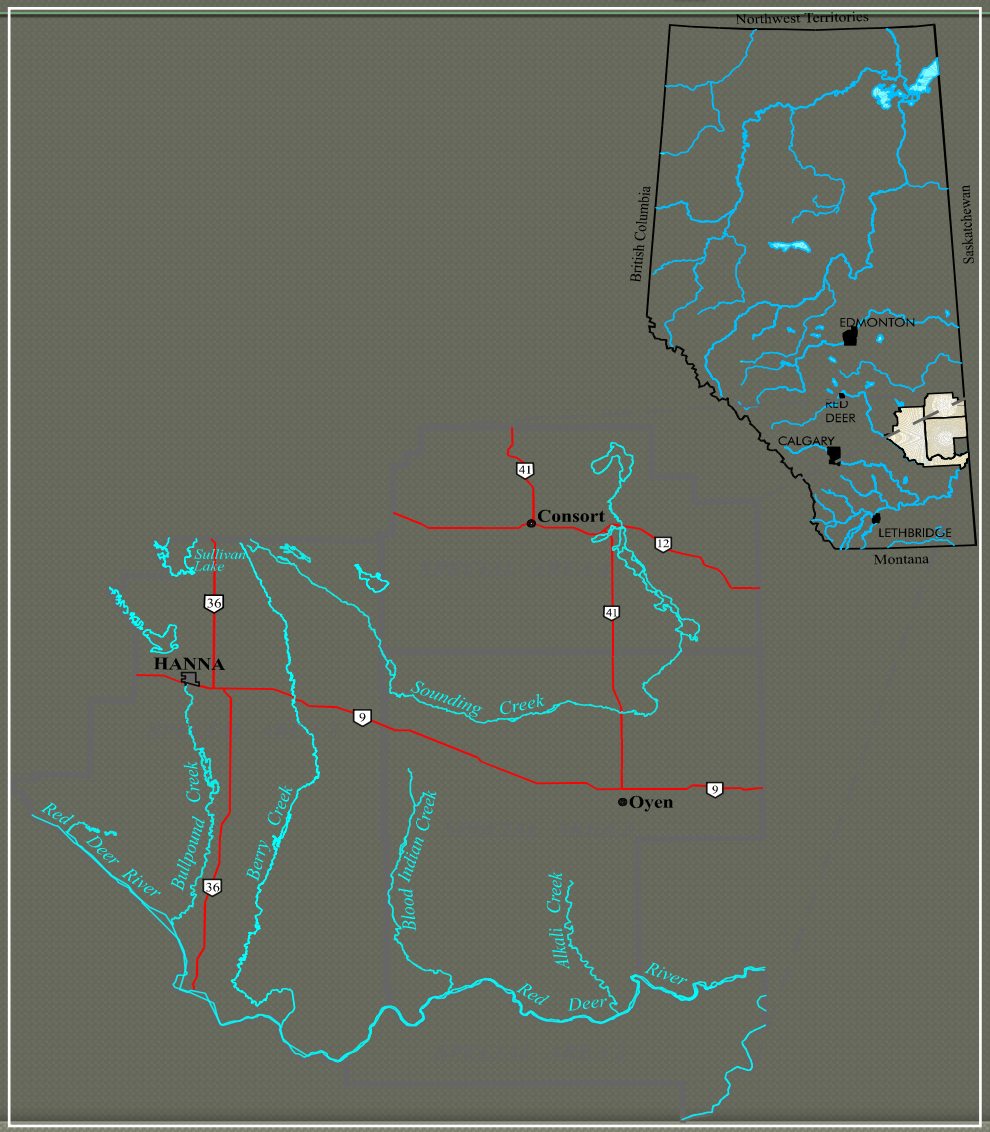
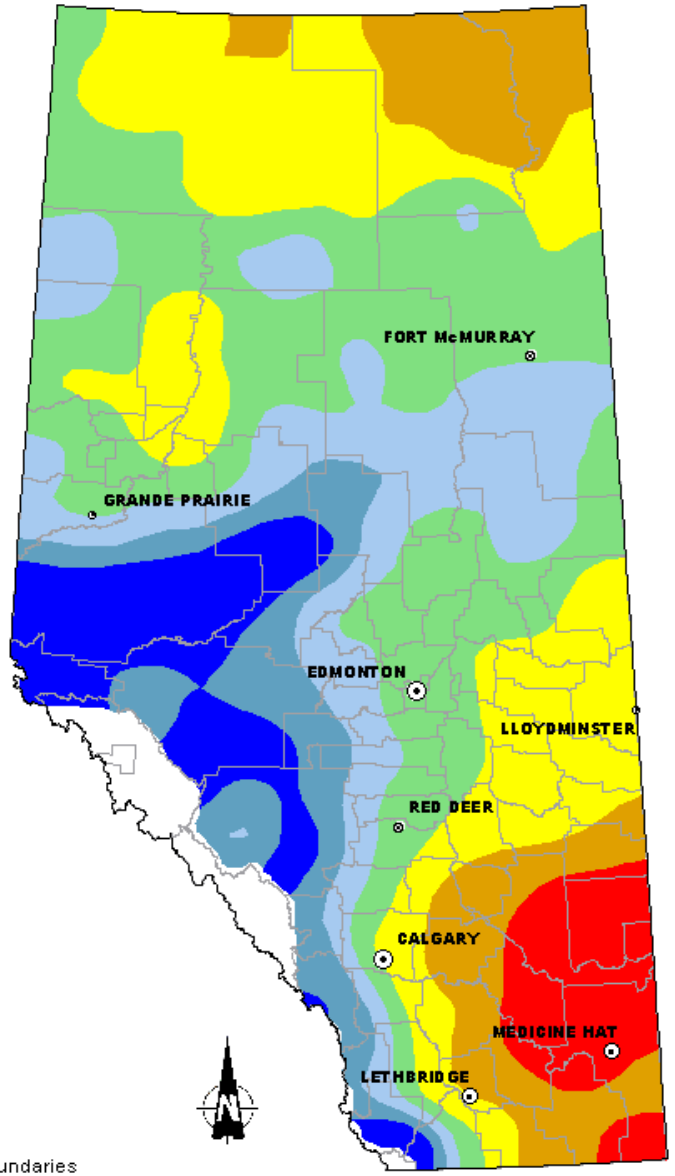
SINS OF THE PAST – HOPE FOR THE FUTURE

CSLA/AAPC Congress 2014


DROUGHT – The Special
Areas Water Supply project

Alberta's Special Areas





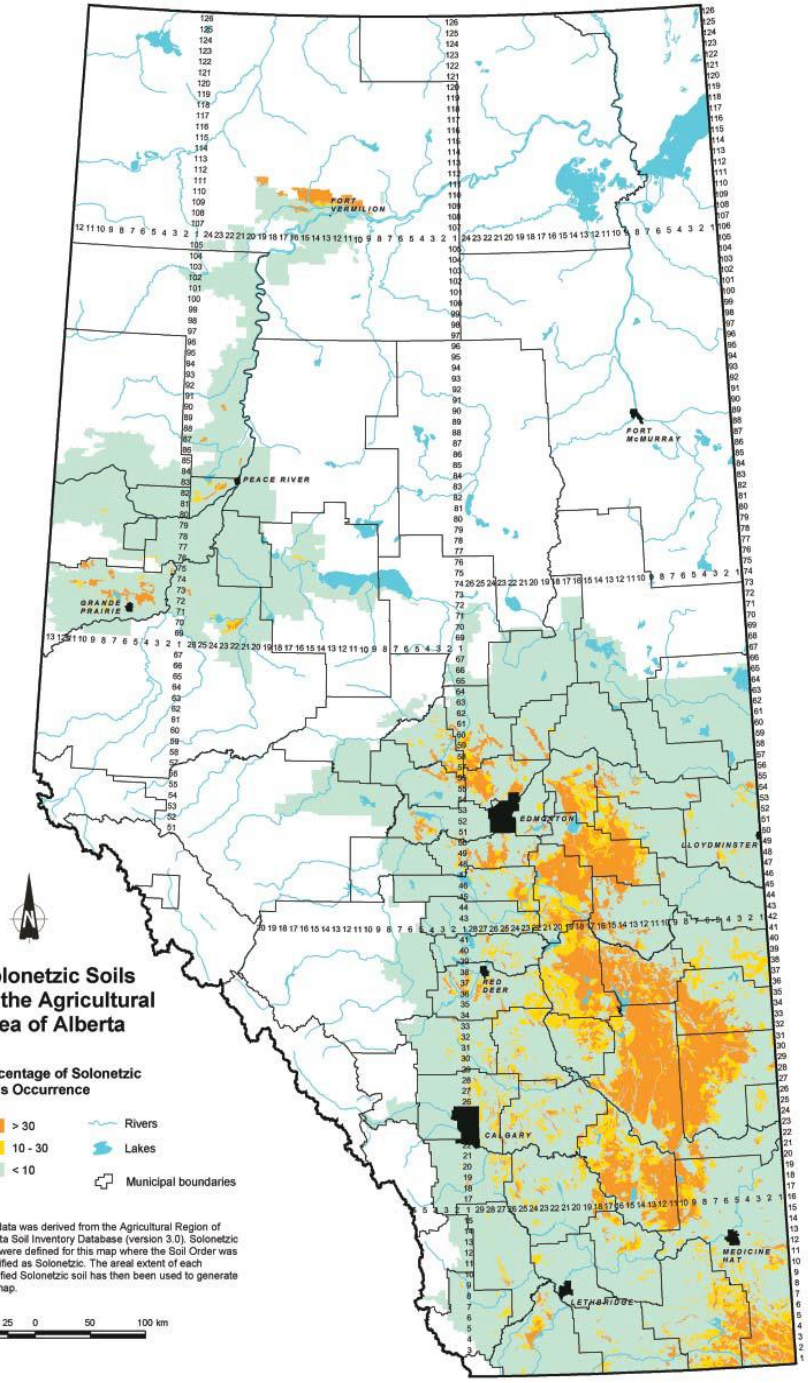
Annual total precipitation, 1961 to 1990

