

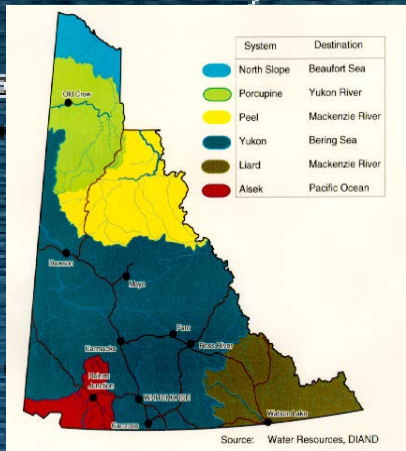
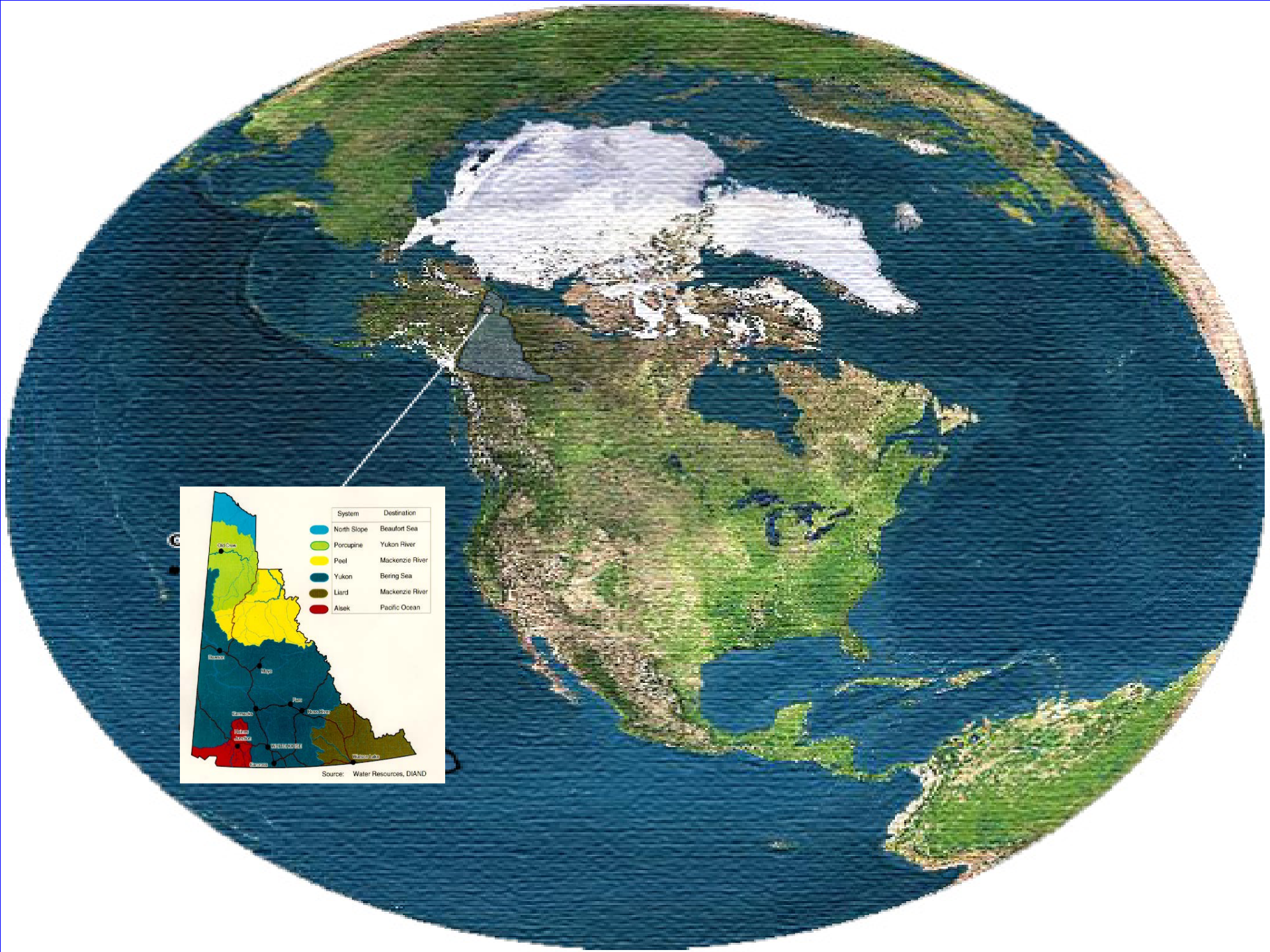
2013 EXTENSIVE YUKON ICE JAM AND FRESHET FLOODING

J Richard Janowicz

Water Resources Branch

Yukon Department of Environment

Whitehorse, Yukon



2013 FLOODING

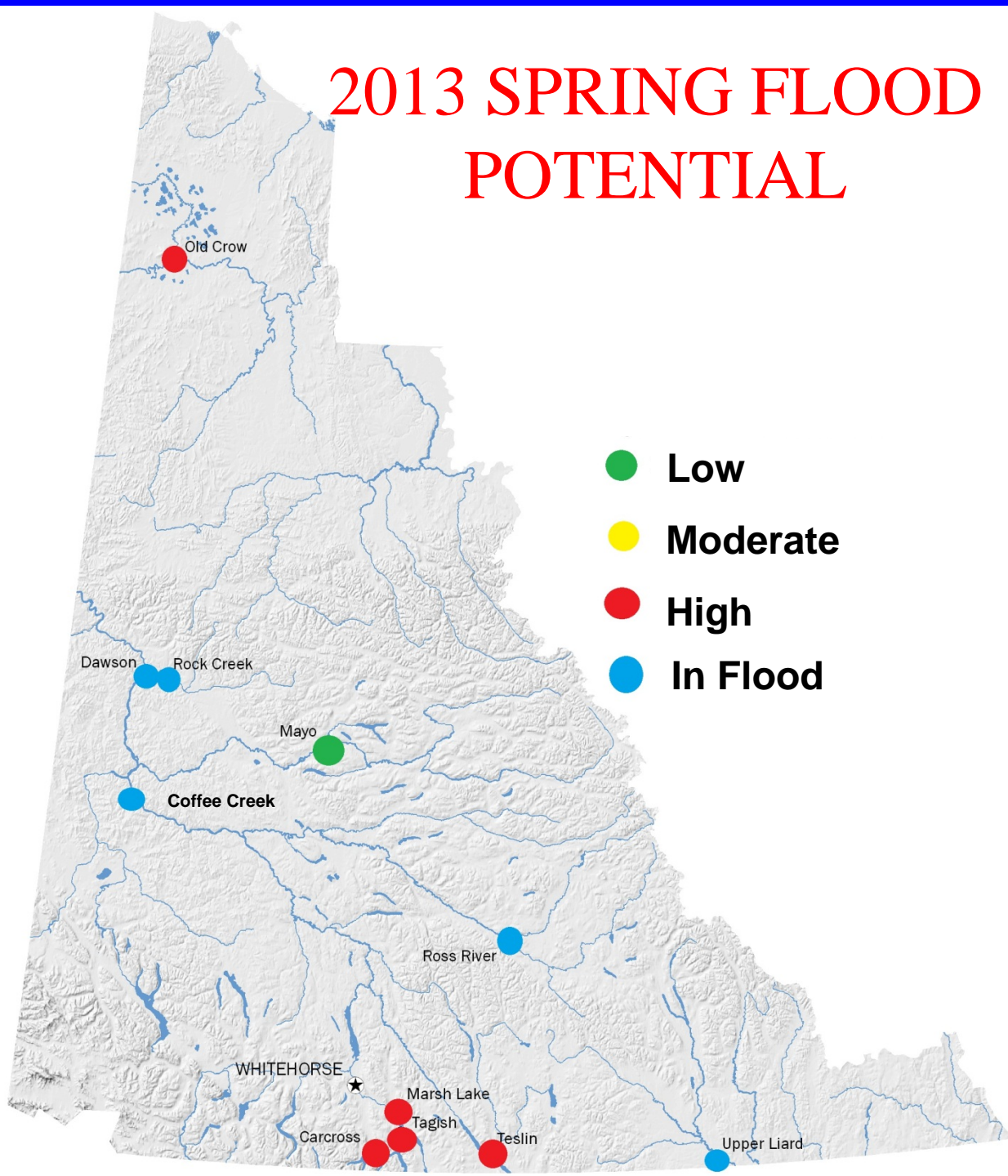


2013 Biggest Flood Year in 30 years

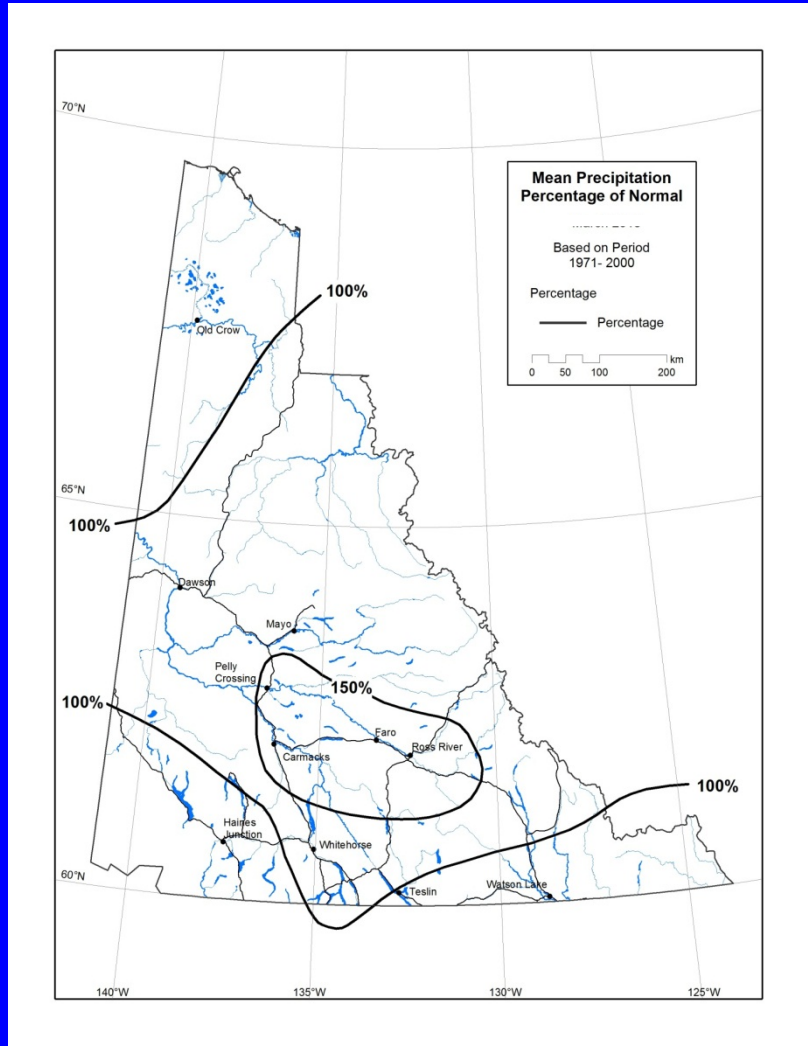
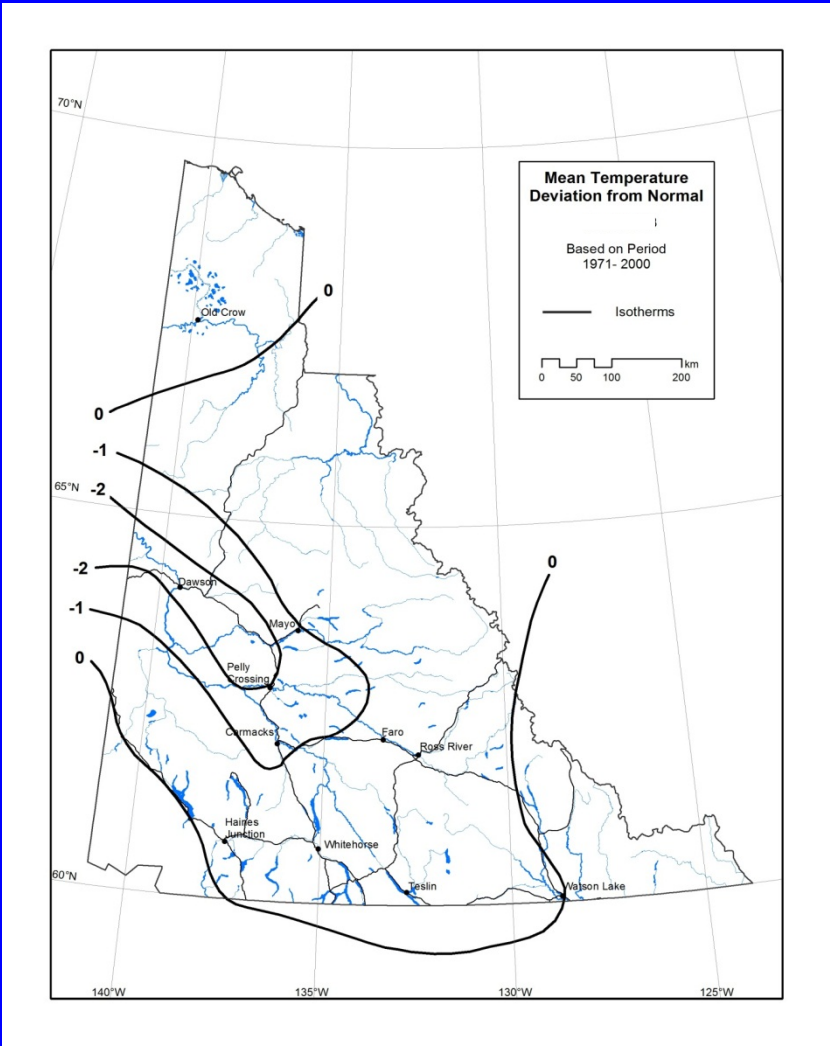
- 7 major ice jam / freshet floods
- Ice jam floods in unique locations
- Freshet floods in unique locations
- Both in some locations



