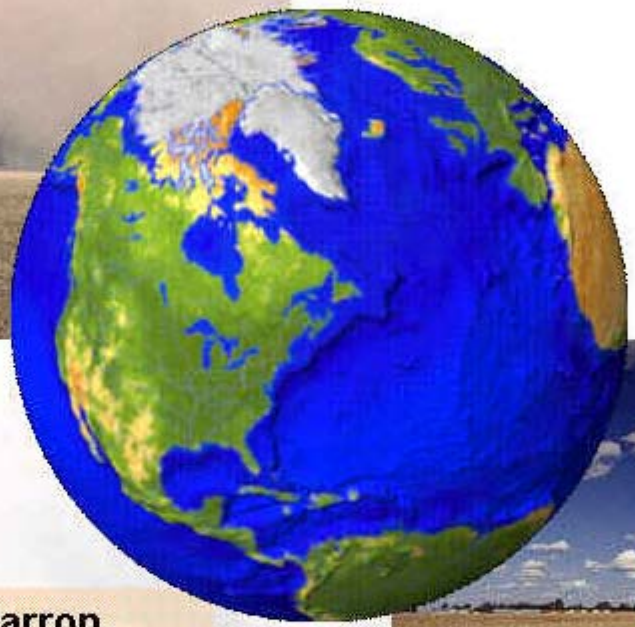
Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Assessment of Climate Change on the Agricultural Resources of the Canadian Prairies



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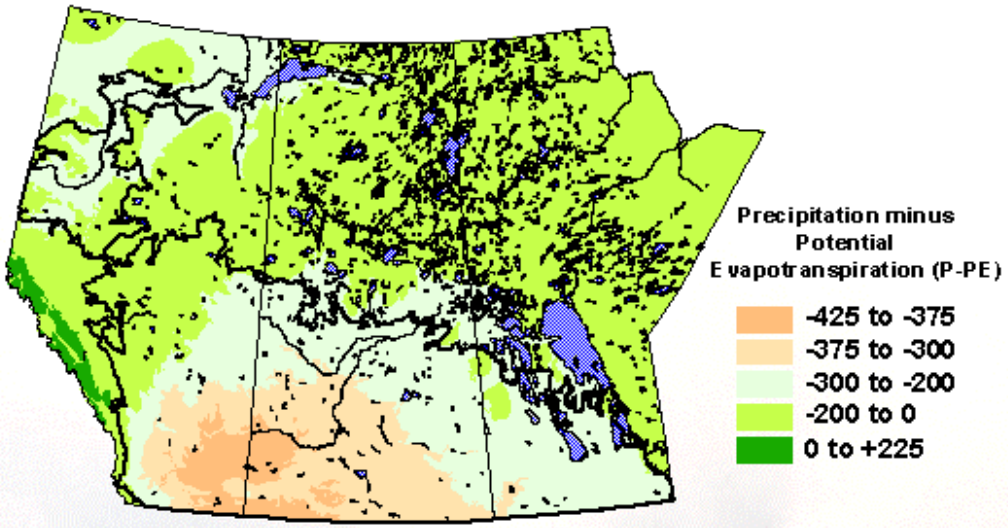
PRAIRIE ADAPTATION RESEARCH COLLABORATIVE

PARC

Canada

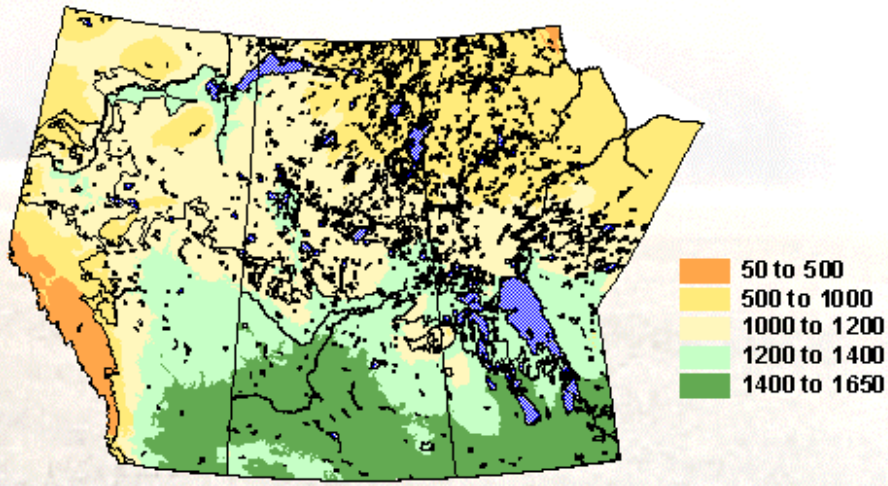
We live in a cool semi-arid region…

Moisture Deficit (P-PE) (1961-90)



• Moisture deficit measures aridity… how dry conditions are. larger negative values, indicate drier conditions.