Precipitation (mm)

- < 350
- 350 to 400
- 400 to 450
- 450 to 500
- 500 to 550
- 550 to 600
- > 600
- No Data
- Municipal Boundaries

Based on 1961 to 1990 data from Environment Canada, Alberta Environment and the U.S. National Climate Data Center. Map displayed on Township generalization.

Alberta
AGRICULTURE, FOOD AND RURAL DEVELOPMENT
Conservation and Development Branch
Resource Management and Irrigation Division



Solonetzic Soils of the Agricultural Area of Alberta

Percentage of Solonetzic Soils Occurrence

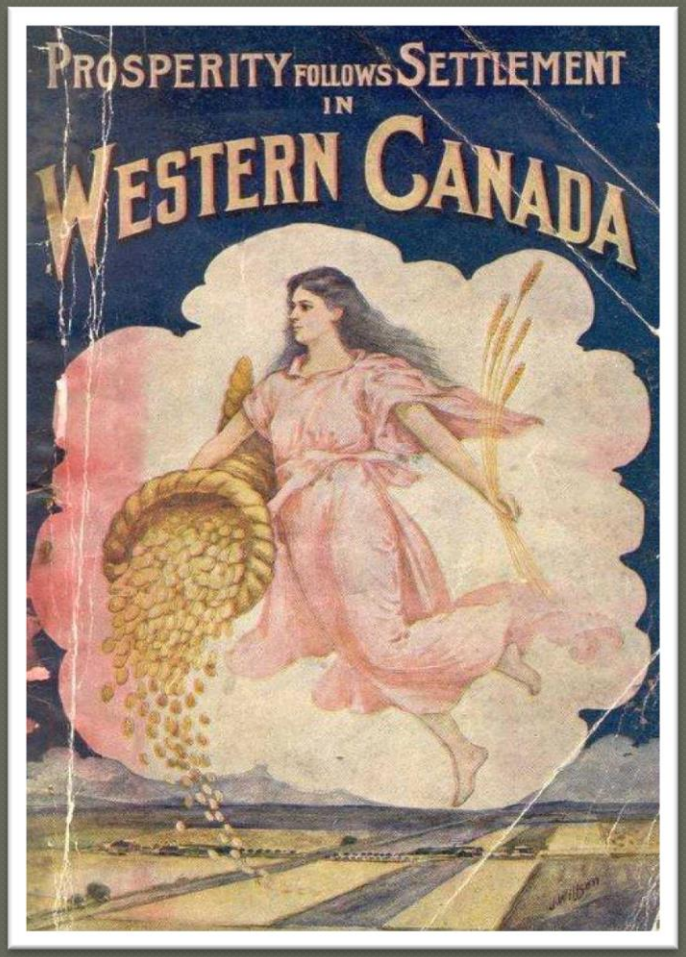
- > 30
- 10 - 30
- < 10
- Rivers
- Lakes
- Municipal boundaries

The data was derived from the Agricultural Region of Alberta Soil Inventory Database (version 3.0). Solonetzic soils were defined for this map where the Soil Order was classified as Solonetzic. The areal extent of each identified Solonetzic soil has then been used to generate this map.

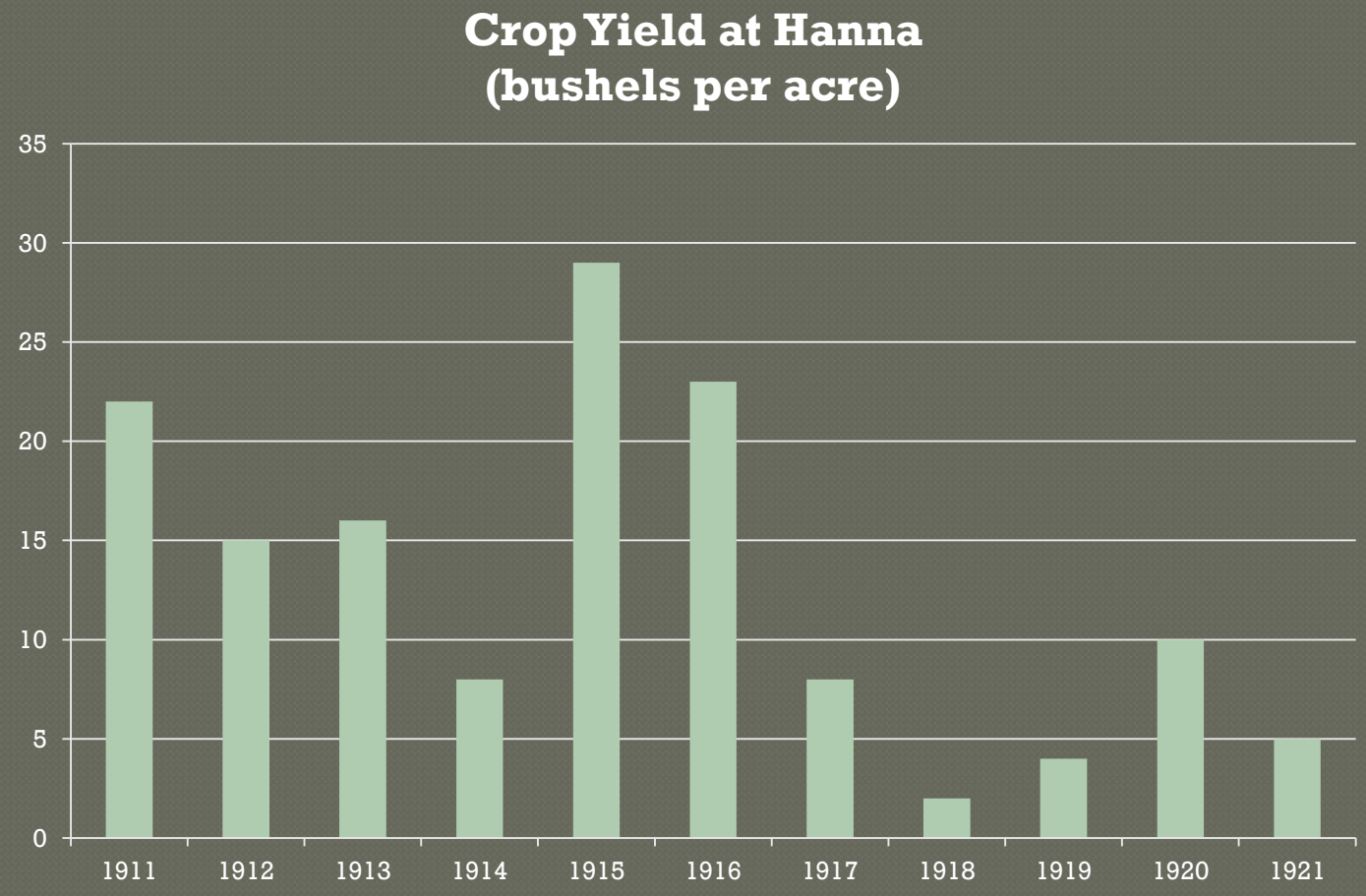
A Brief History

- 1860 Palliser expedition – not suitable for farming
- Early cattle ranching until winter of 1906-07 loss of two thirds of cattle herd
- Open for homesteading in 1909 (CPR and Federal Government)
- Population exploded – shift from cattle to wheat