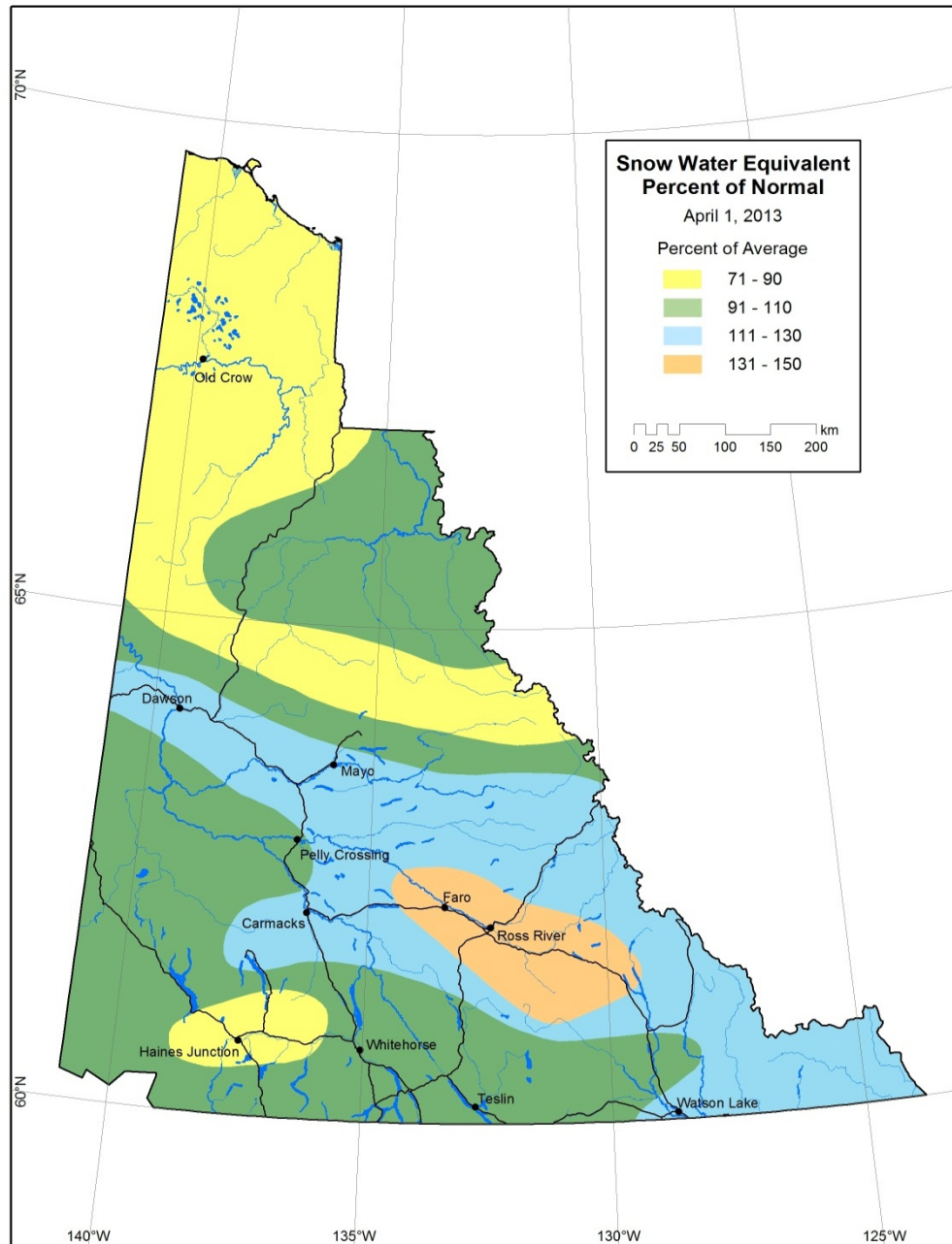
2013 SPRING FLOOD POTENTIAL



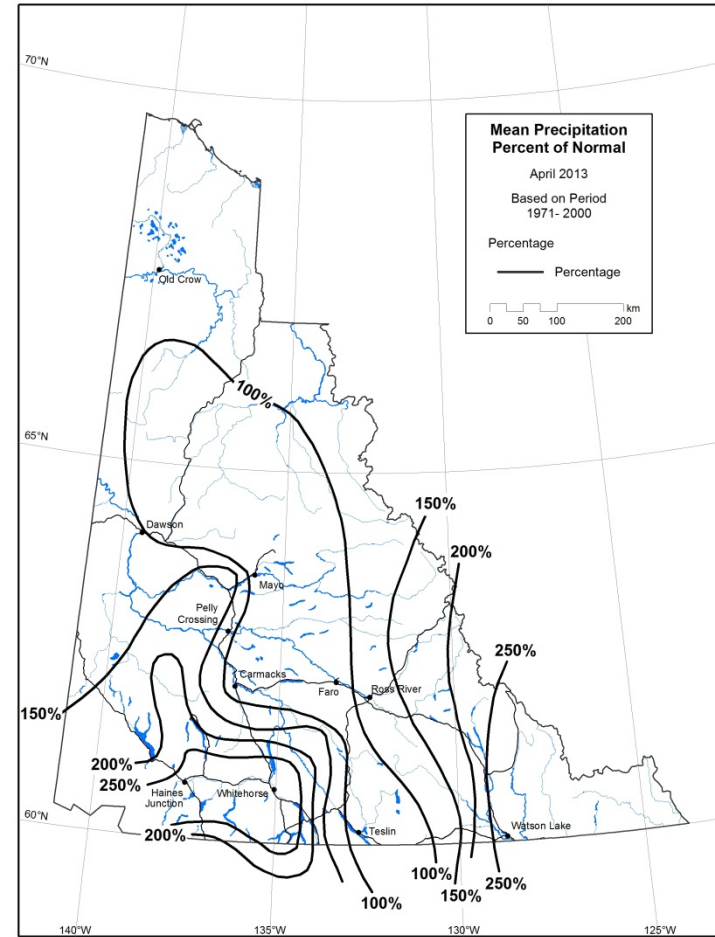
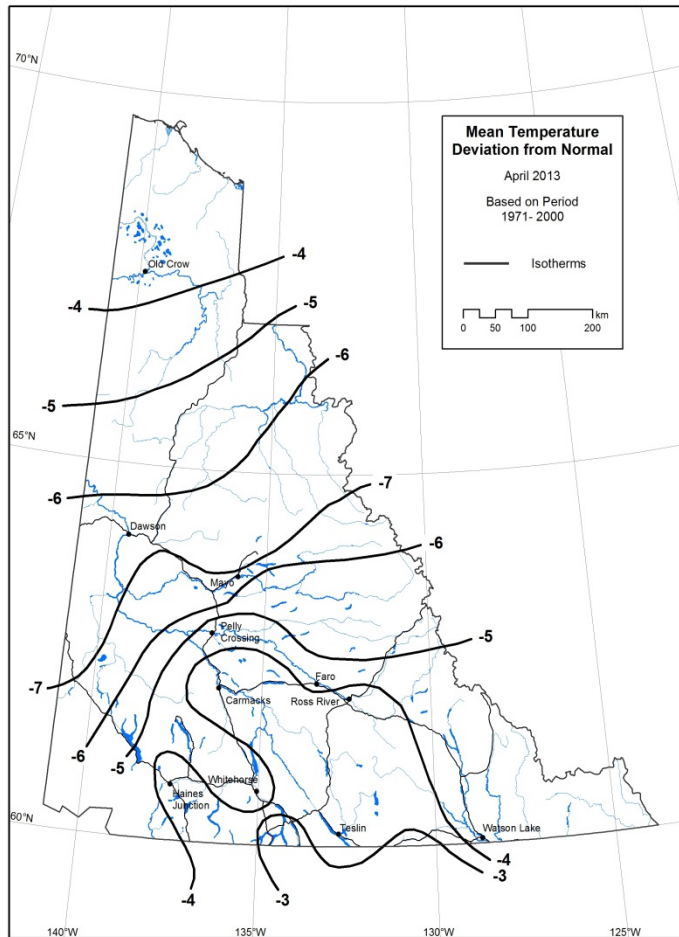
2012 – 13 WINTER METEOROLOGICAL CONDITIONS



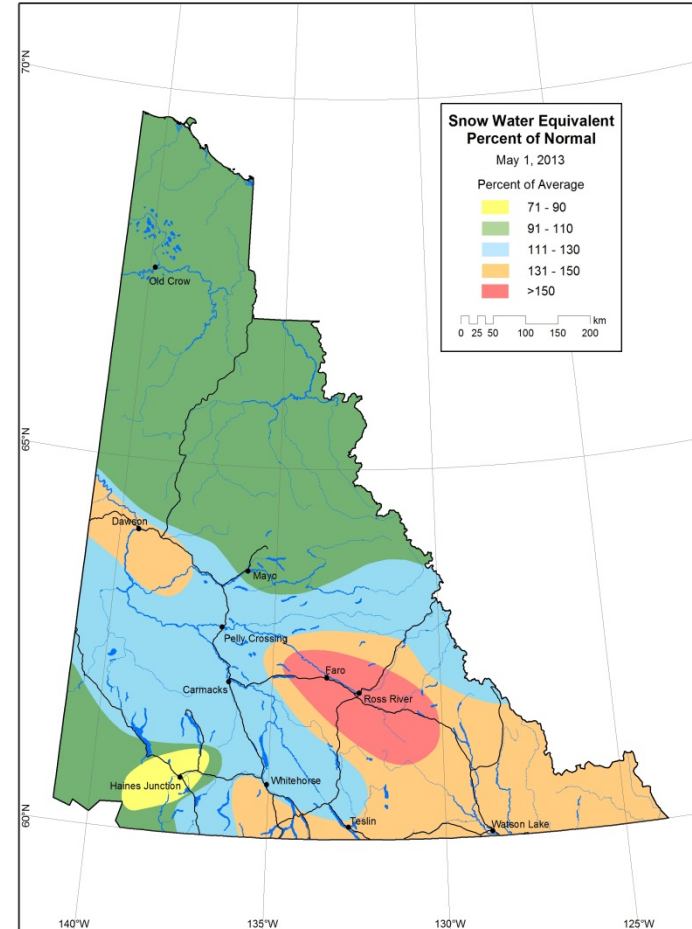
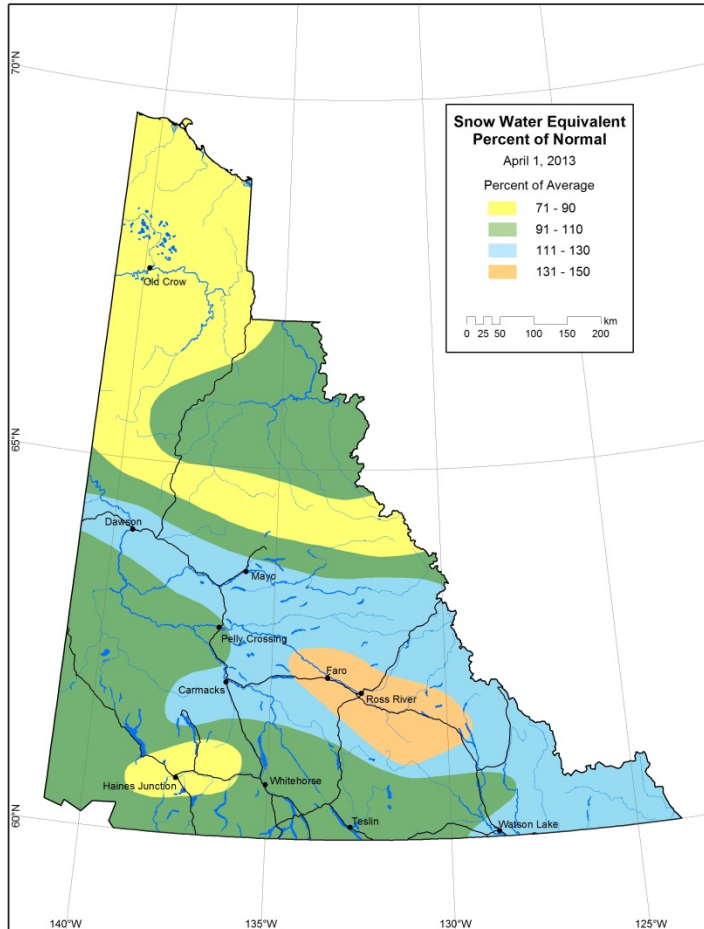
APRIL 1 SWE