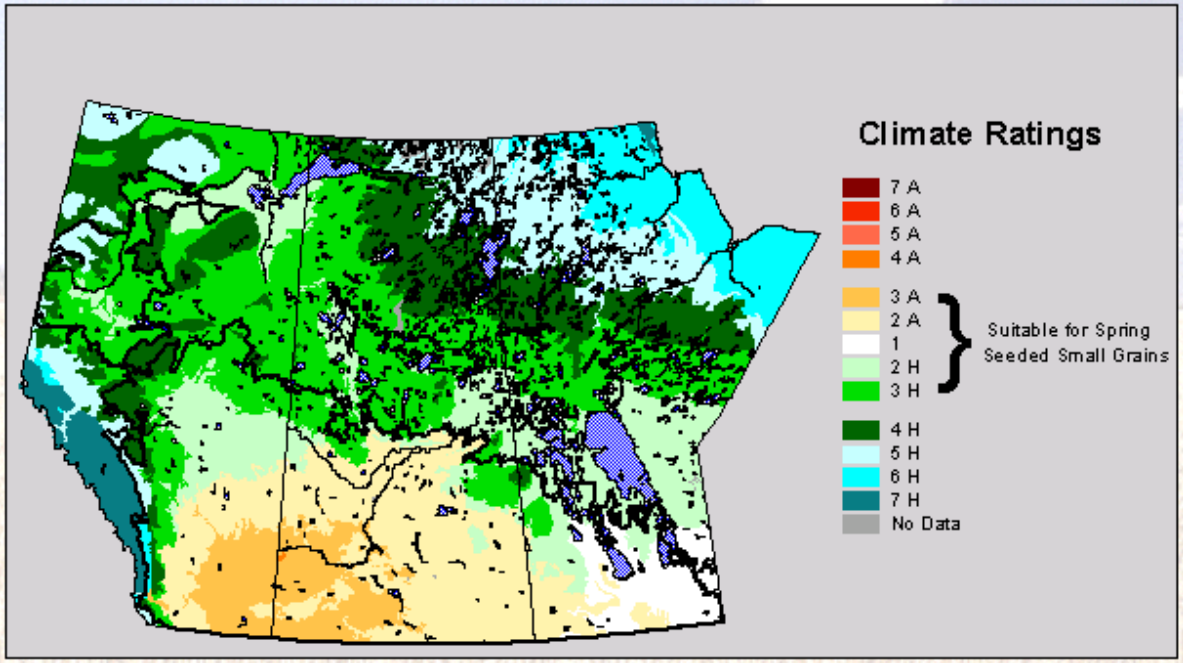
Temperature Factor (EGDD) (1961-90)



•Temperature Factor measures favourable growing conditions in effective growing degree days (EGDD).

Small changes in climate could affect agricultural production…

Land Suitability Rating System (LSRS) Climate Classification (1961-90)

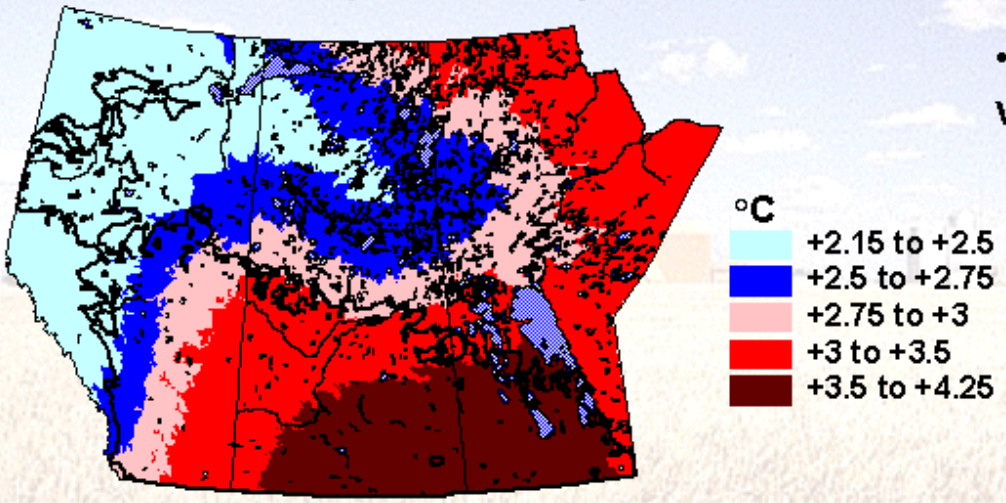


- Climate classes 1 to 3 are suitable for spring-seeded cereals like wheat
- Class 4 is marginal for cultivation
- Classes 5 to 7 are unsuitable for cultivated agriculture

- "A" indicates a moisture limitation
- "H" indicates a temperature limitation

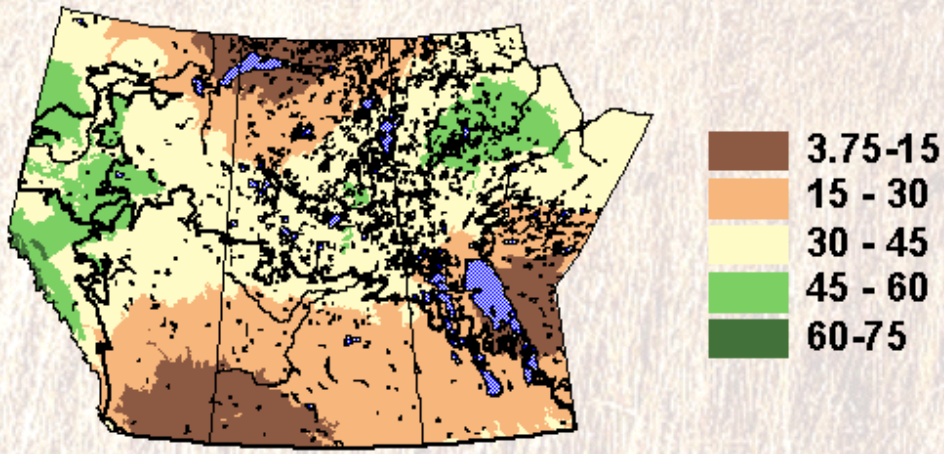
Climate change models predict increases in temperature and precipitation…

Mean Annual Maximum Temperature Change (2040-69)



- Southern Saskatchewan and Manitoba will see large increases in temperature.

