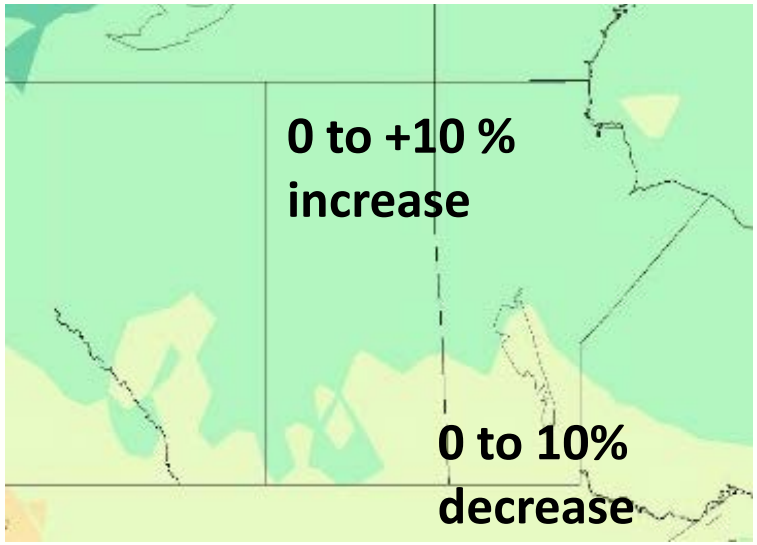
Precipitation is HIGHLY variable

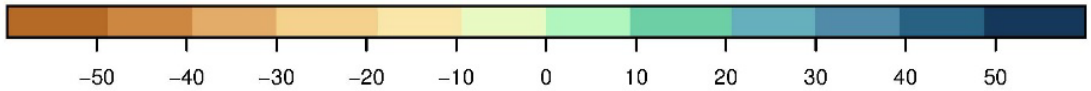
Seasonal Precipitation Change 2050s

Winter



Summer





Precipitation change (%) RCP8.5 in 2046–2065: (50th percentile)

Source: CCDS 2015

These are combining into some outcomes that can be highly hazardous

Photo: Government of Saskatchewan

Earlier snow melt or lack of snow cover….

Spring runoff on frozen soils

Length of season of Frozen Lakes

Mid-winter melt

Grass fires

Photo: Wittrock Winter 2009

Early start to forest fires season

Reduced recharge of soil moisture groundwater, reservoirs, dugouts etc

Shifts from dry to wet…
SURPRISES should be expected

28 May 2015 Estevan Region
Photo: Radchenko

Photo: WSA, TransCanada Highway
washed out June 2010

More intense precipitation events

More freezing rain events in winter

Ice buildup on powerlines

Ice buildup on roadways

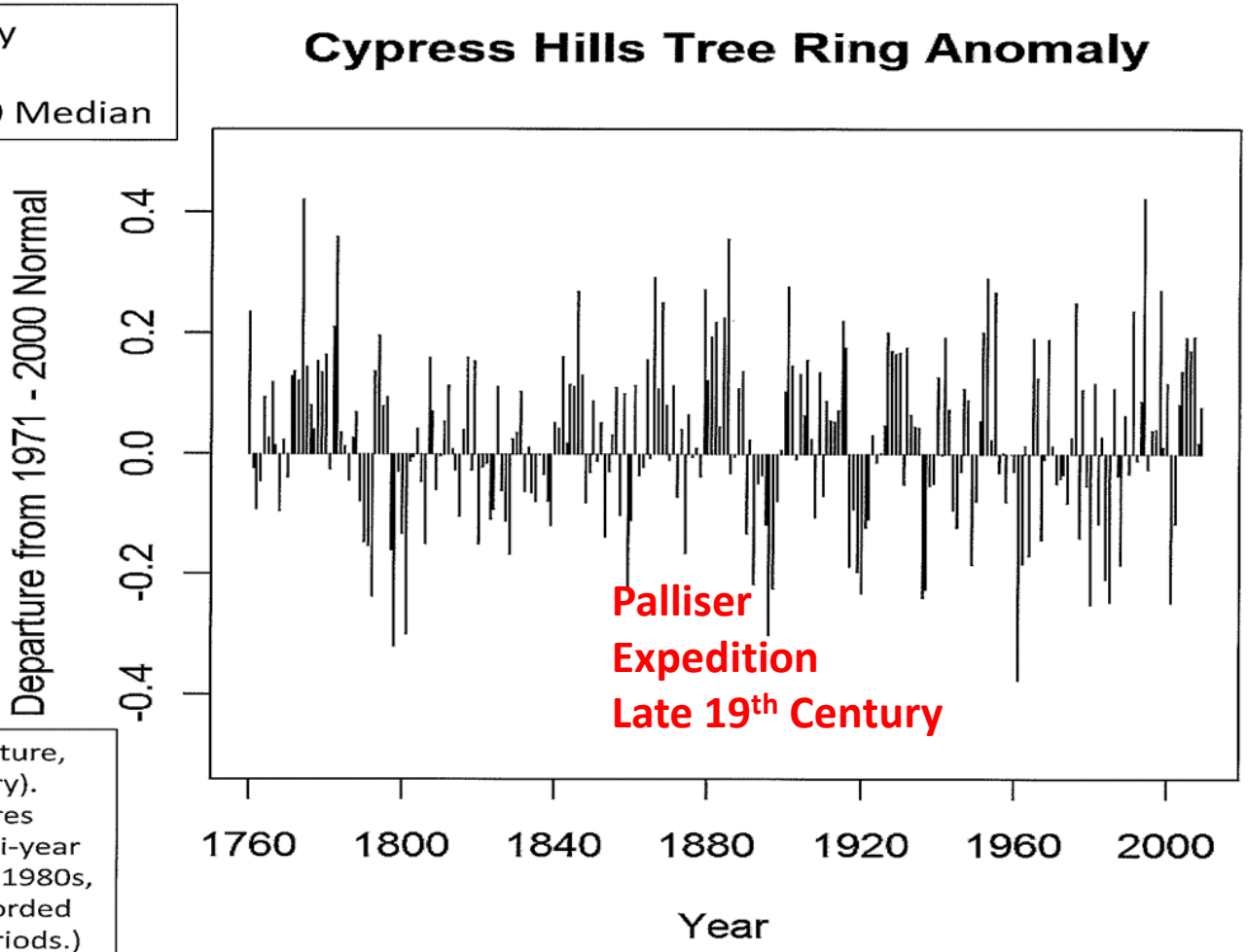
Large variability exists with many severe wet and dry periods