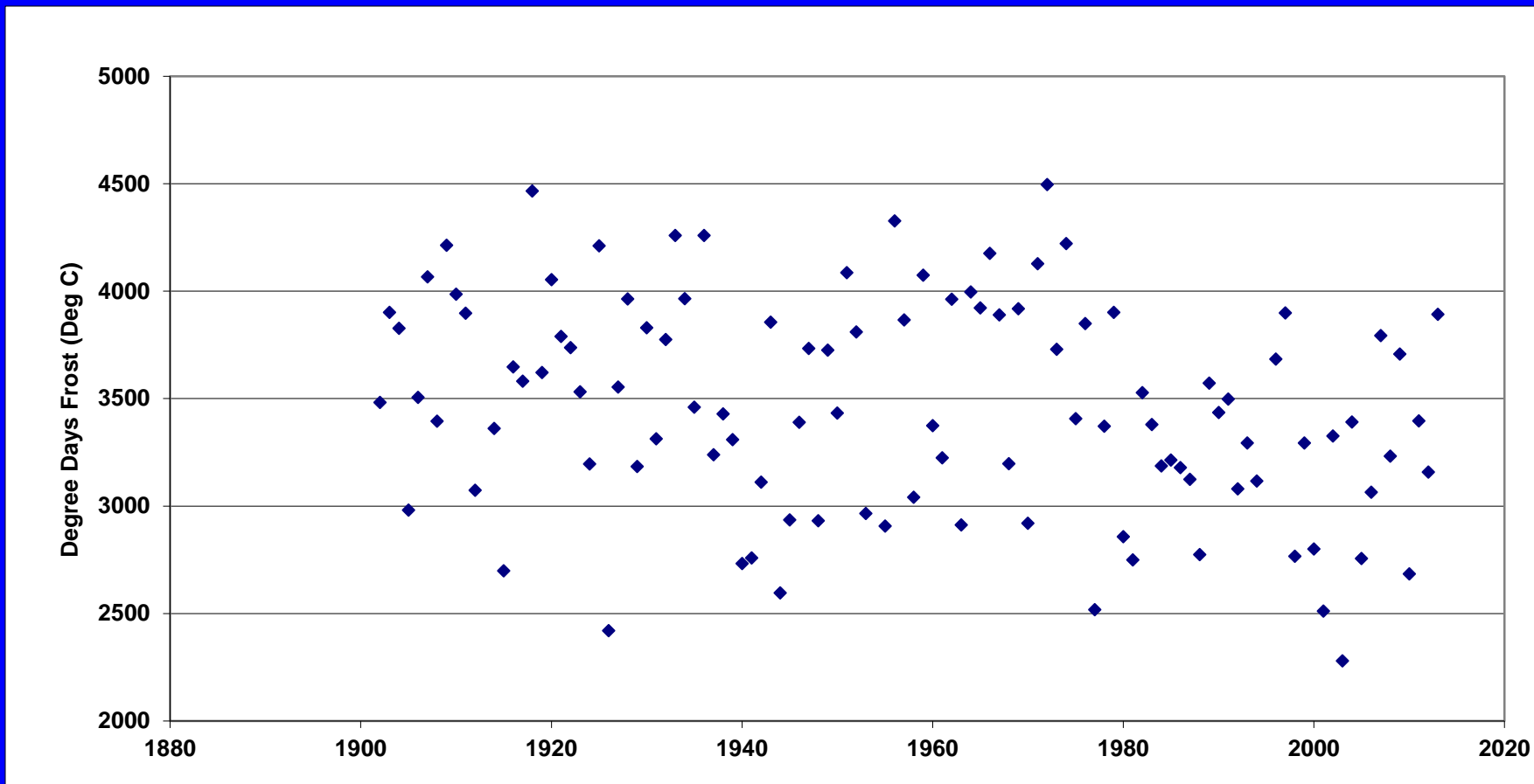
APRIL 2013 METEOROLOGICAL CONDITIONS



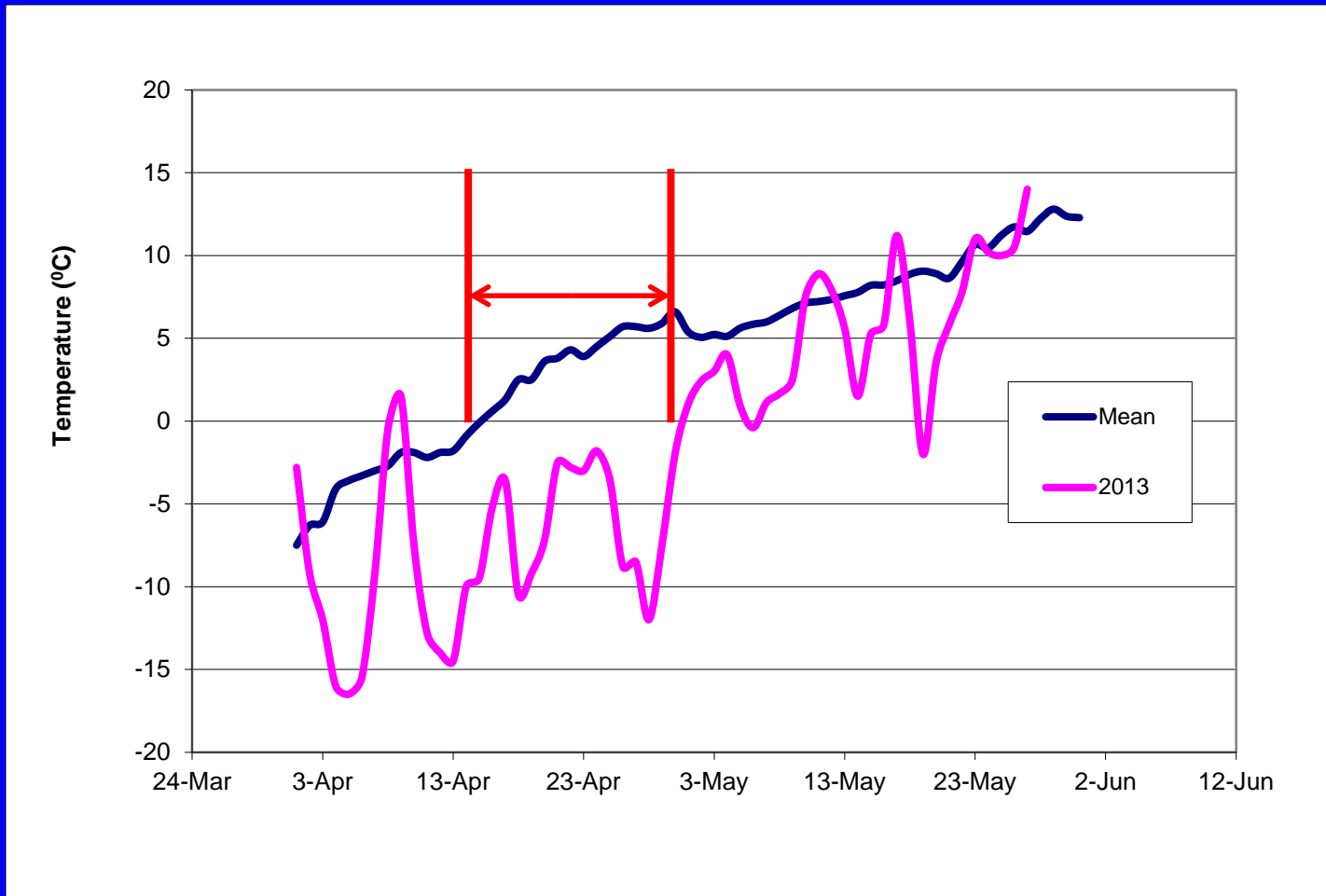
MAY 1 SWE



DAWSON DEGREE DAYS FROST



2013 DAWSON AIR TEMPERATURE



2013 BREAK-UP



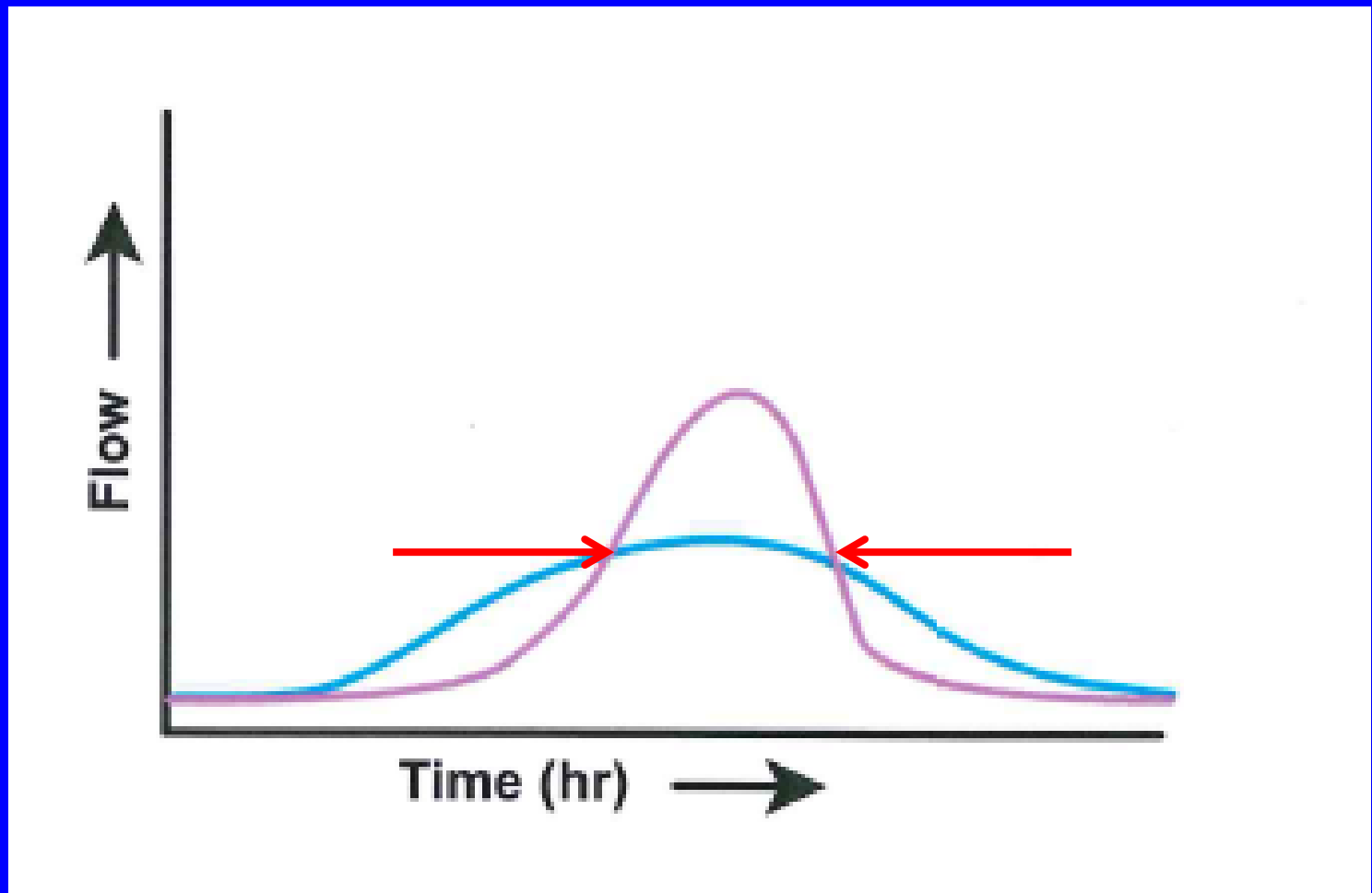
Return to Normal
Temperatures Resulted in
Rapid Melt and Runoff