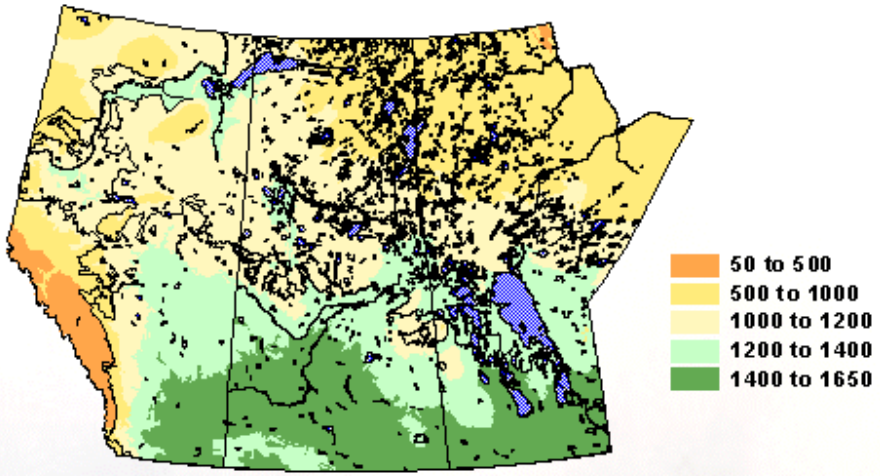
Mean Annual Precipitation Change (mm) (2040-69)



- Northwestern Alberta and northern Manitoba will see largest increases in precipitation.

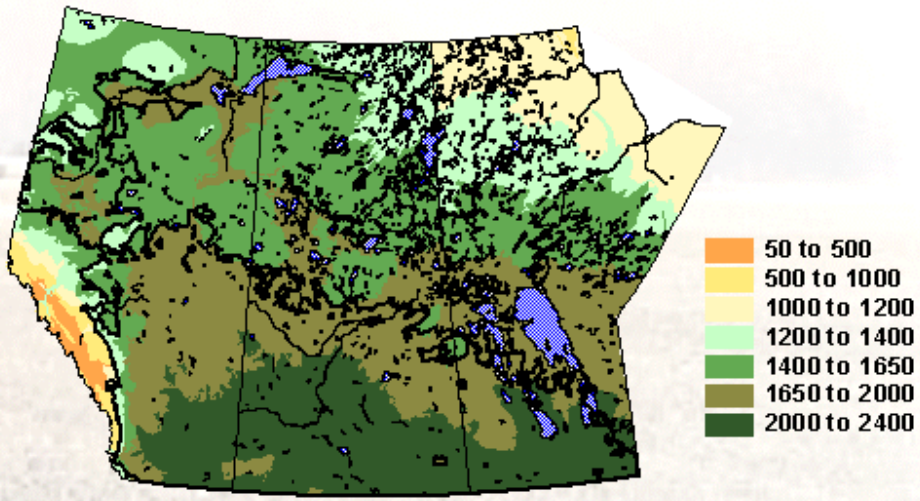
Higher temperatures will provide a warmer and longer growing season…

Temperature Factor (EGDD)
(1961-90)



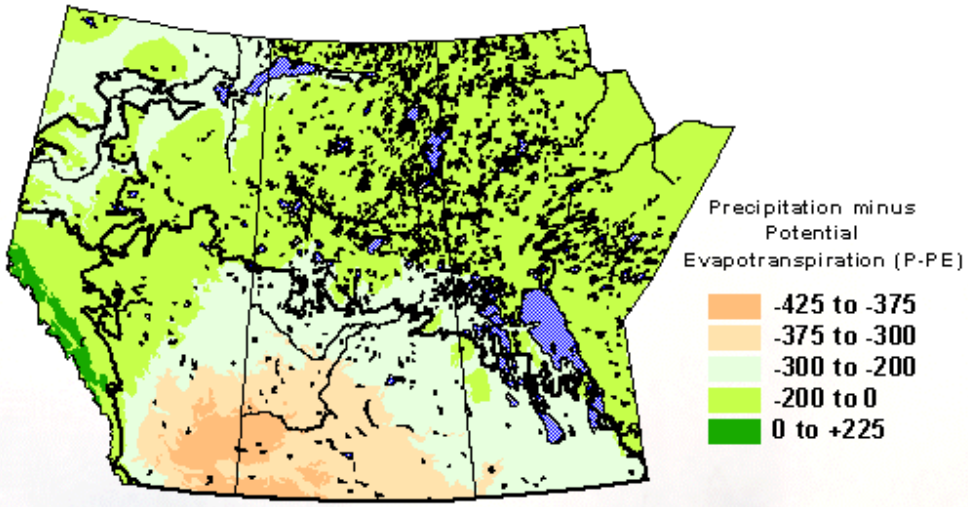
- All of the Prairies will have more favourable temperatures for a longer growing season.