Land of Promise

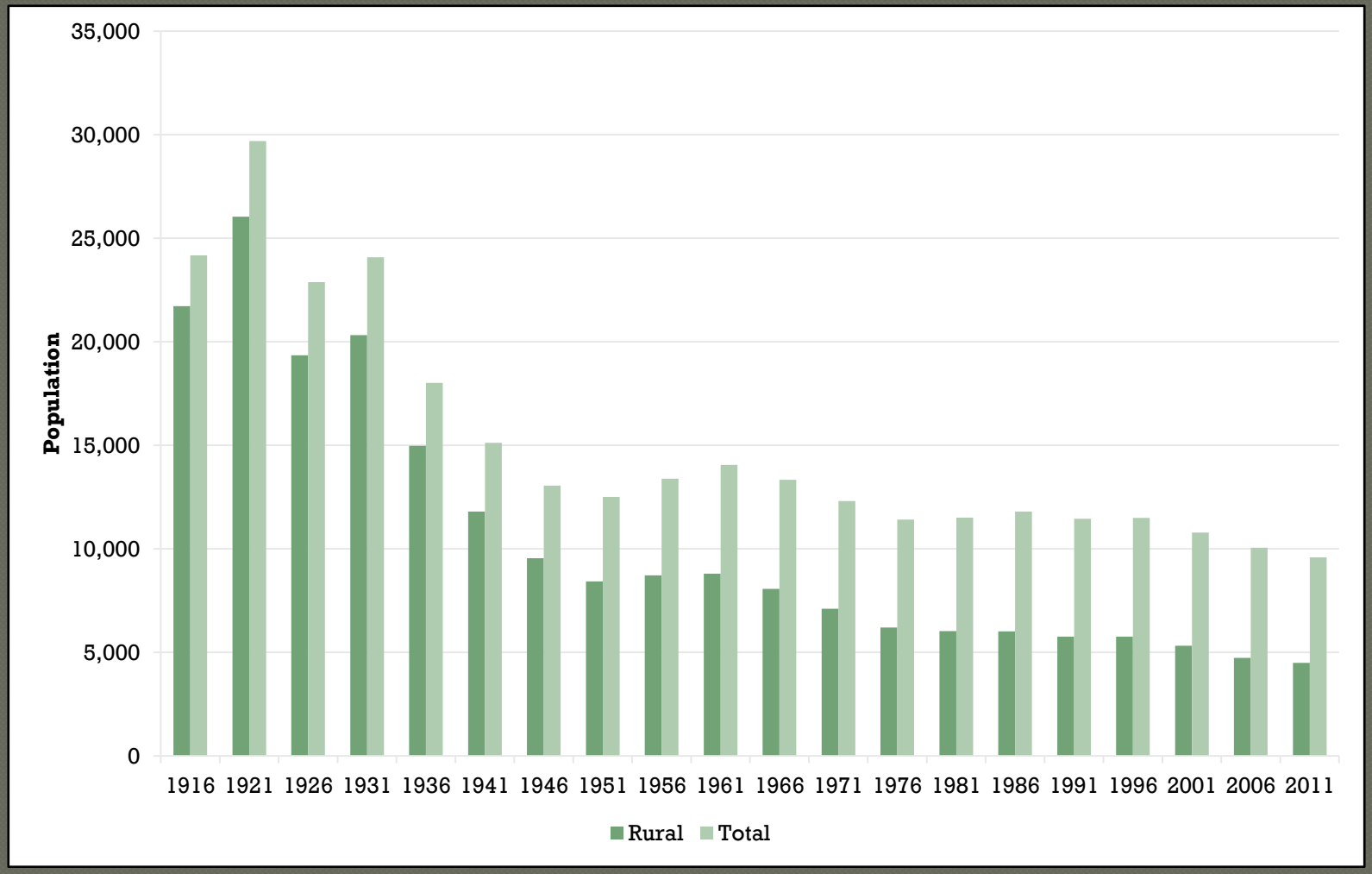


Deception of Climate Variability



The Harsh Reality

Population


35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Population
1916 1921 1926 1931 1936 1941 1946 1951 1956 1961 1966 1971 1976 1981 1986 1991 1996 2001 2006 2011
Rural
Total

Climate Adaptation

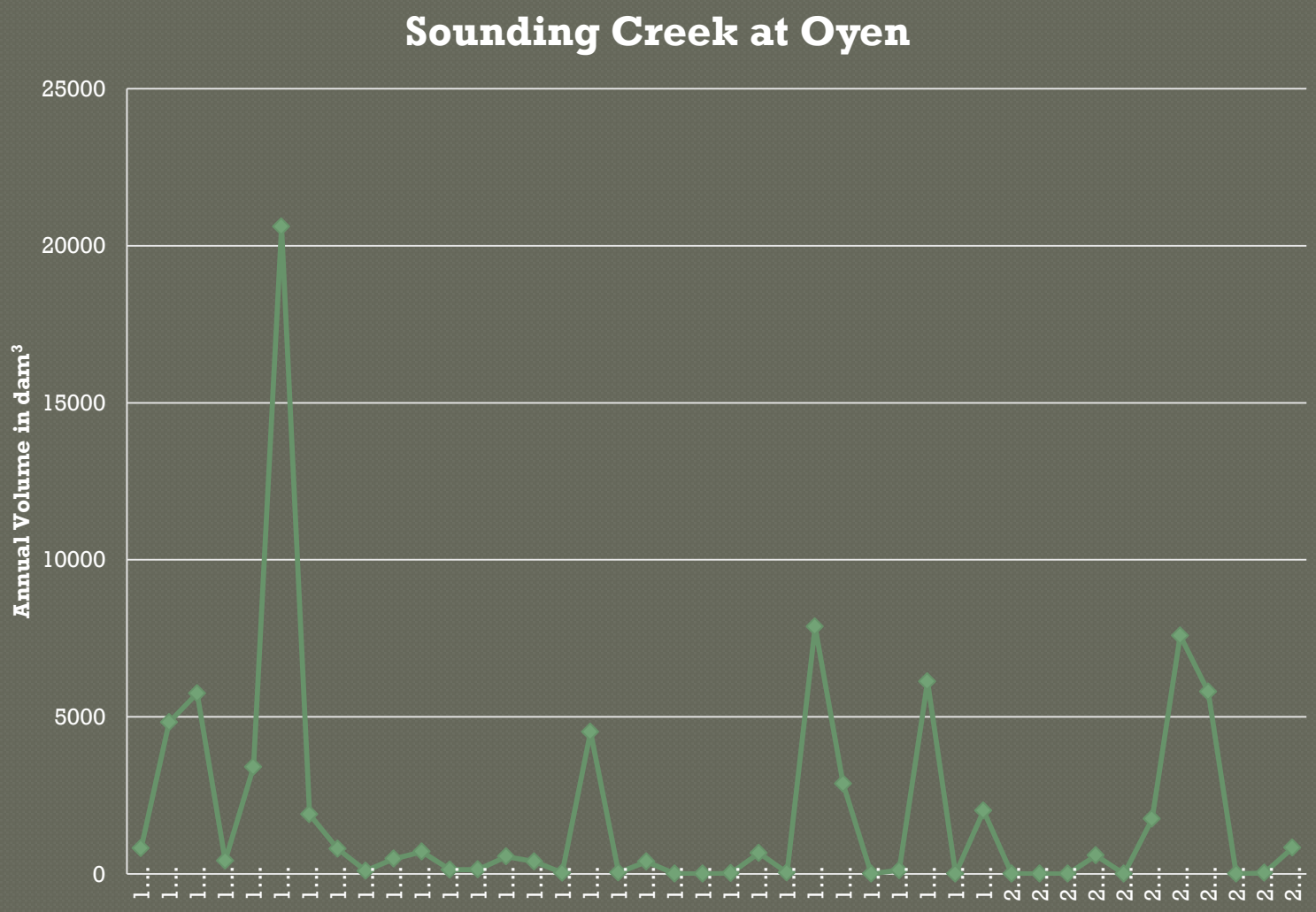
- Institutional Change
  - Creation of Special Areas Board
  - Mortgage and tax default lands
  - Organized Depopulation and Land Rationalization
- Research and Outreach
  - Dominion Agricultural Research Stations
  - Revegetation of degraded land
  - Appropriate agriculture

Climate Adaptation (cont.)