Rapid Discharge and Stage
Increase

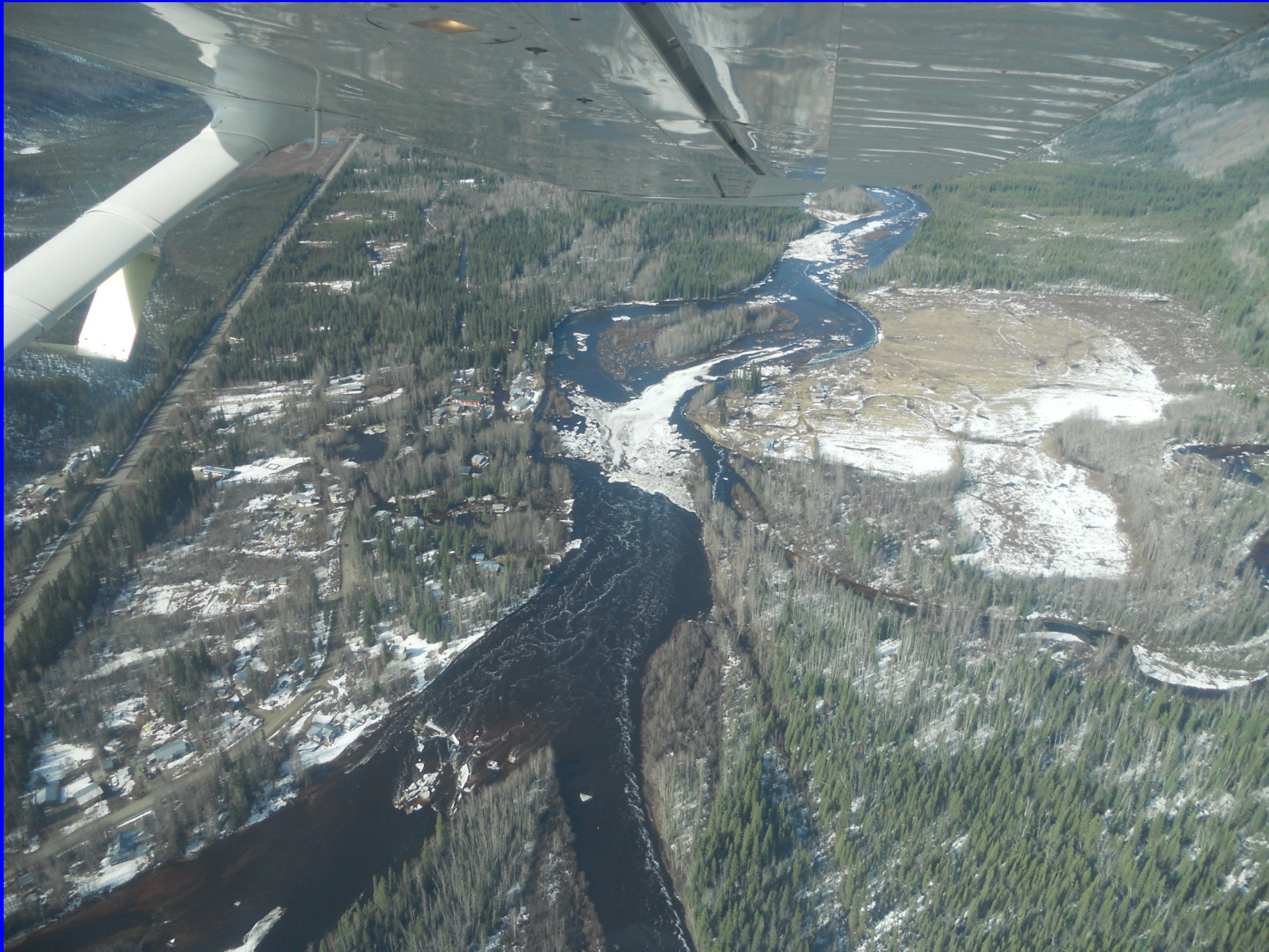
Breaking Ice into Large and
Strong Blocks