Temperature Factor (EGDD)
(2040-69)



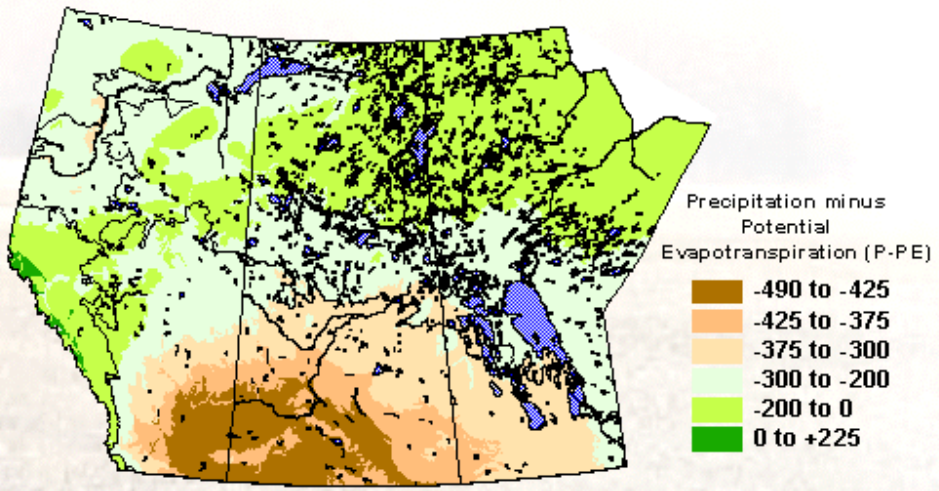
But less moisture for cropping…

Moisture Deficit (P-PE) (1961-90)



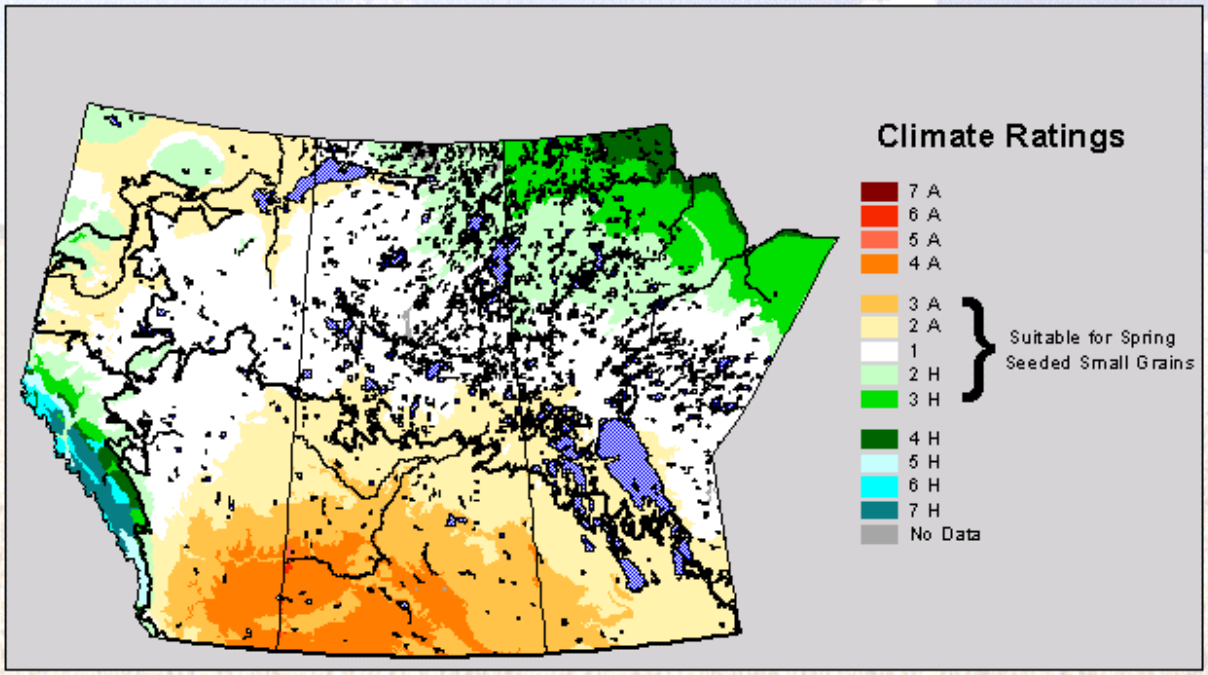
- Dry conditions in southern areas of the Prairies may intensify and expand.