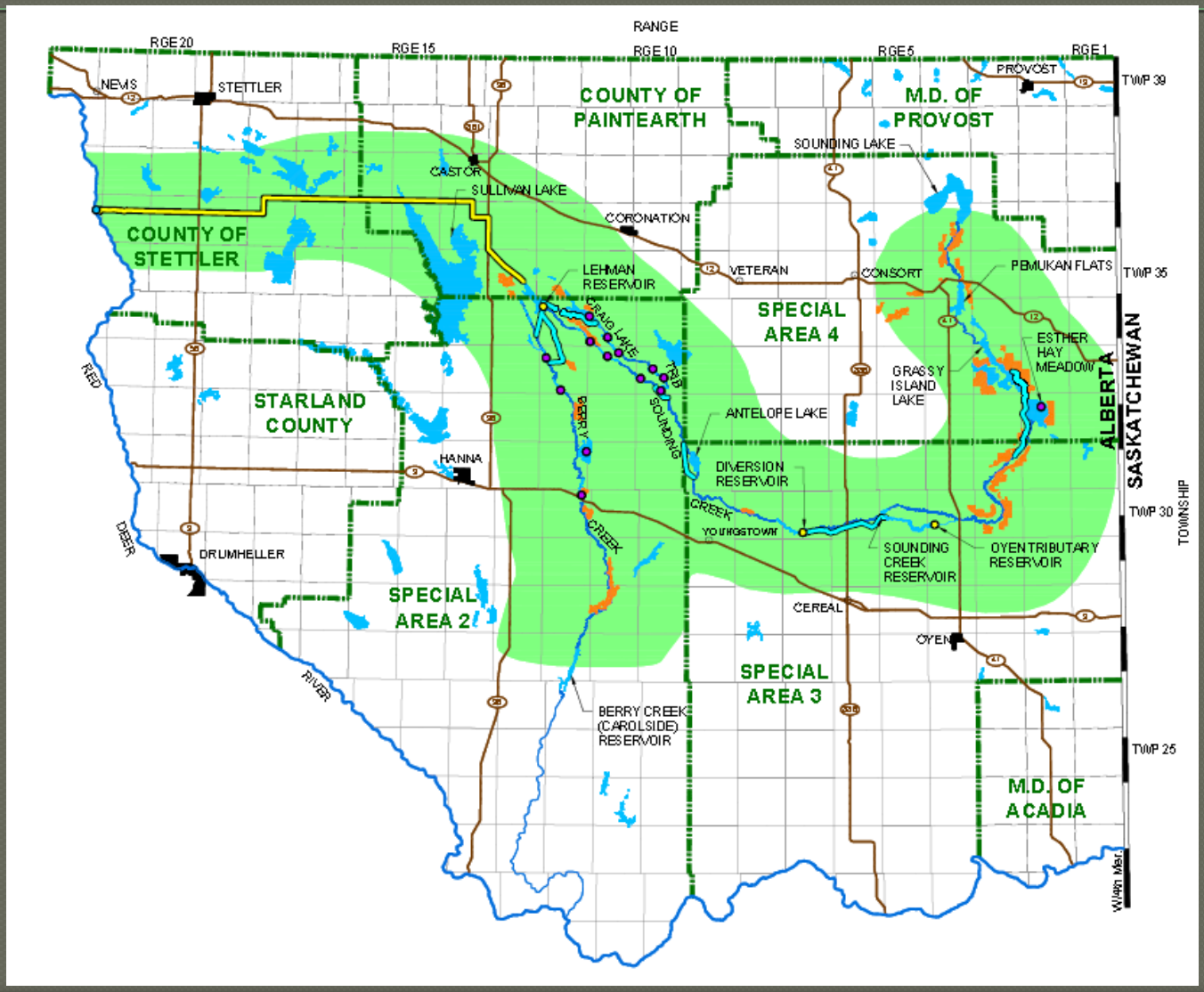
- Individual Initiative
  - Novel equipment and new farming practices
- Water Management
  - Prairie Farm Rehabilitation Administration
    - Reservoirs
    - Dugouts
  - Ducks Unlimited Canada
    - Reservoirs
    - Managed wetlands

Water Management

Natural Variability



Special Areas Water Supply Project



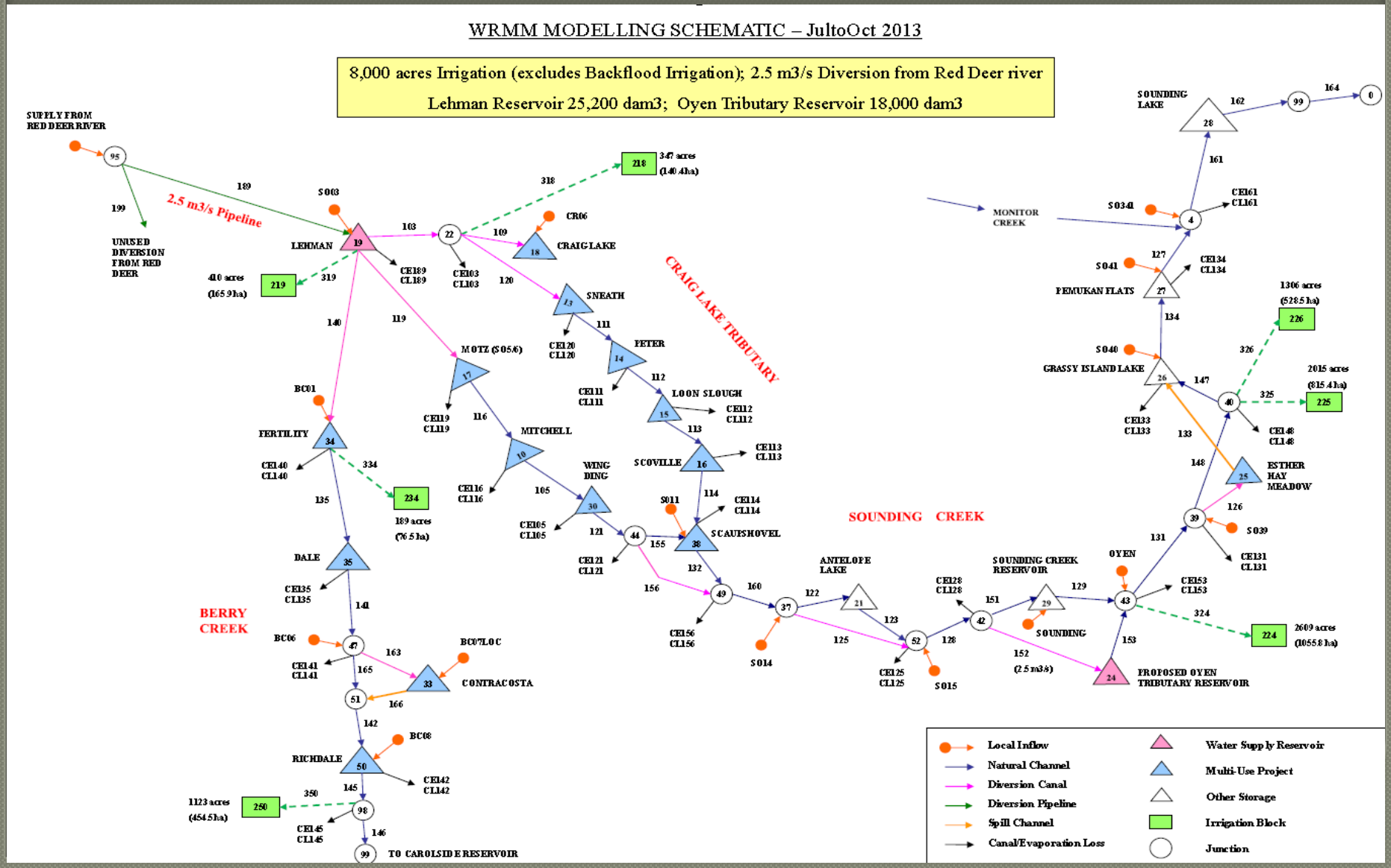
Project Purpose

- Stock watering allowing improved use of grazing land
- Multi-use projects providing waterfowl habitat, hay or forage, and stock water
- Irrigation primarily of hay and forage to complement livestock operations
- Recreation on new reservoirs
- Enhanced riparian areas