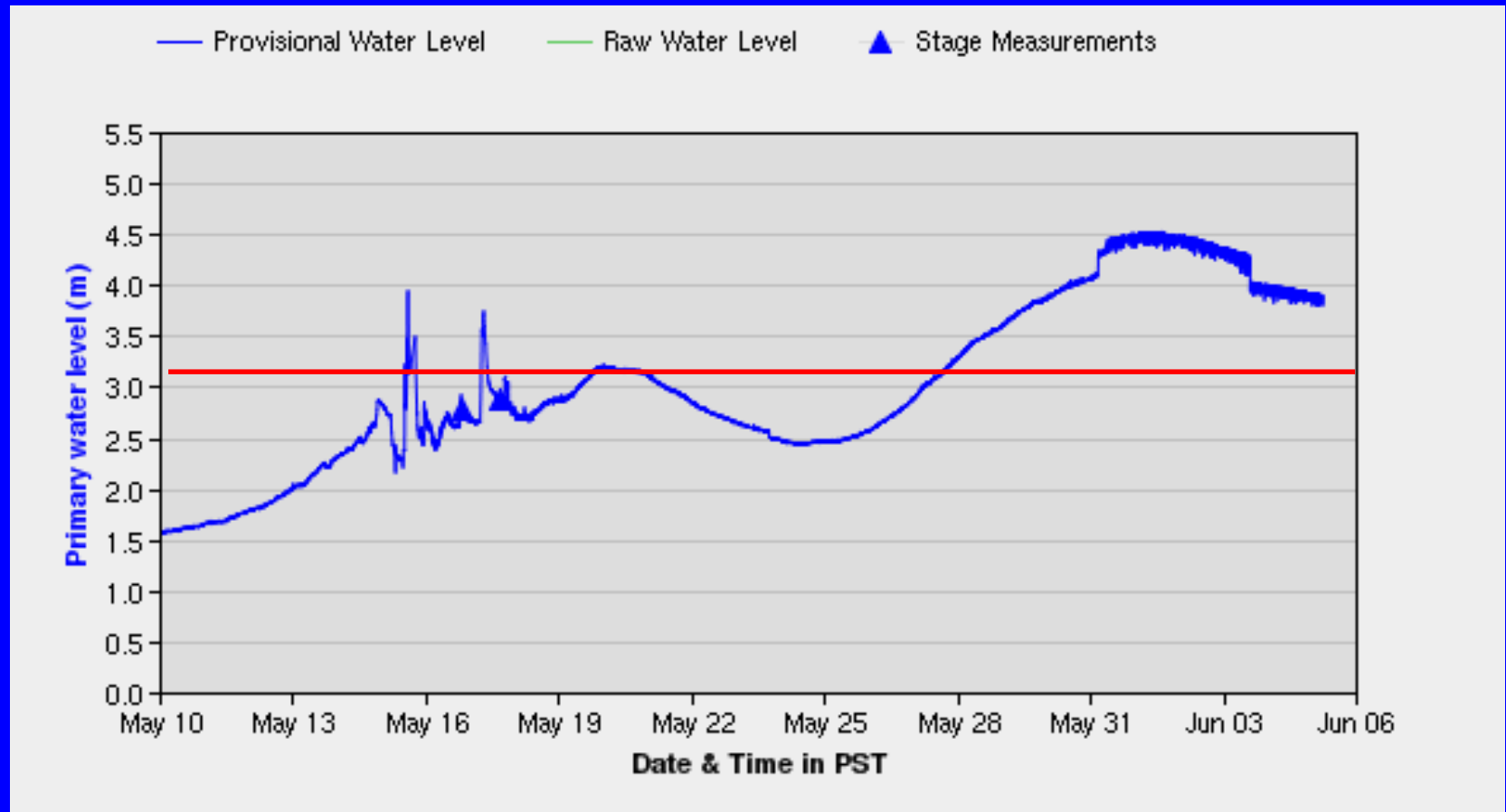
COMPRESSED RUNOFF PERIOD

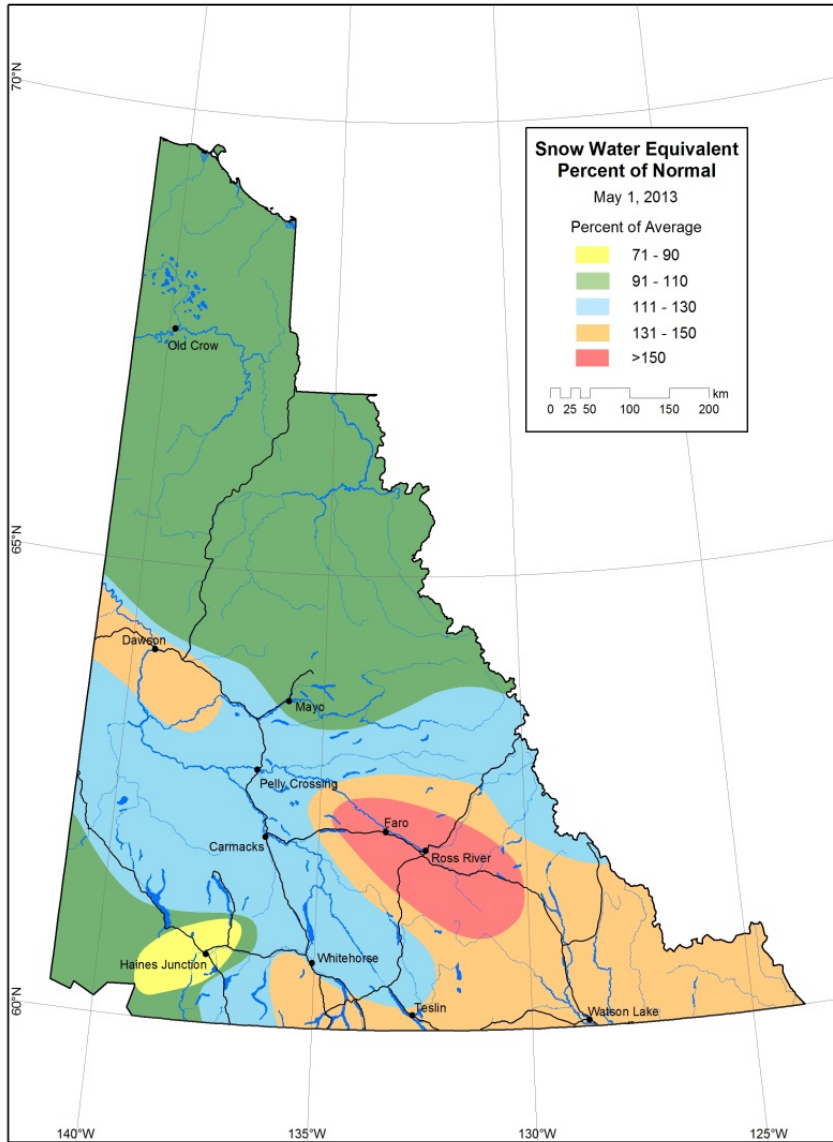






PELLEY RIVER AT ROSS RIVER



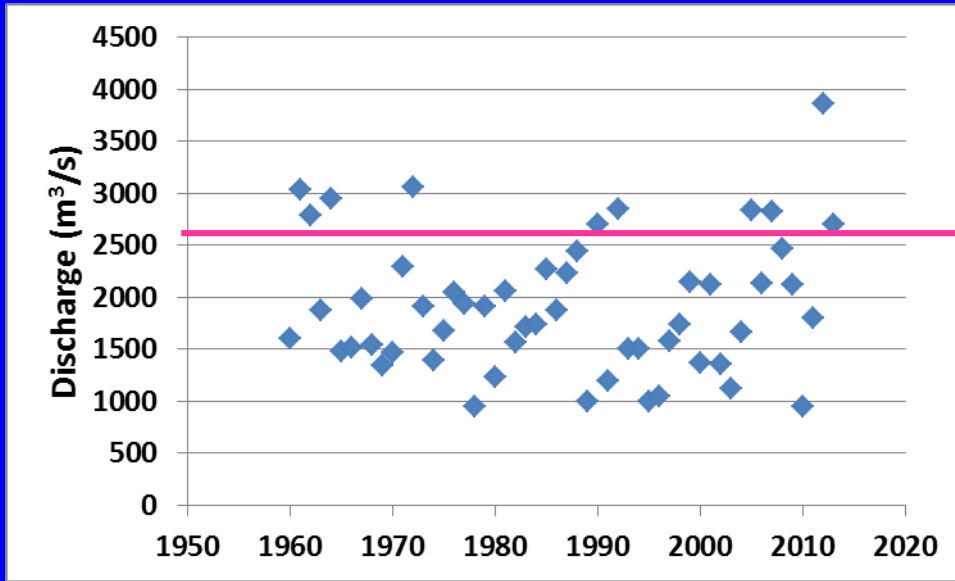


MAY 1 SWE

LIARD RIVER BASIN – FLOOD OF RECORD

Liard River at Upper Crossing
1960 – 2013
Annual Maximum Peak Flow

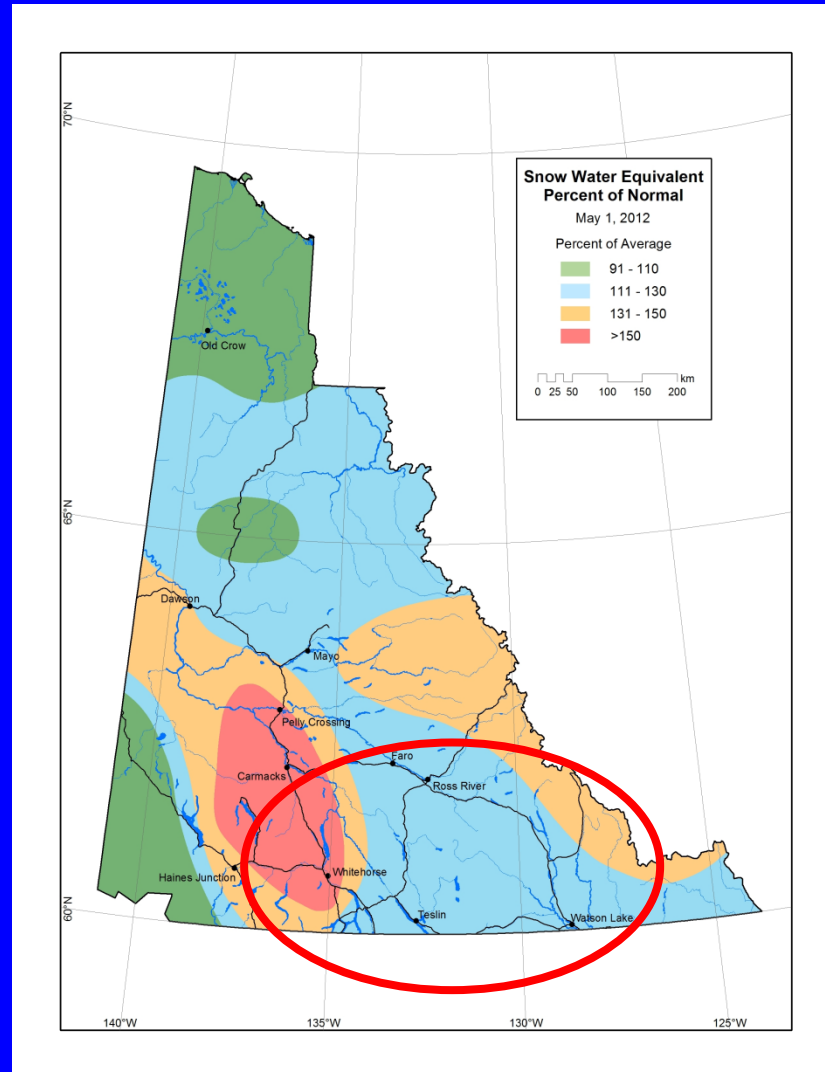
2012



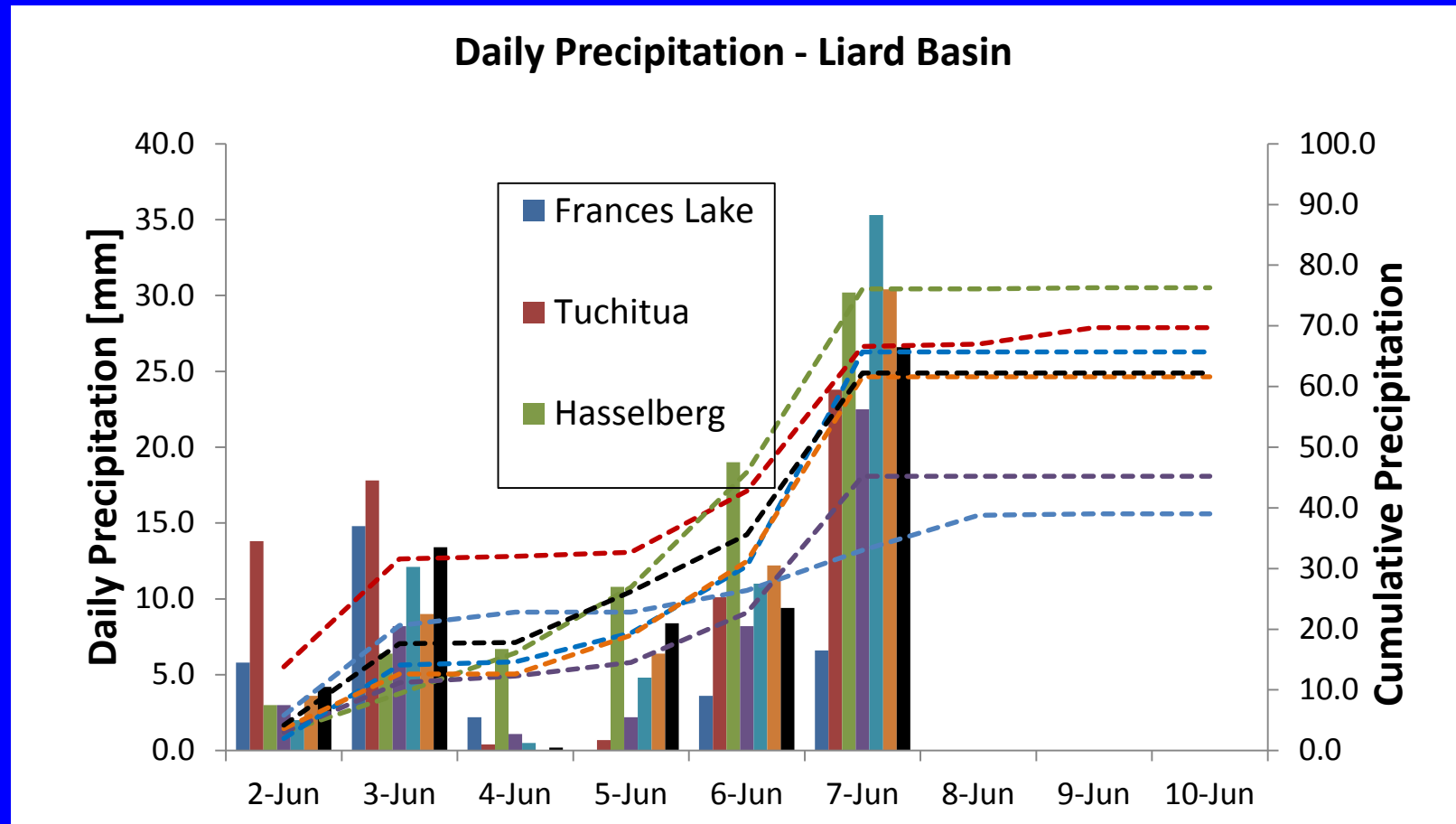
LIARD RIVER BASIN - 2012



MAY 1 2012 SWE



JUNE 2 – 7, 2012 RAINFALL – LIARD BASIN



YUKON CLIMATE WARMING??

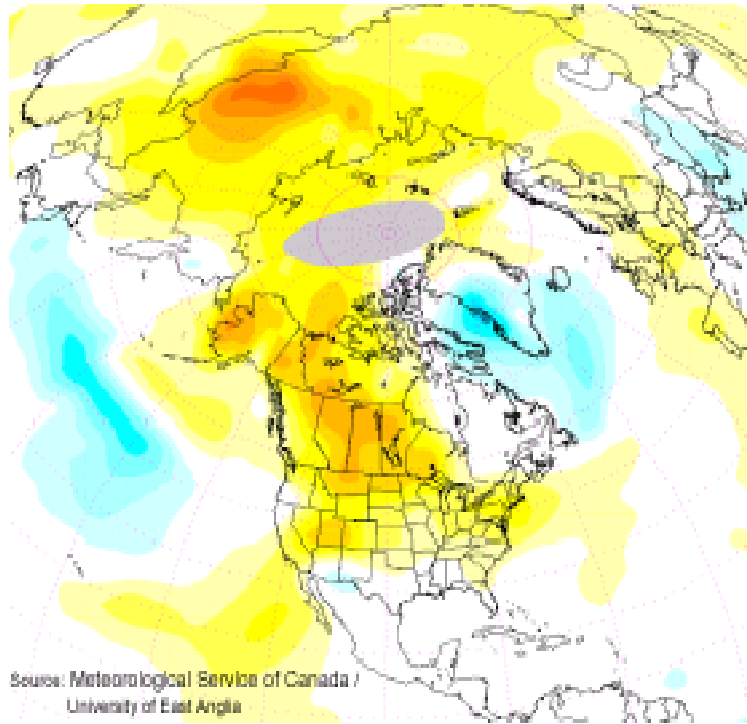


Major Recent Flooding
Events (2007, 2009, 2012,
2013)