Moisture Deficit (P-PE) (2040-69)



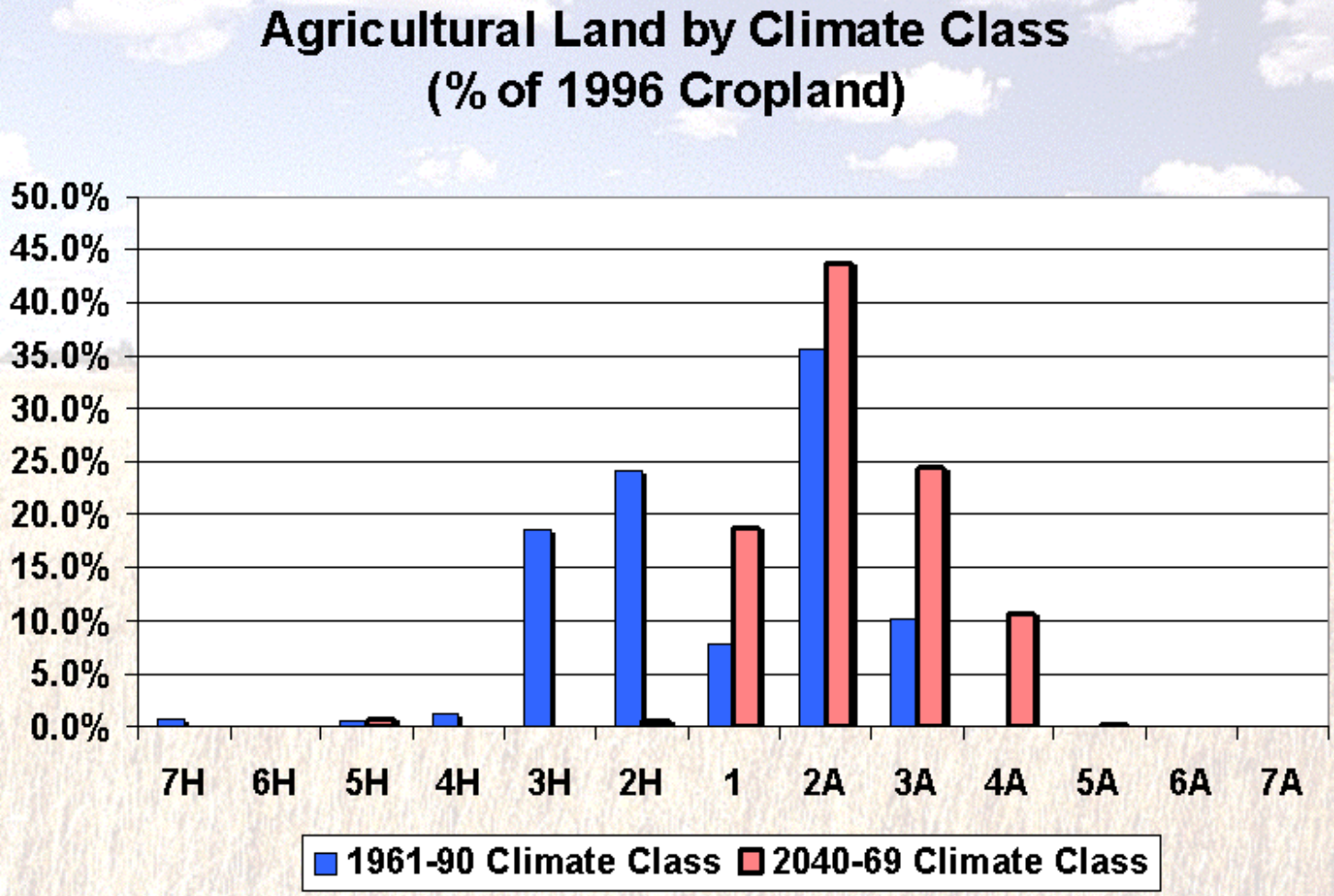
Favourable cropping conditions may shift northward …

Land Suitability Rating System (LSRS) Climate Classification (2040-69)