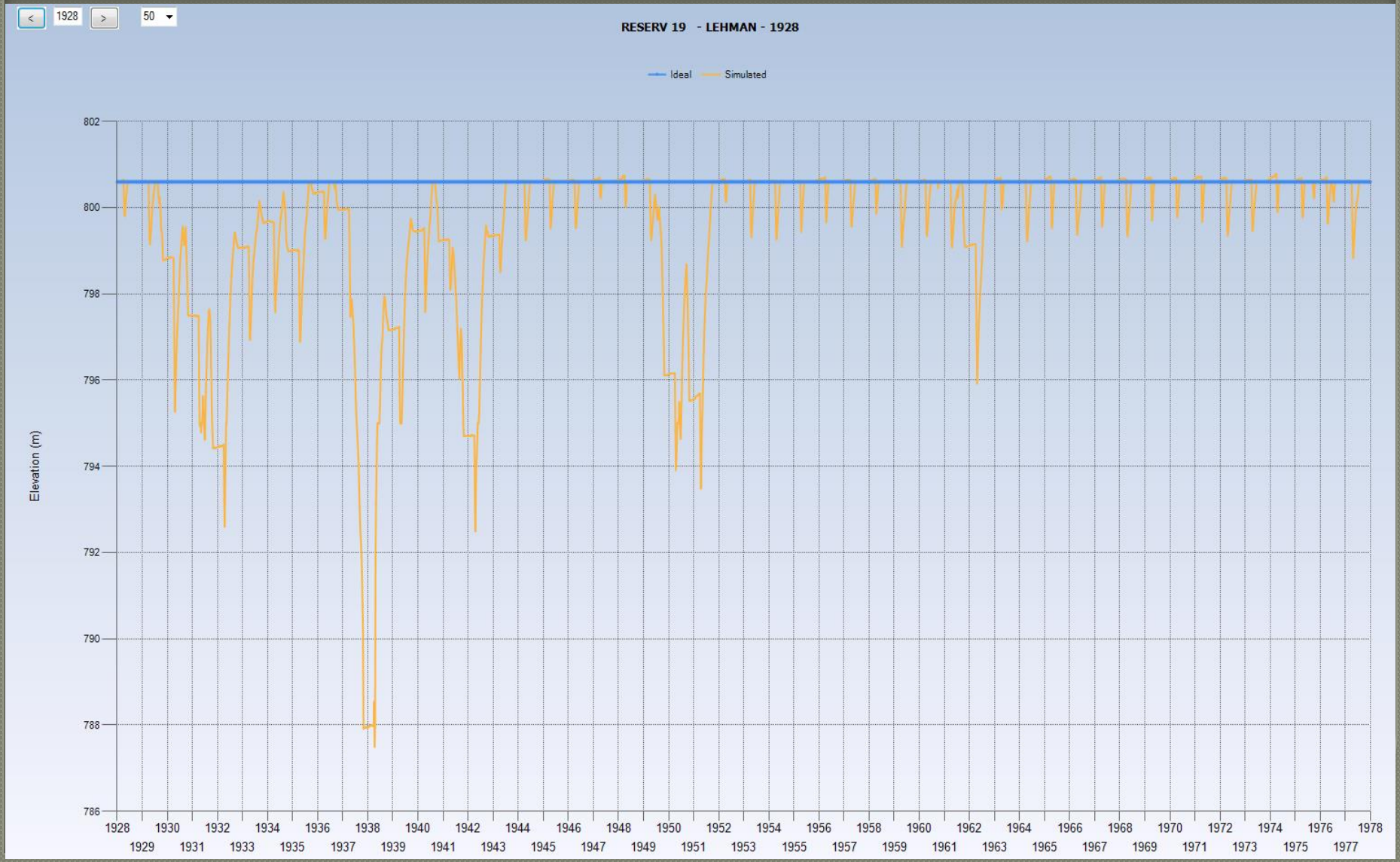
Will it work?

- Water Balance Model Testing
  - What has happened can happen
  - Hydrological period of record
  - What would happen with project in place