Some Evidence Climate
Warming Yukon Reality

Annual Surface Air Temperature Trends 1961-1990



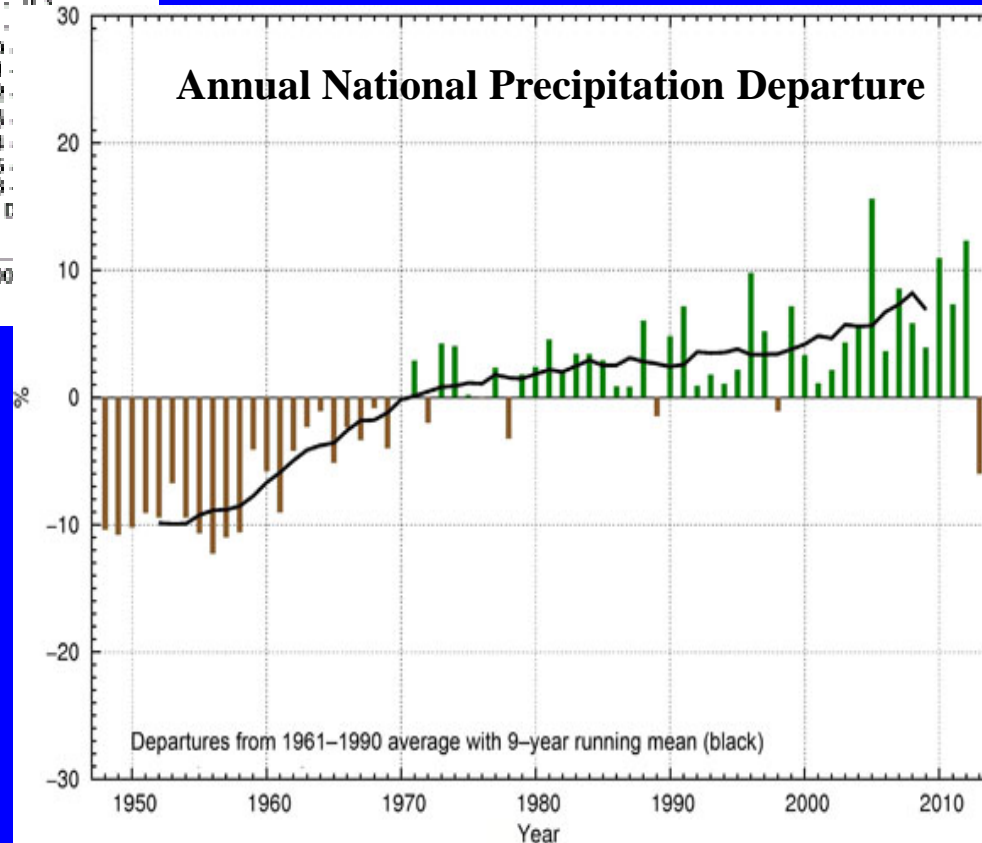
°C per decade



2000

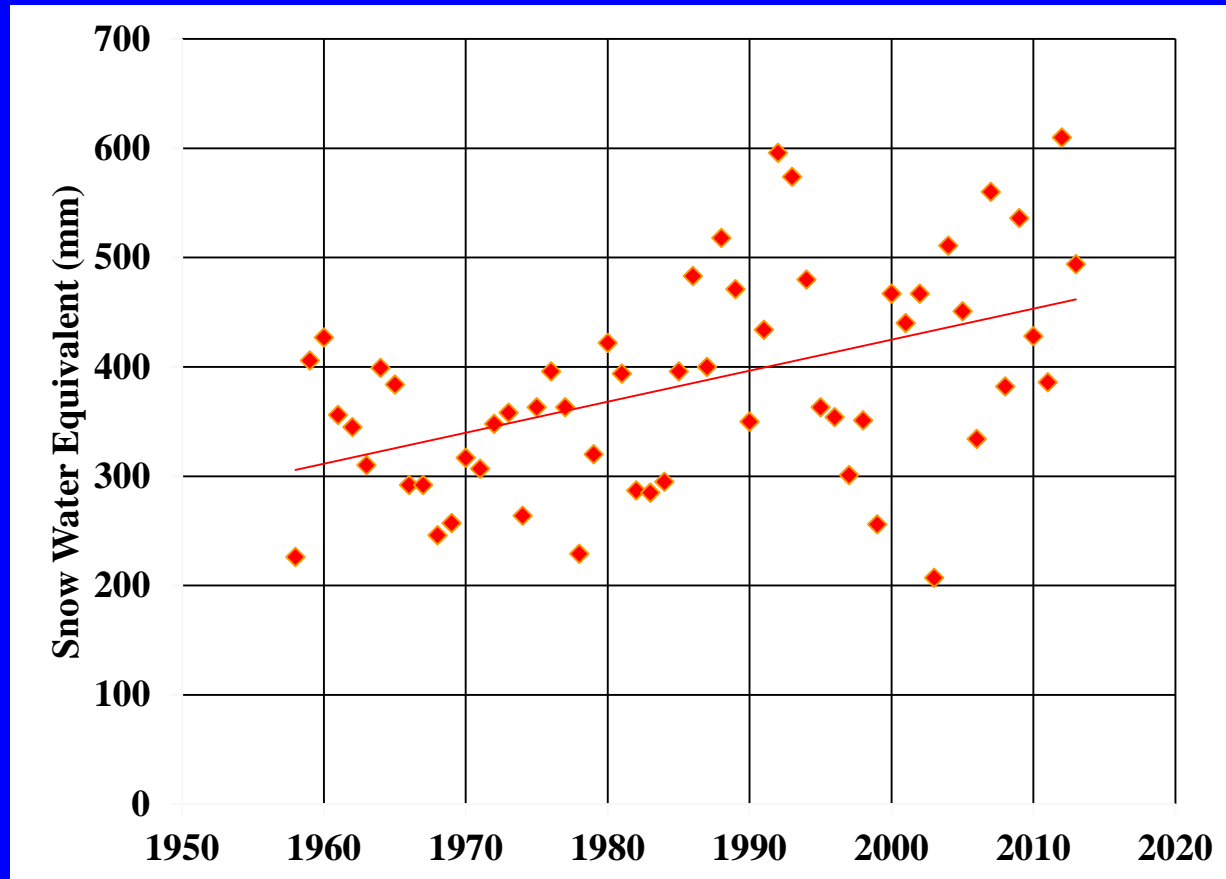
HISTORICAL TEMPERATURE AND PRECIPITATION

Annual National Precipitation Departure

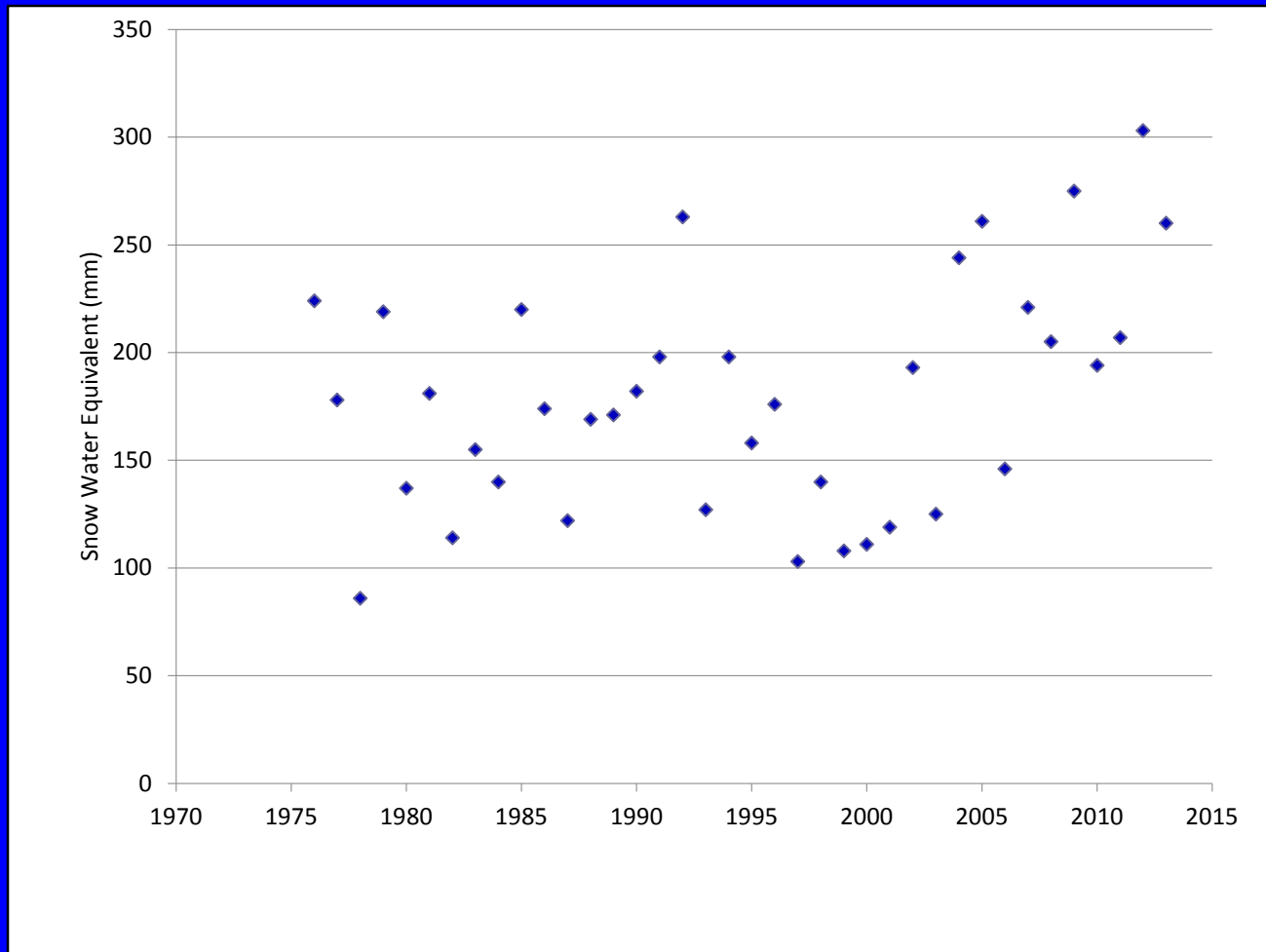


- Summer Temp + 2 - 6 ° C
- Winter Temp + 4 - 6 ° C
- Summer Precip + 5 - 10 %
- Winter Precip -10 - + 20 %

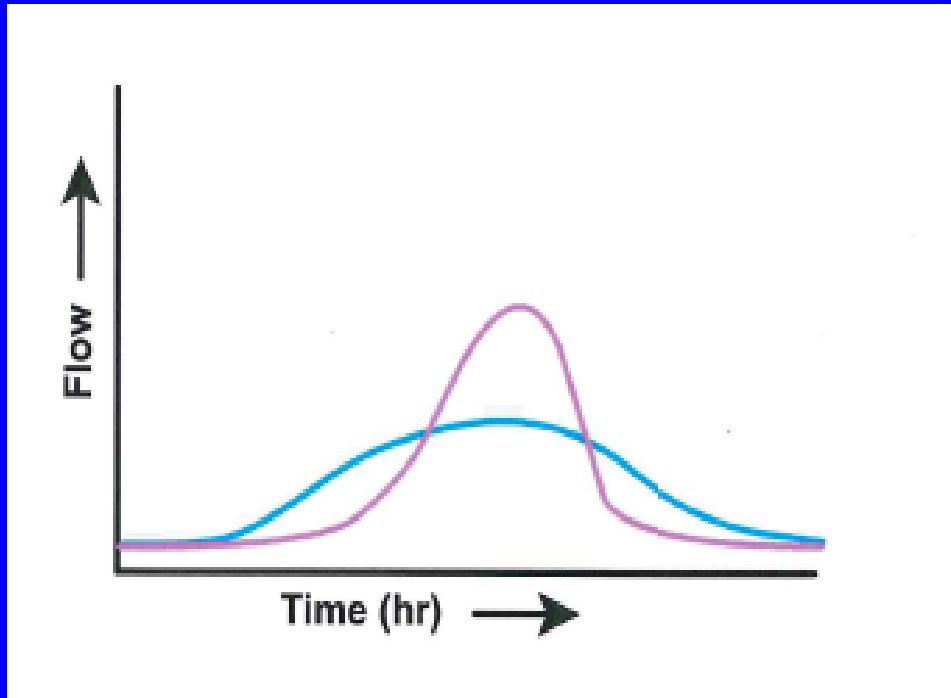
LOG CABIN SNOW WATER EQUIVALENT 1958 - 2013



HYLAND RIVER SNOW WATER EQUIVALENT 1976 - 2013



CLIMATE WARMING IMPACTS ON HYDROLOGIC RESPONSE



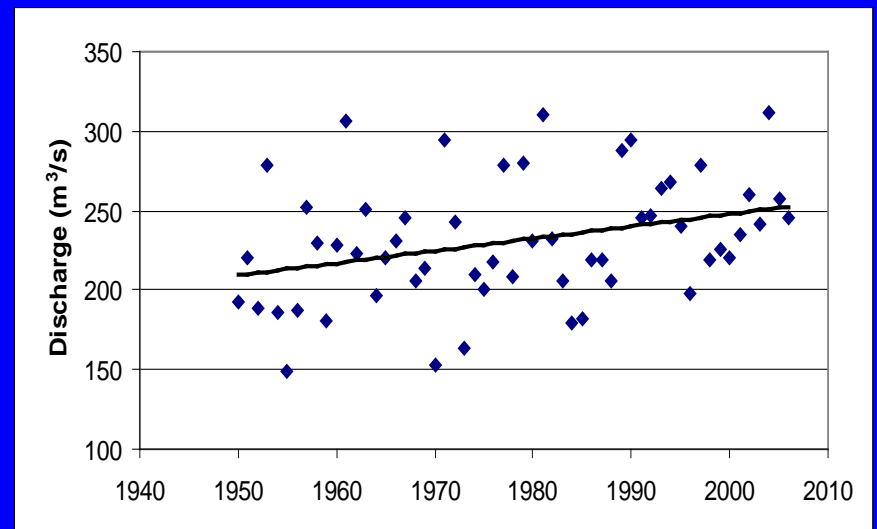
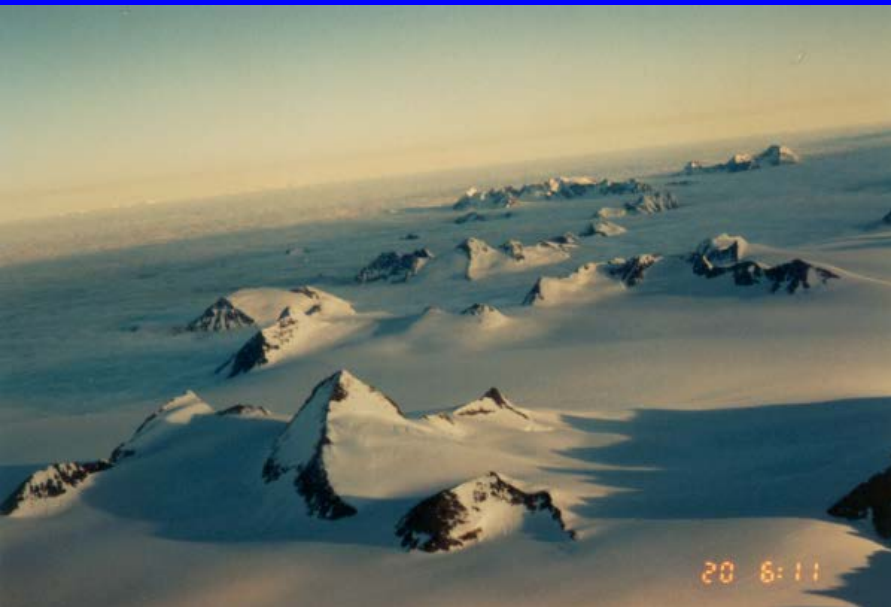
- Greater Precipitation
- Higher Temperatures
- Compressed Runoff Period