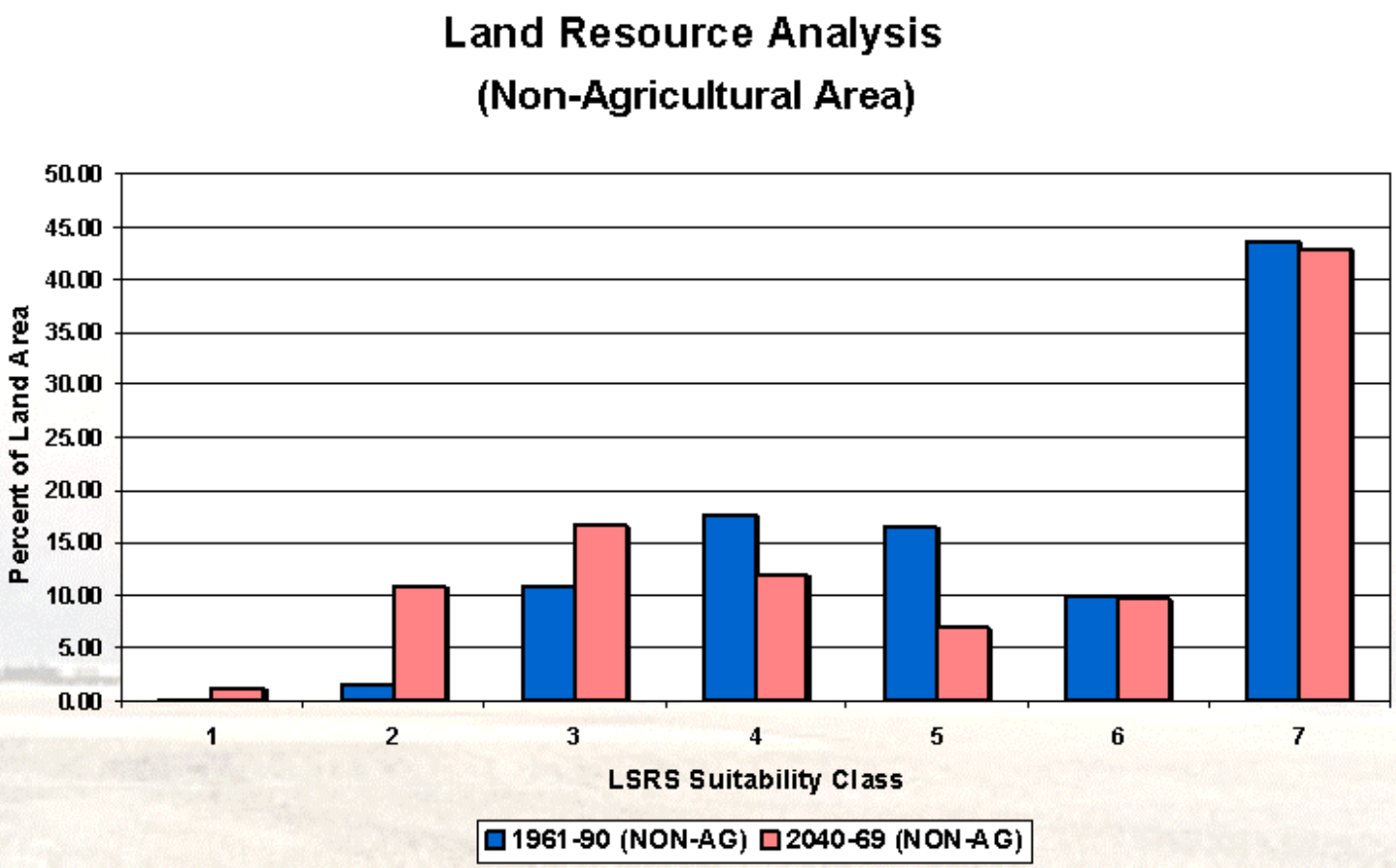
- Large areas of currently non-agricultural land could have favourable climate, but may not have suitable soils.

Necessitating possible changes in cropping from spring-seeded cereals…



- Areas that are now farmed will become warmer and drier

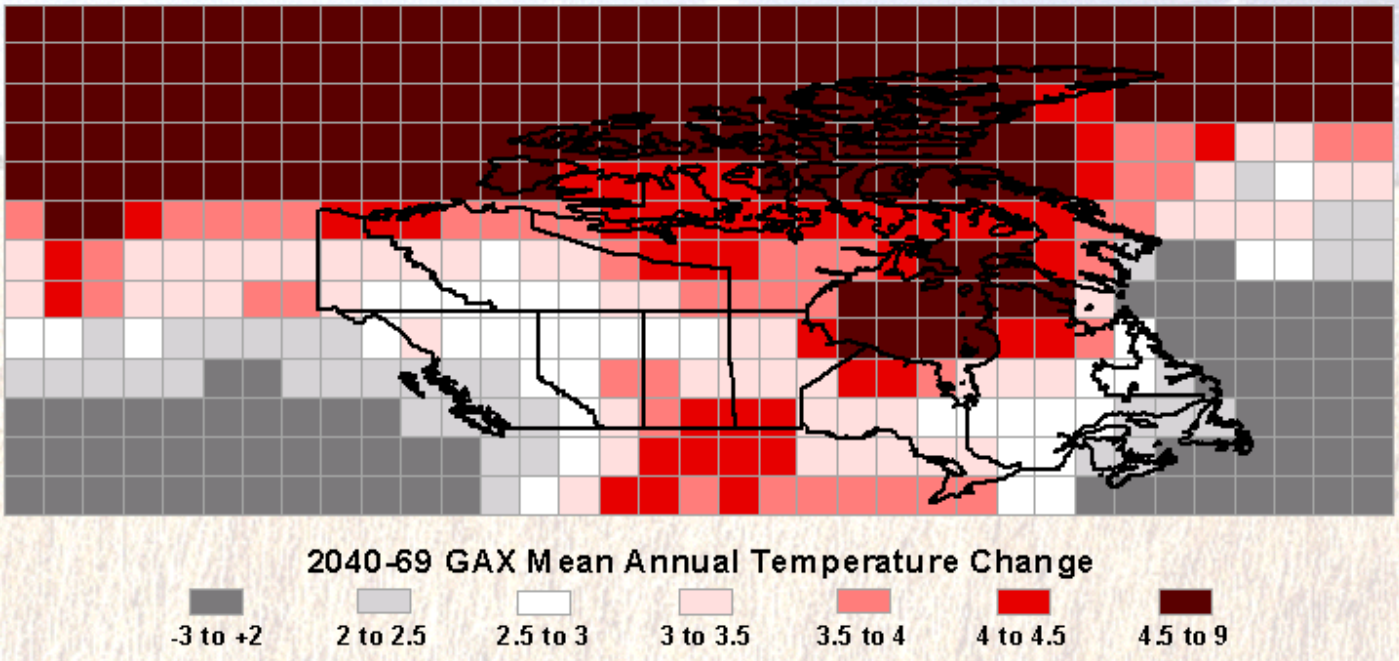
And potential expansion into traditionally non-agricultural areas…