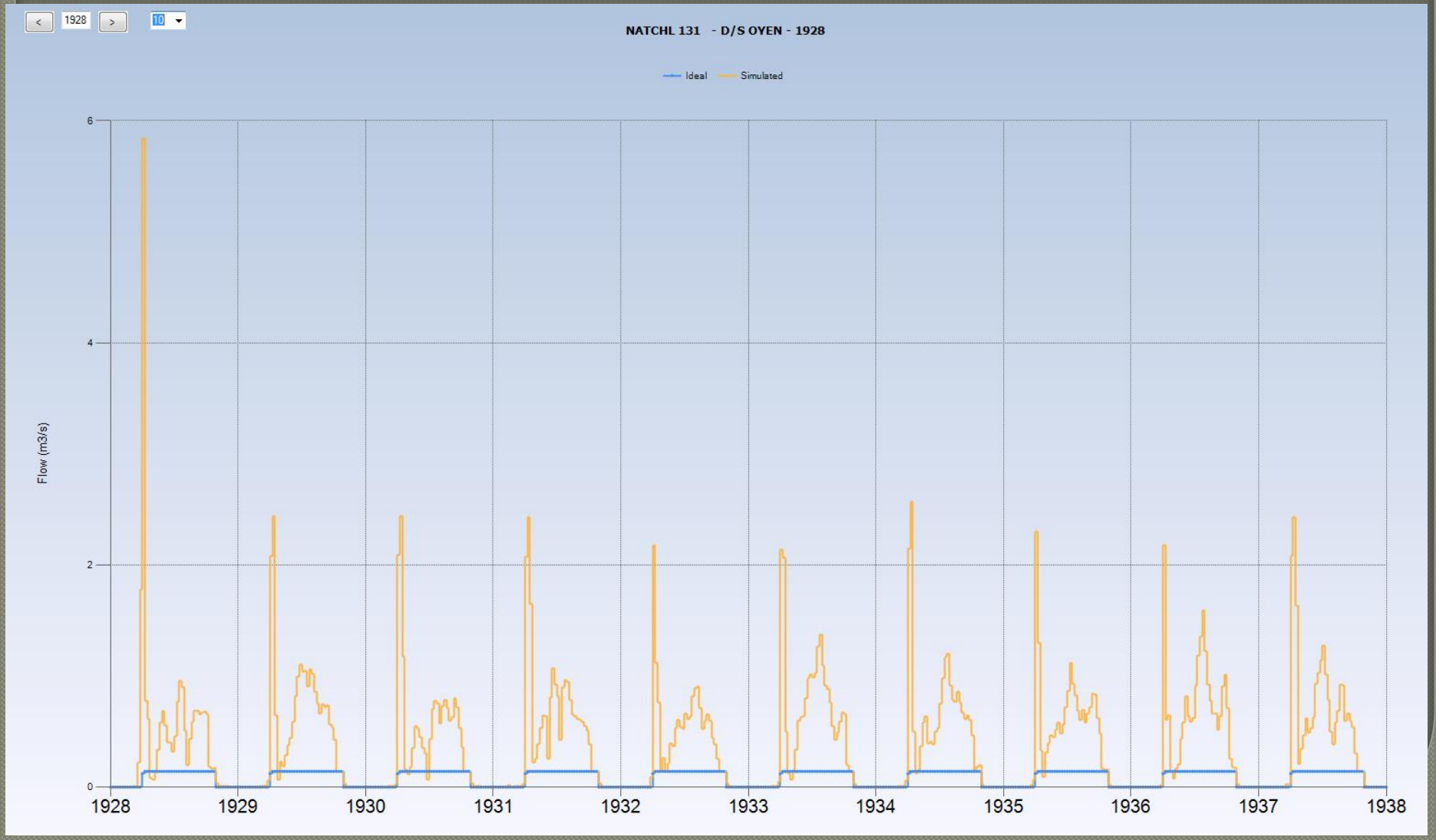
Water Balance Model



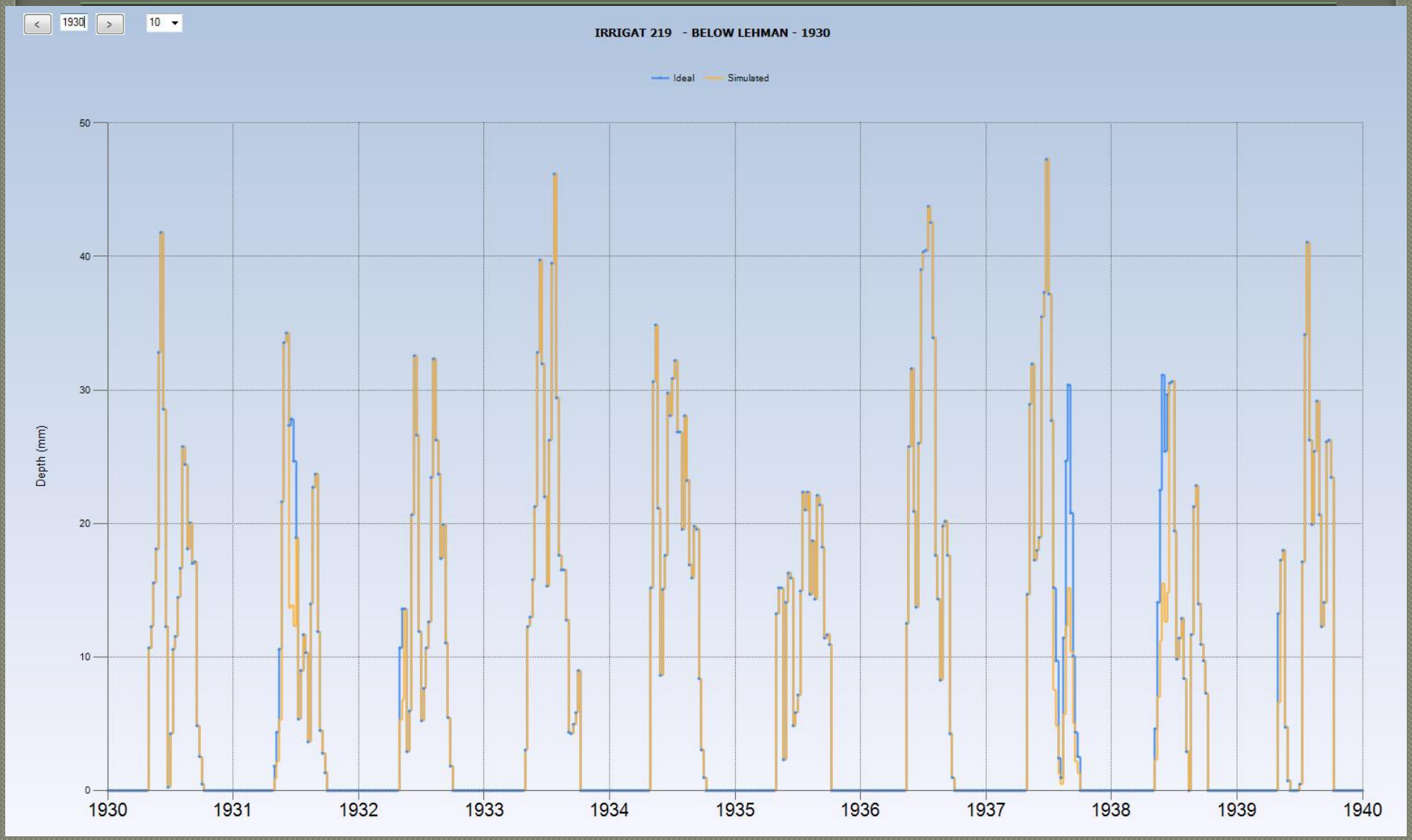
Reservoir Performance



Stream Flow


NATCHL 131 - D/S OYEN - 1928
Ideal
Simulated
Flow (m3/s)
0
2
4
6
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938

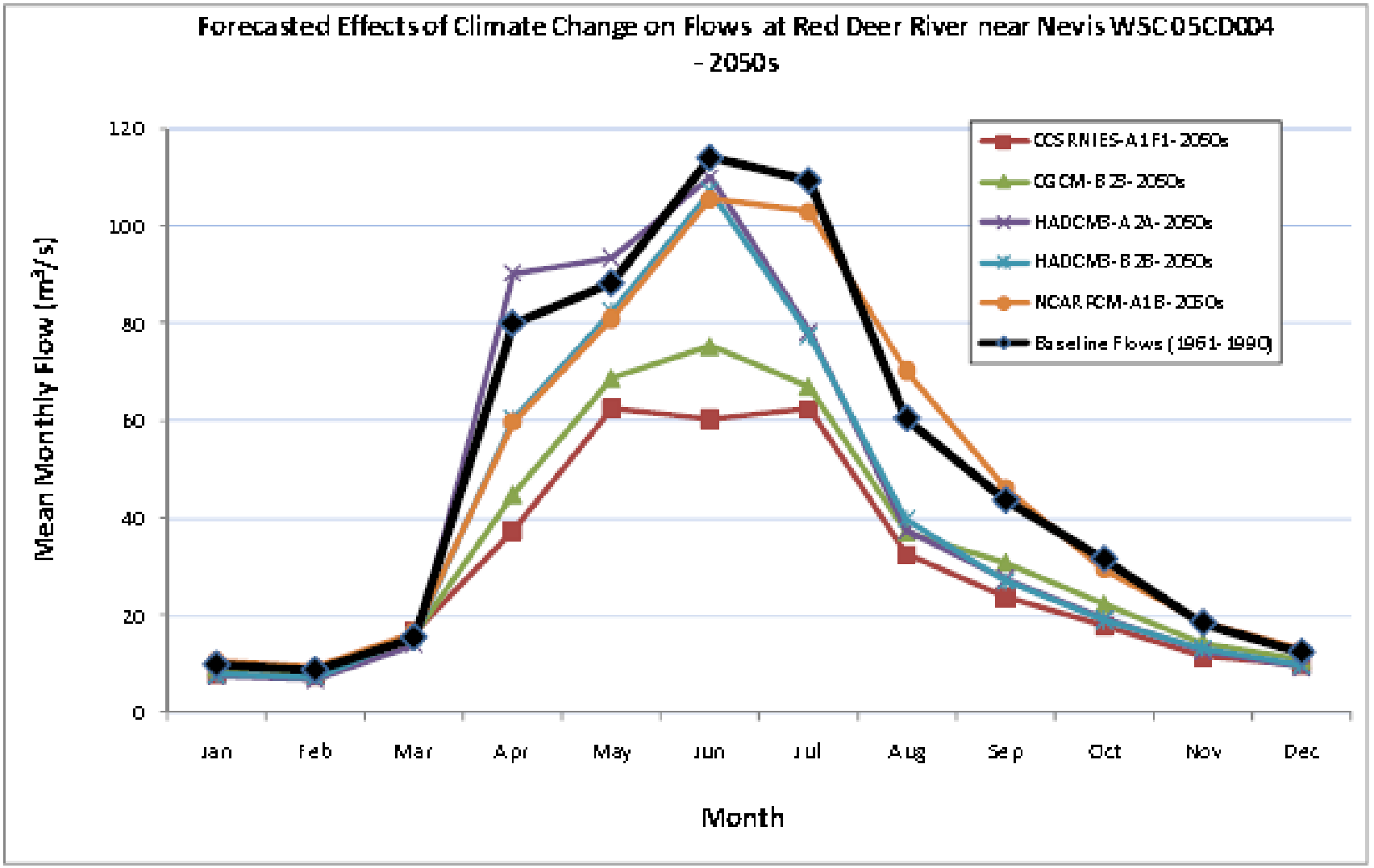
Irrigation Performance



What about future climate change?