CLIMATE WARMING IMPACTS ON HYDROLOGIC RESPONSE

Increasing Peak Flows Due to Melting Glaciers / High Elevation Snowmelt

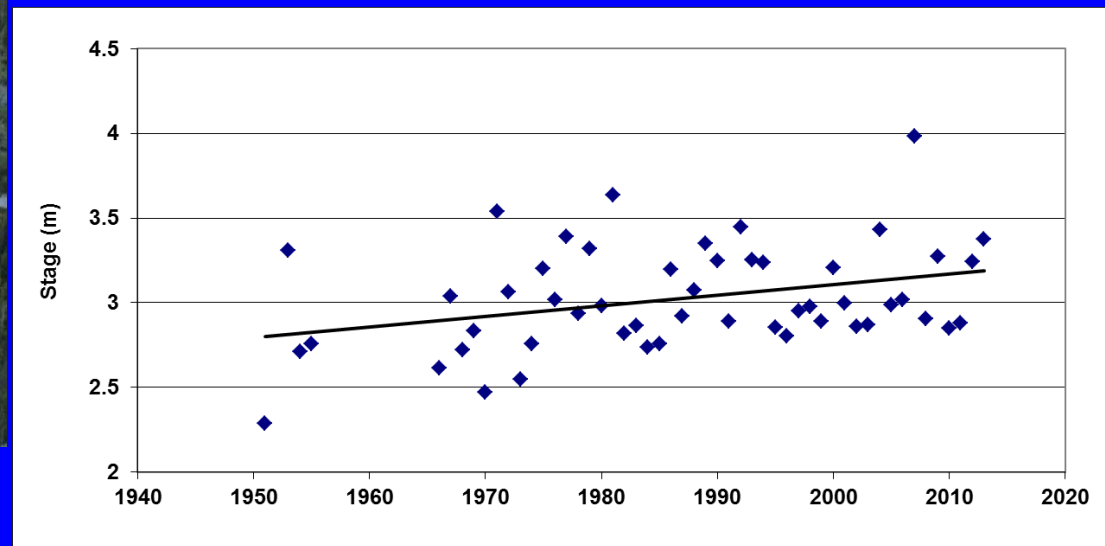
Atlin River nr Atlin

Maximum Annual Peak Flow



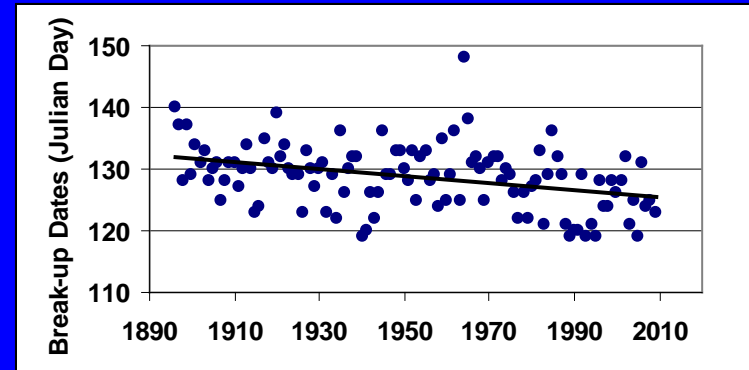
CLIMATE WARMING IMPACTS ON HYDROLOGIC RESPONSE

MARSH LAKE MAXIMUM STAGE 1950 – 2013



RIVER ICE REGIME TRENDS

Break-up Timing



Yukon River at Dawson (1896-2013)

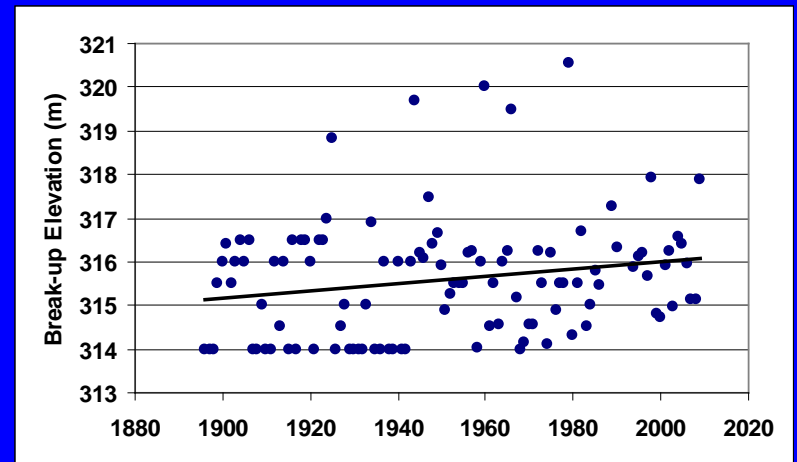
- Break-up Timing Advanced 6 days

RIVER ICE REGIME TRENDS



Dawson - 1979

Break-up Severity

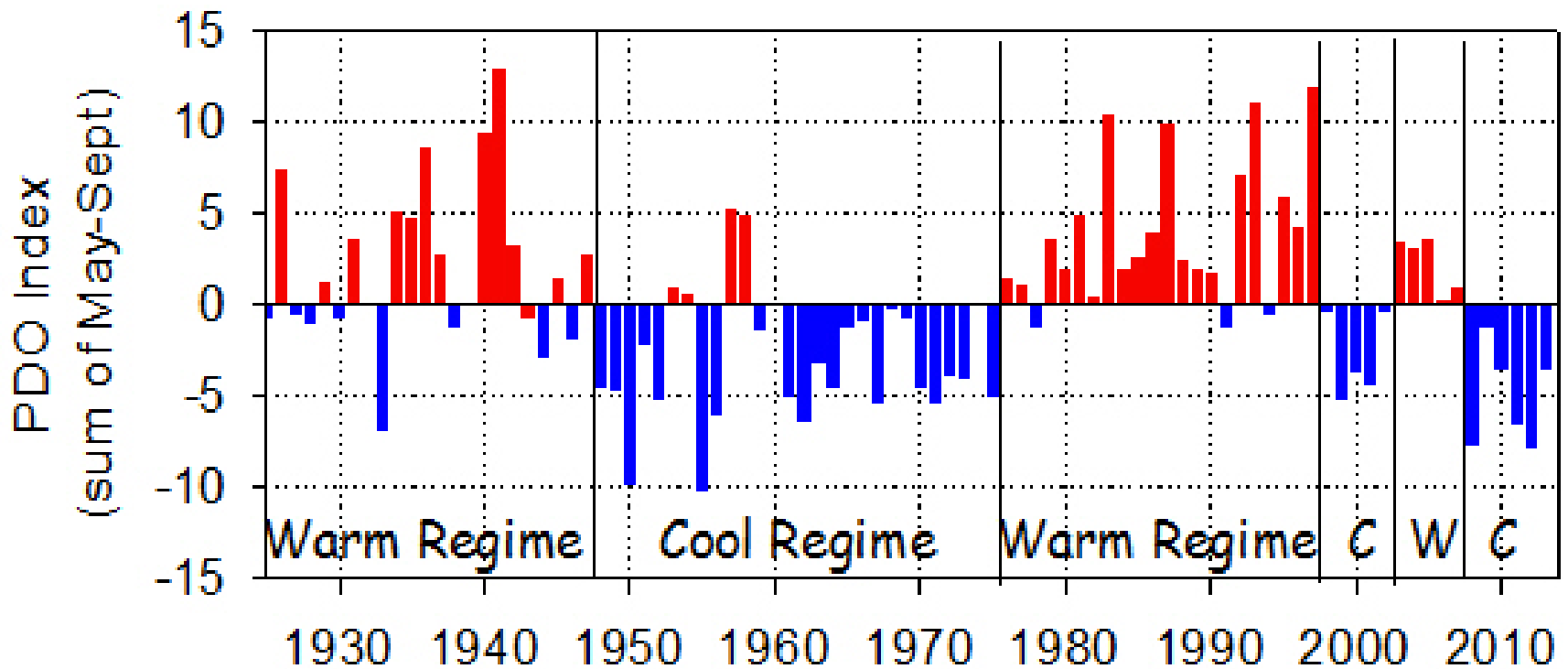


Yukon River at Dawson Annual
Maximum Break-up Elevation
(1896 - 2013)

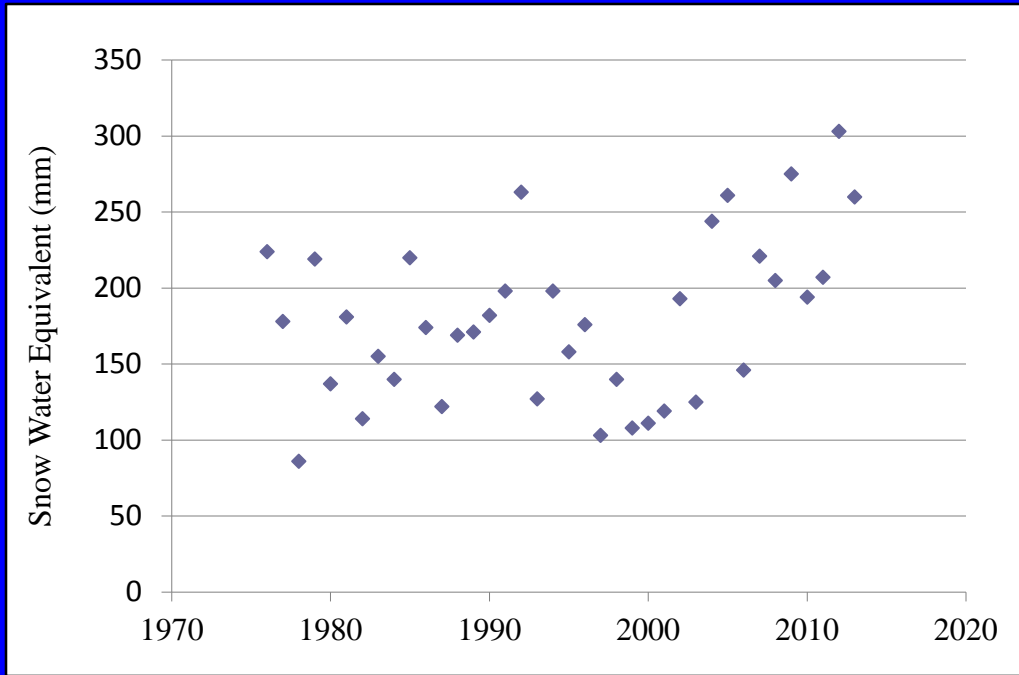
RIVER ICE REGIME TRENDS



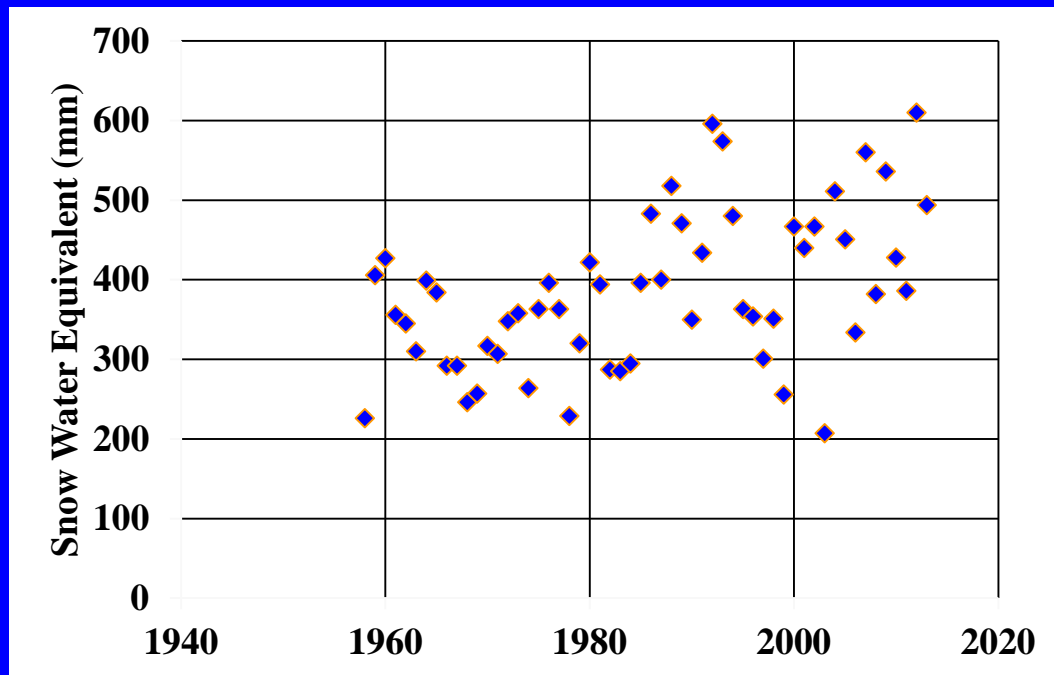
TELECONNECTIONS??