- Land along the agricultural fringe will become suitable for cropping

These results use one climate scenario…

Canadian Global Circulation Model (CGCM1)



http://www.cics.uvic.ca/

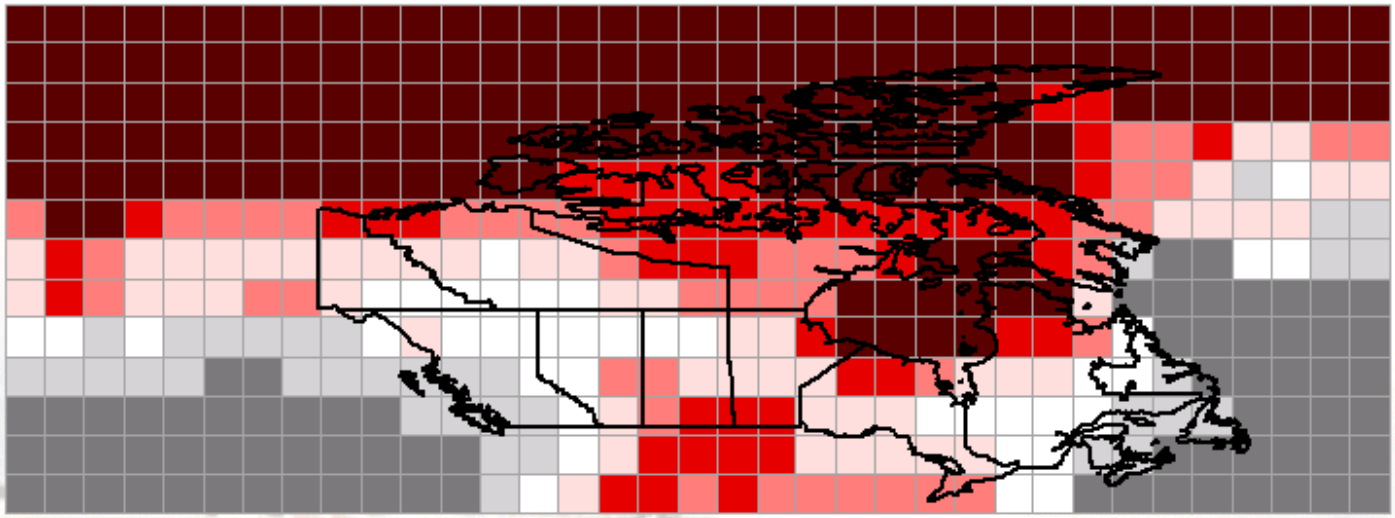
- Other climate change scenarios must be compared to these results.

There will be a need for adaptation regardless of the magnitude of change.

Process for relating climate change scenarios to Agricultural resources…

Selection of climate change model…

Canadian Global Circulation Model (CGCM1)



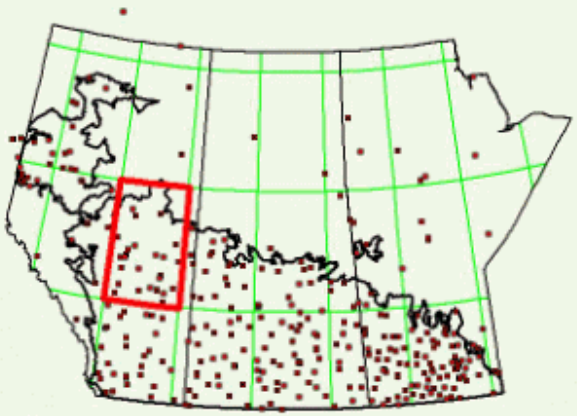
2040-69 GAX Mean Annual Temperature Change

-3 to +2	2 to 2.5	2.5 to 3	3 to 3.5	3.5 to 4	4 to 4.5	4.5 to 9

http://www.cics.uvic.ca/

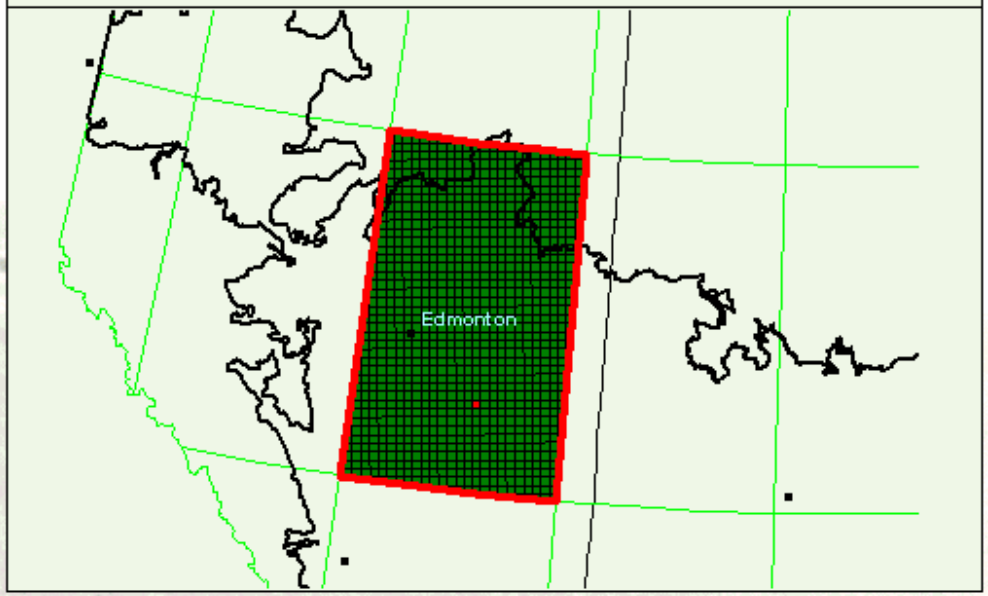
Climate station and climate model data were interpolated to a 500 Arc Second (~10-15km) grid cell…