- What do we model?
- Common belief in increased variability
- Global models resolve poorly at local levels

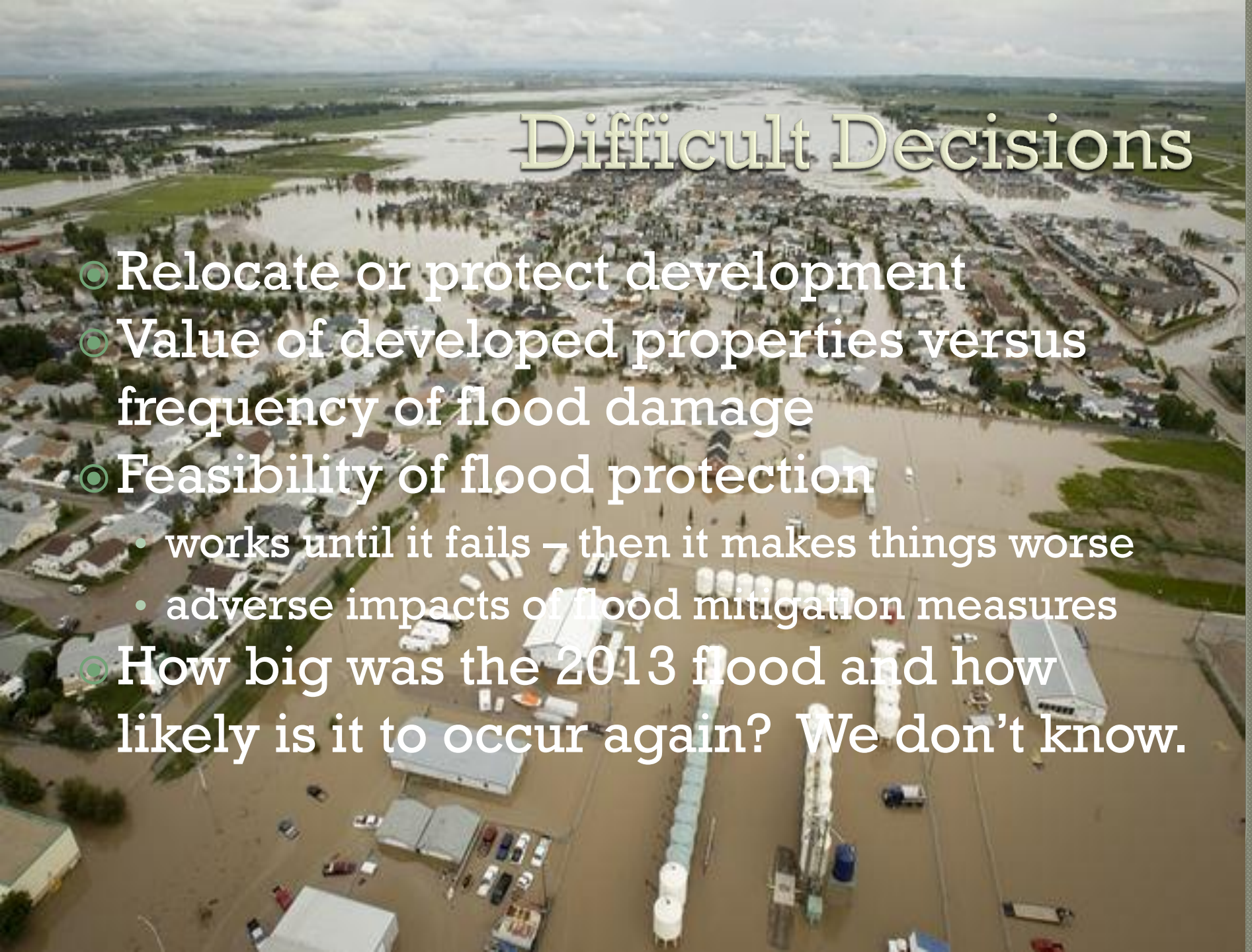
Range of Predictions 2050




Flood – Southern Alberta 2013

Extent of Flood Damage

- Alberta's 2013 floods Canada's most **costly** natural disaster
- Damage to some new ill-advised development
- Most areas of damage have been settled for a long time
- The river valleys have become major amenities inviting adjacent development
- LA's share in the blame for the extent of damage



Difficult Decisions

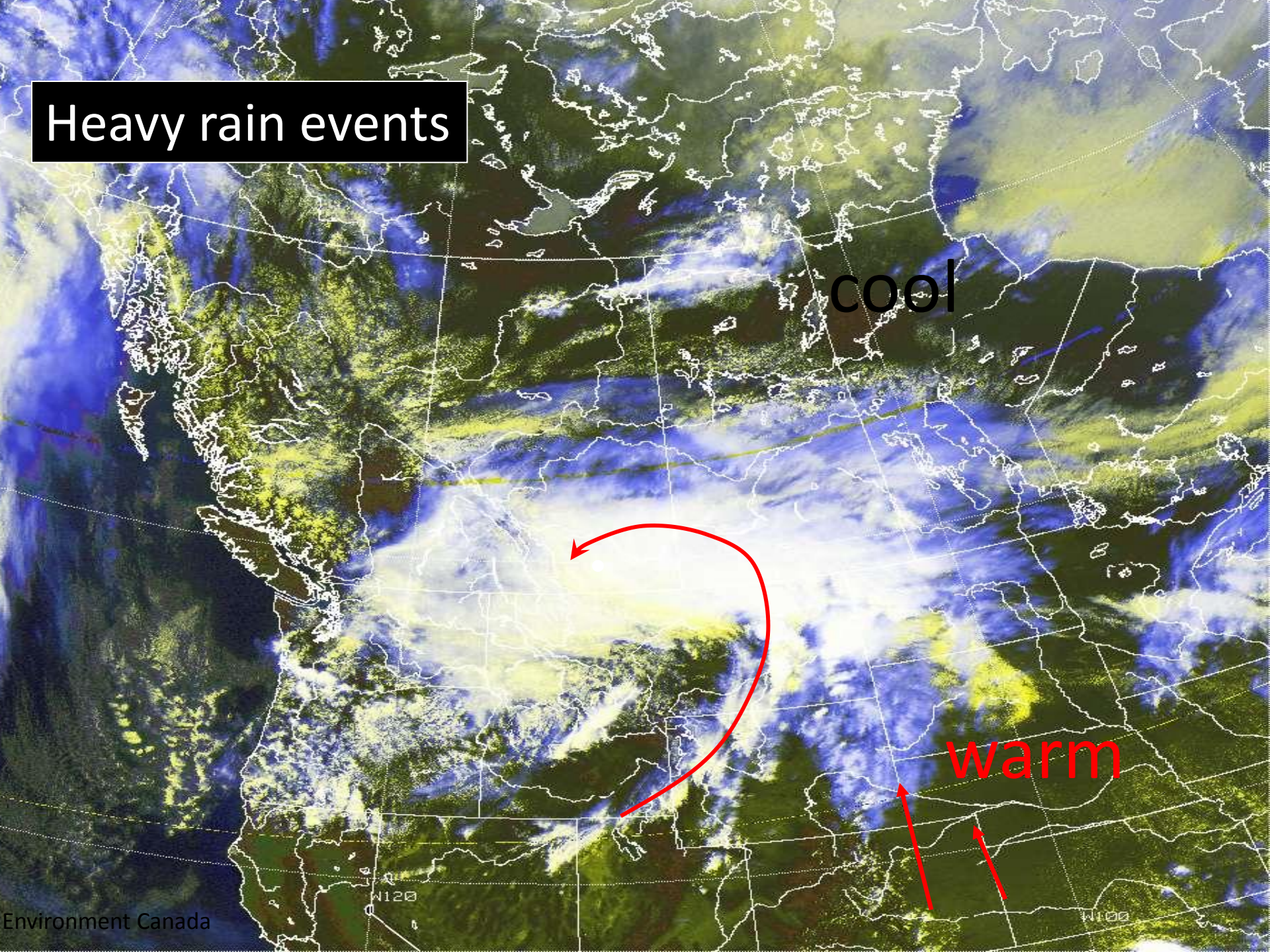
- Relocate or protect development
- Value of developed properties versus frequency of flood damage
- Feasibility of flood protection
  - works until it fails – then it makes things worse
  - adverse impacts of flood mitigation measures
- How big was the 2013 flood and how likely is it to occur again? We don't know.