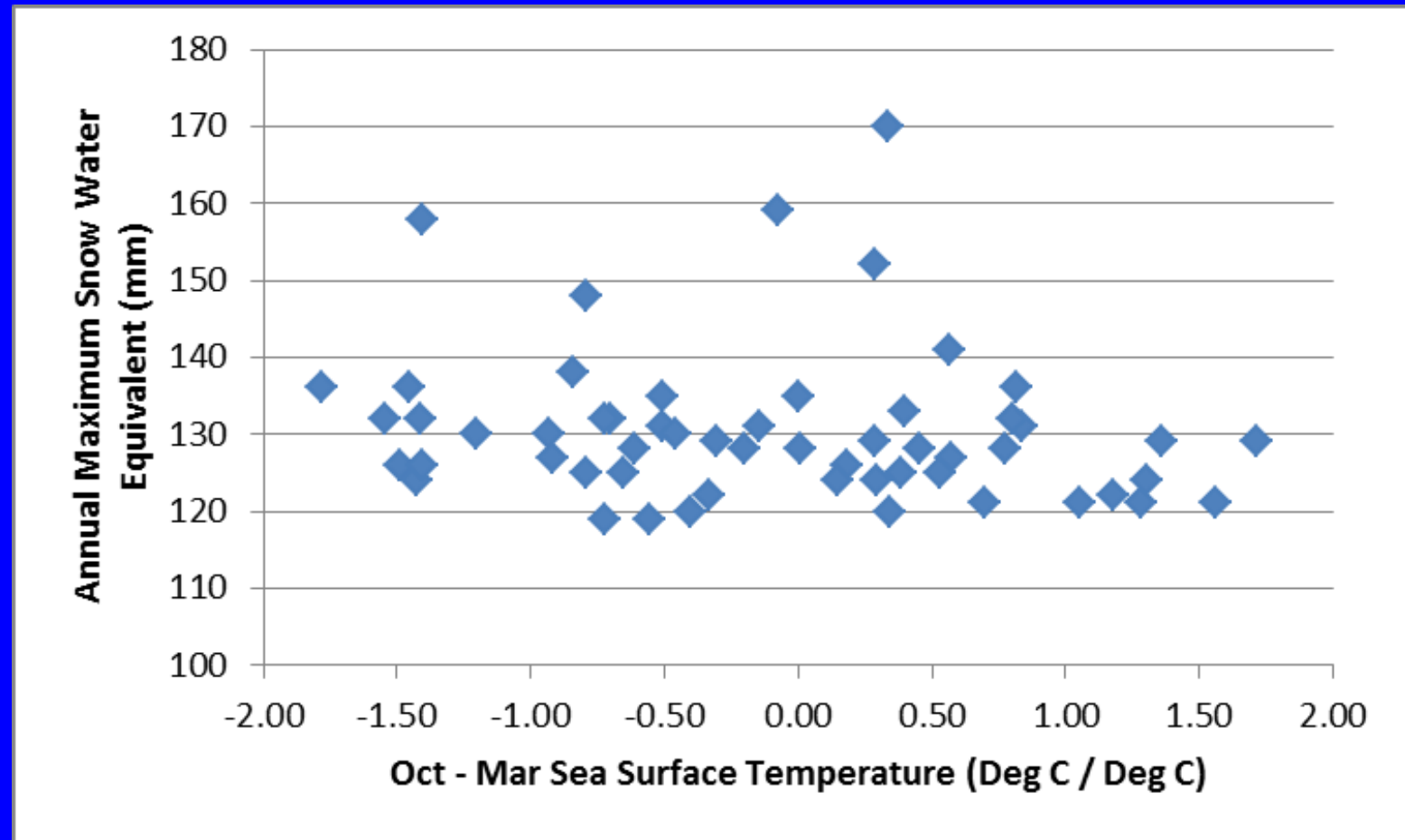
HYLAND RIVER SWE



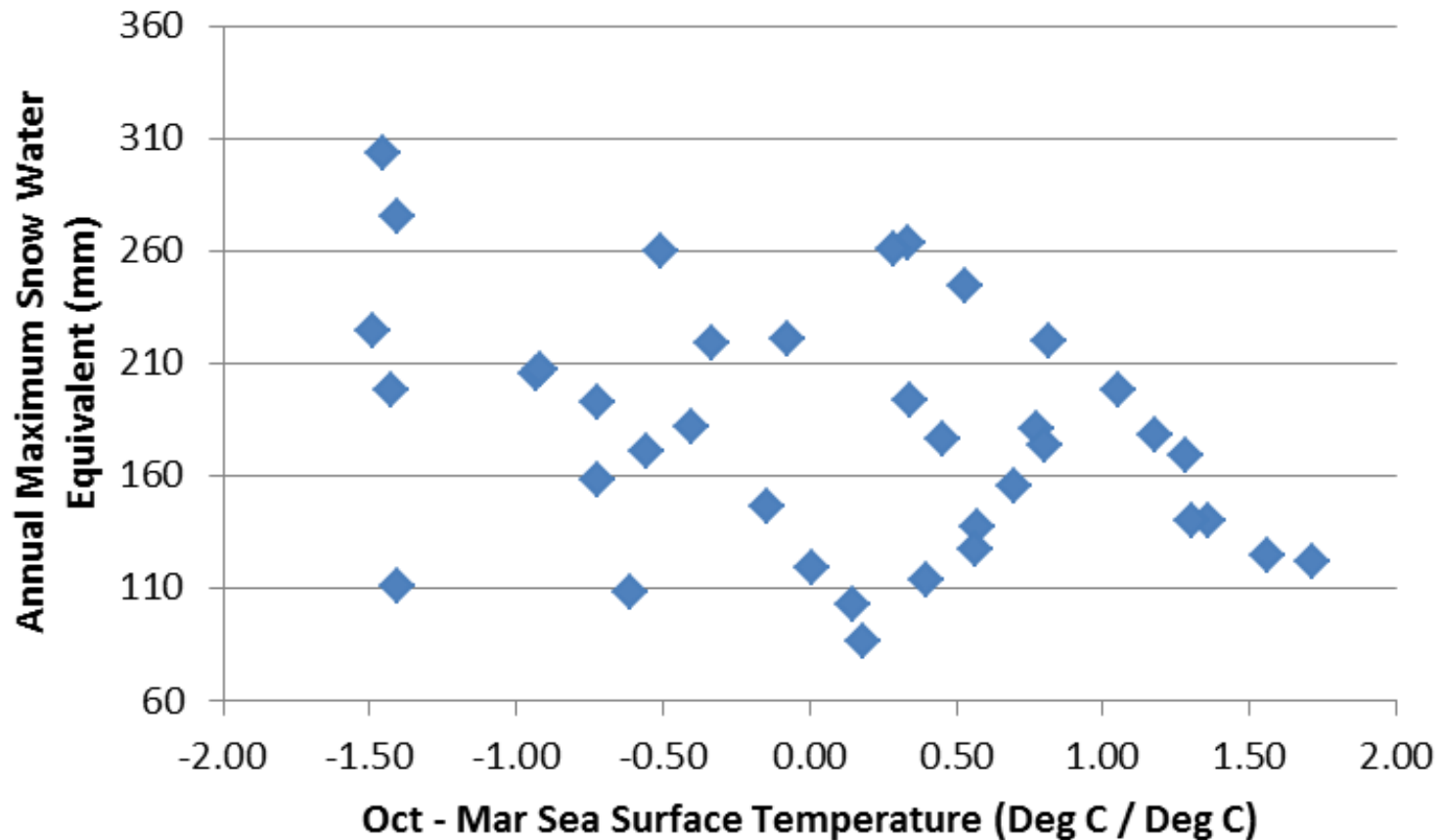
LOG CABIN SWE



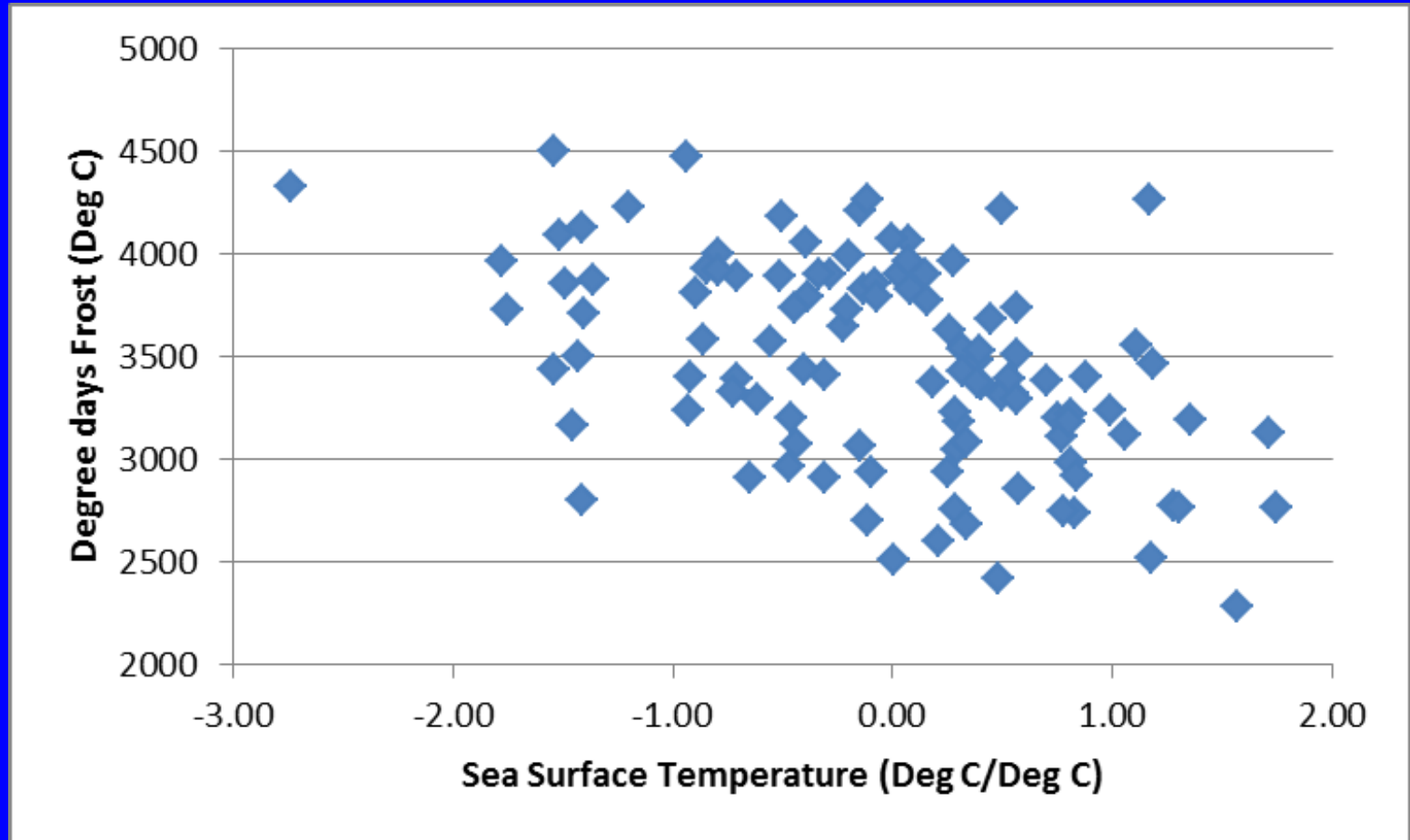
LOG CABIN SWE / SEA SURFACE TEMPERATURE (PDO INDEX)



HYLAND RIVER SWE / SEA SURFACE TEMPERATURE



DAWSON DEGREE DAYS FROST / SST



OTHER TELECONNECT – IONS ?

	¹ ENSO	² MJO	³ PNA	⁴ AO
11-Dec	La Nina		N-P	P
12-Jan	La Nina		P-0-P	P-N
12-Feb	N/A		N/A	N/A
12-Mar	La Nina		N-P-P	P-P-0
12-Apr	0		P-N	0
12-May	0		N-0-0	P
12-Jun	0		P-N-P	N-0
12-Jul	0		0-0-N	N-P-0
12-Aug	0		N-0-P	P-N-N
12-Sep	0		0-0-N	P-0-N
12-Oct	0		N	N
12-Nov	0		0-N	N-P-N
12-Dec	0		N-N-P	N
13-Jan	0	P-N	P-0	0-N-P
13-Feb	0	8,1,6	P	P-N
13-Mar	0	6,7,3	P-N-0	N
13-Apr	0	3,4,N,N	0-N	N-P-0
13-May	0	12,34,5,N	N	P
13-Jun	0	N,N,N,1	N	P
13-Jul	0	2,3,N,N	N	0
13-Aug	0	N,N,8,1	0	P
13-Sep	0	1,2N,5,6	P	N
13-Oct	0	6,N,N,8	N	P
13-Nov	0	1,N,N,N	N	P
13-Dec	0	N,3,4,N	N	P

¹El Nino Southern Oscillation

²Madden-Julian Oscillation

³Pacific North American Oscillation

⁴Arctic Oscillation

- El Nino – Southern Oscillation
- Madden – Julian Oscillation
- Pacific North American Oscillation
- Arctic Oscillation

FUTURE (PRESENT) DIRECTIONS

- Emergency Measures Organization has Funding to Carry Out Floodplain Mapping of Every Yukon Community
- 2 Year Project
- LiDAR Surveys 2014
- Environment Yukon Developing Flood Frequency Curves





THANK YOU