Inter-annual Variability
~250 of Tree Rings;
0 Baseline: 1971-2000 Median

Above "0" is wetter

Below "0" is drier

- The more severe the departure, the more extreme (wet or dry).
- Repeated years of departures indicate drier or wetter multi-year exposure (e.g. 2001-02; late 1980s, 1920s-30s, 1850s are all recorded historic extreme drought periods.)

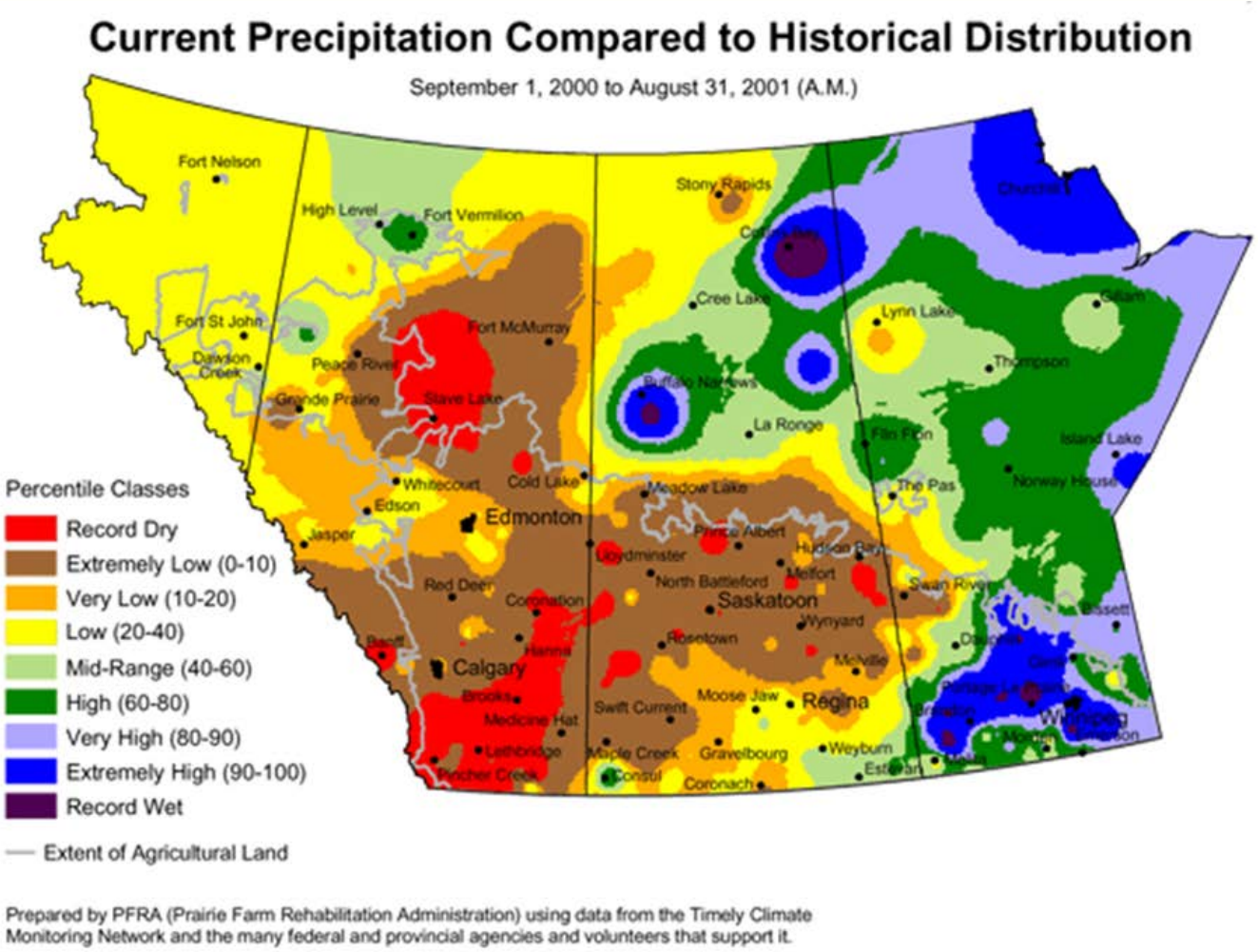


Sauchyn p.comm.

More frequent and severe forest fires

Photo: Government of Saskatchewan 2015

Droughts - some last multiple years; some occur across extensive areas



Future Possible Droughts?

(Wheaton et al. 2013)

- Chances of multi-year droughts increase
- Increases in severity and area
- Droughts overwhelm the increases in average precipitation