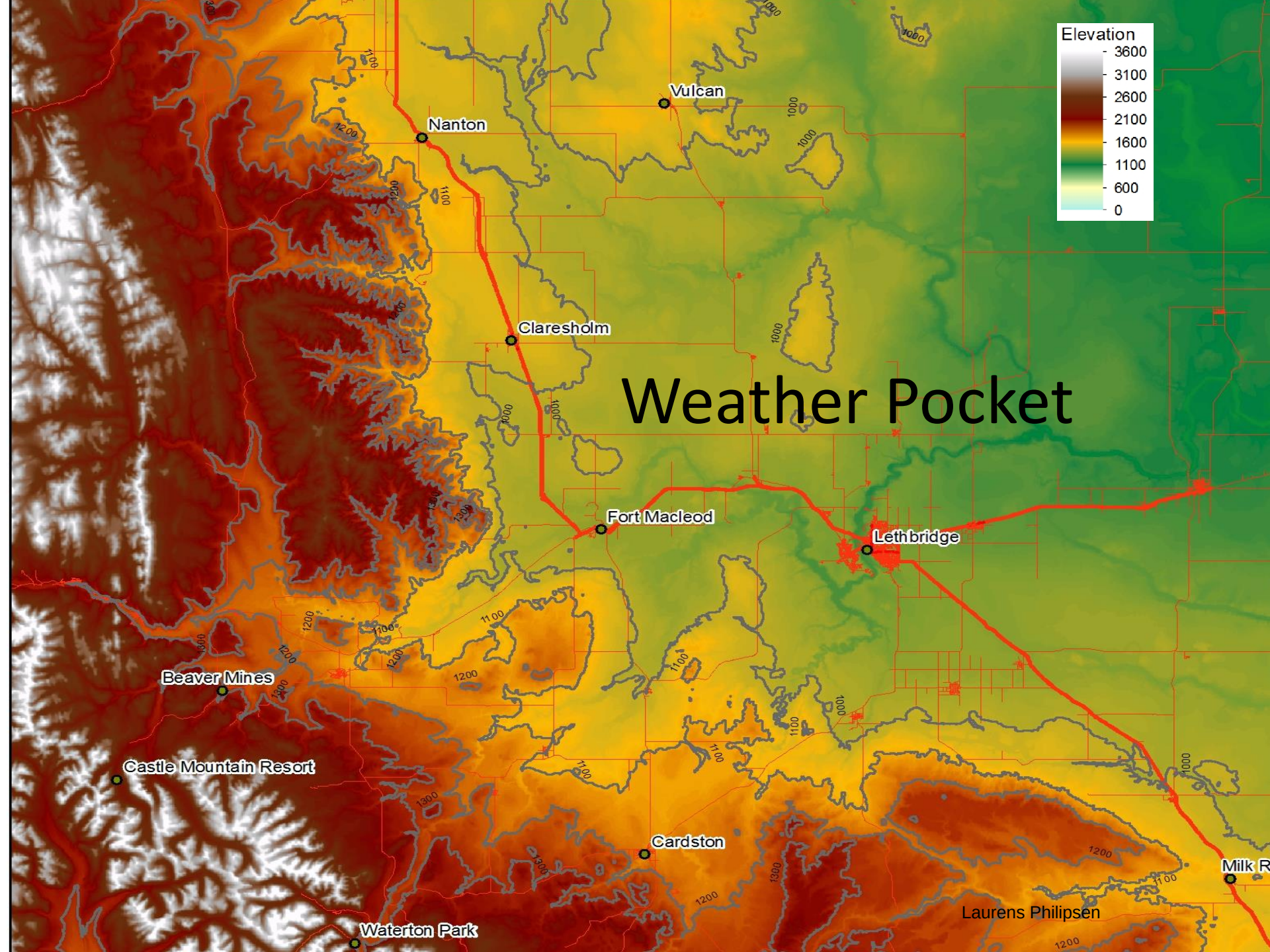
How big was the flood?

- Gauging stations washed out
- Channel erosion and relocation at gauging stations
- Spillage from one basin into another
- Flood flows calculated from secondary sources (e.g. high water marks on bridges)
- Peak flows for 2013 flood still being calculated

What was the flood frequency?

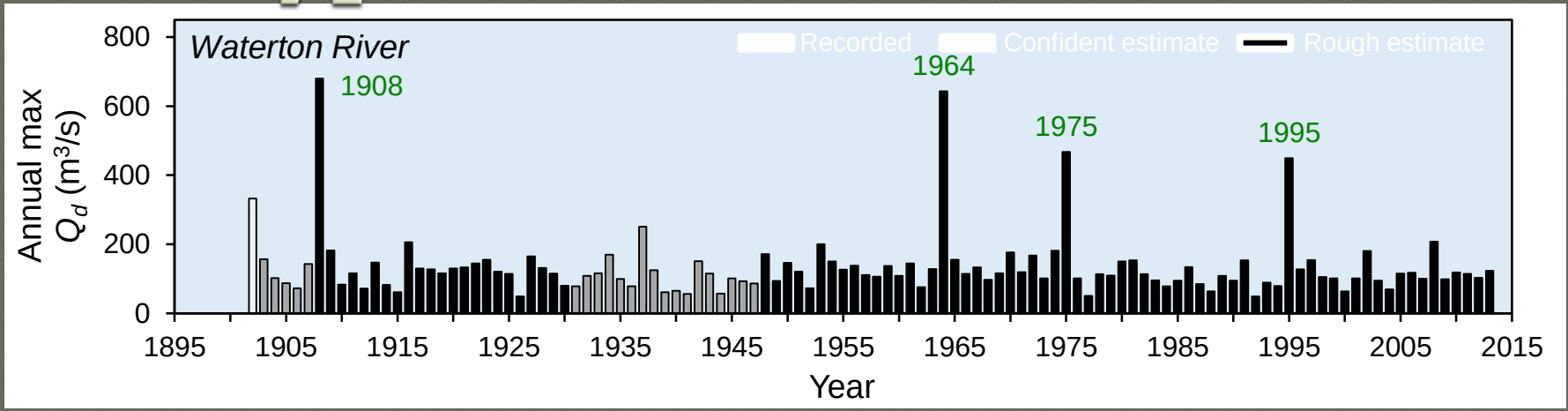
- Limitations of hydrologic record
  - many gauging stations have short history
  - many gauging stations relocated periodically
  - much unreliable data
- Limitations of analysis
  - difficulty of assigning probabilities to infrequent events
  - no reliable statistical method of analyzing flood frequency

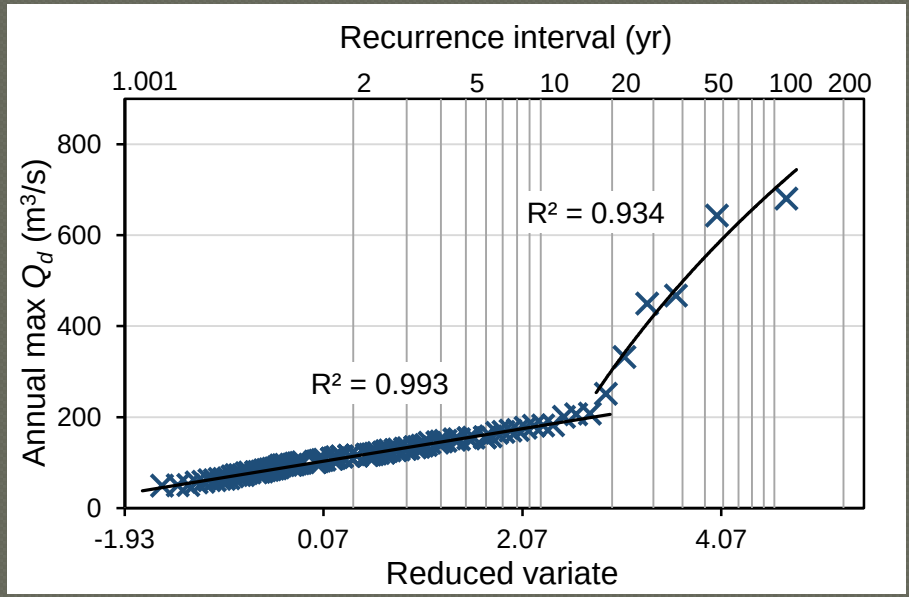

Heavy rain events
cool
warm
W120
W100
Environment Canada



Weather Pocket

Typical Flood Flow Pattern





Key Points

- We don't have a good understanding of historical flood frequency
- An understanding of general climate change in the region will likely not help predict changes in flood frequency
- We need a prediction of frequency of changes in weather patterns
- Understand the certainty of error in probability