- Expect surprises, such as fast switches to from drought to extreme rainfalls

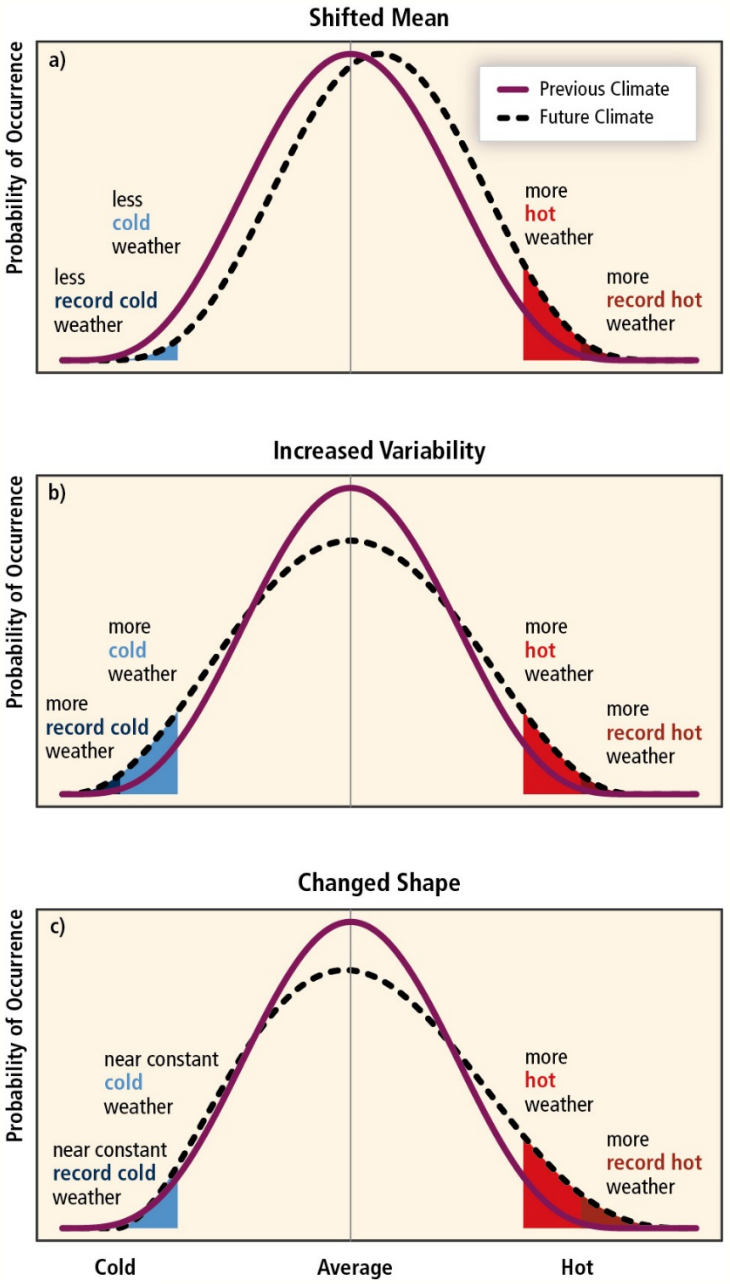
Future Expected Climates

Photo: E. Wheaton 2009

- Accelerated changes in current conditions, e.g. even longer growing seasons, milder winters, lower number of blizzards(but perhaps more intense), decreased snow cover, increased heat waves
- Past droughts may seem mild compared with future droughts
- Increased potential for major rainstorms and floods
- More switches of dry/wet and hot/cold
- Expect the unexpected with unstable climates

Wheaton 2015, Wittrock and Wheaton 2015

The future will be…. a shift to a "new normal"… and *changing extremes*



Sources: IPCC 2012

What is the Future Risk for Natural Hazards

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