CGCM1 Grid Cell Scale and Climate Stations



AAFC/ECORC and NRCAN/CFS

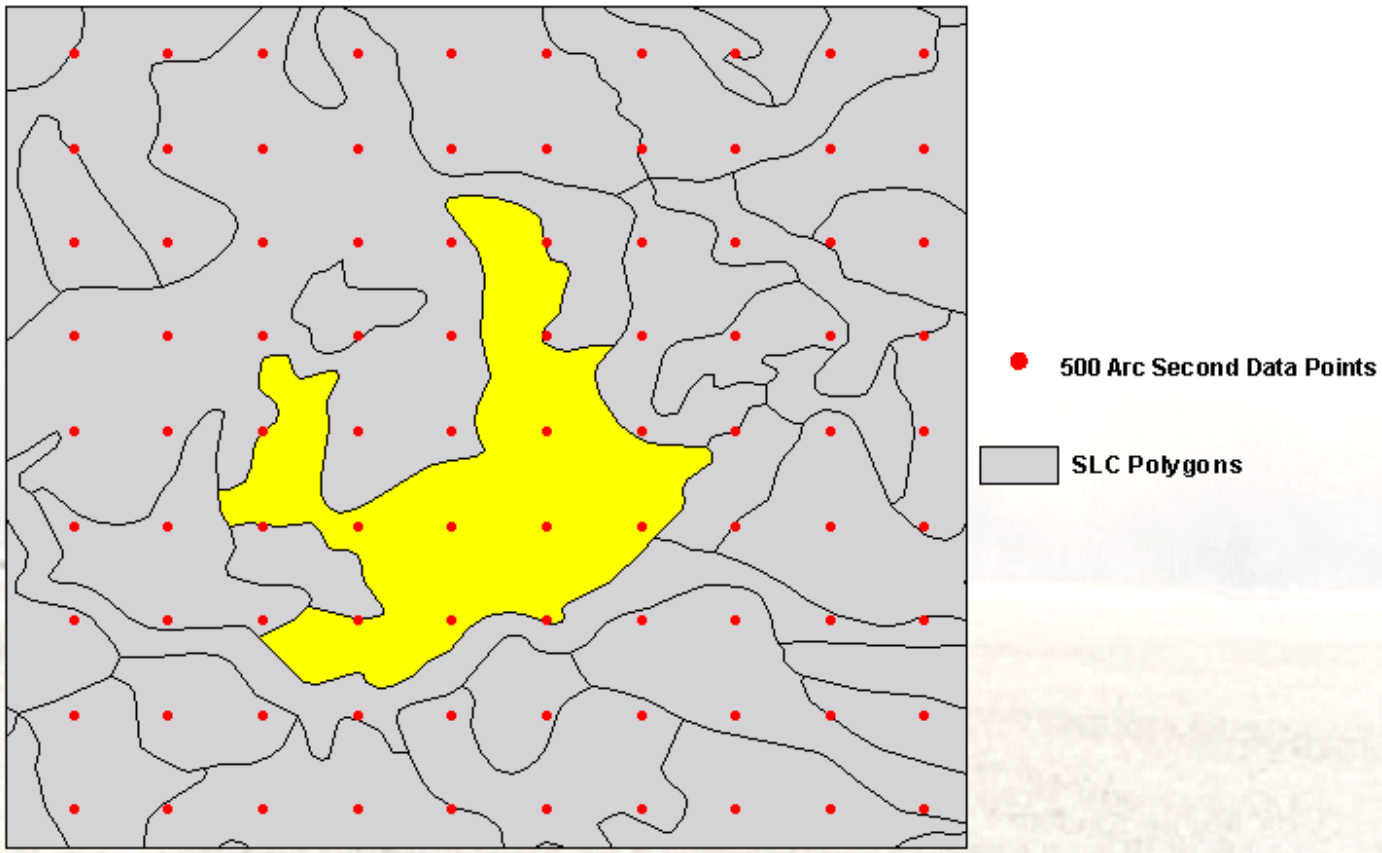
Interpolated Grid Cell Scale (500 Arc Second)



Bootsma, A. 2000. Procedure for Calculating: crop heat units, growing degree-days, effective growing degree-days, precipitation deficit/surplus, aridity index from monthly climate normals data. Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, Ottawa.

Grid cell data was averaged within the Soil Landscapes of Canada (SLC) polygons…

500 Arc Second Data (Averaged within SLC Polygons)



http://sis.agr.gc.ca/cansis/nsdb/slc/intro.html

The Land Suitability Rating System (LSRS) was calculated from 1961-90 and 2040-69 data…

LSRS Parameters

- Soil Landscapes of Canada (SLC)
- soil layer file/soil names file
- soil component file
- climate file (P-PE/EGDD)

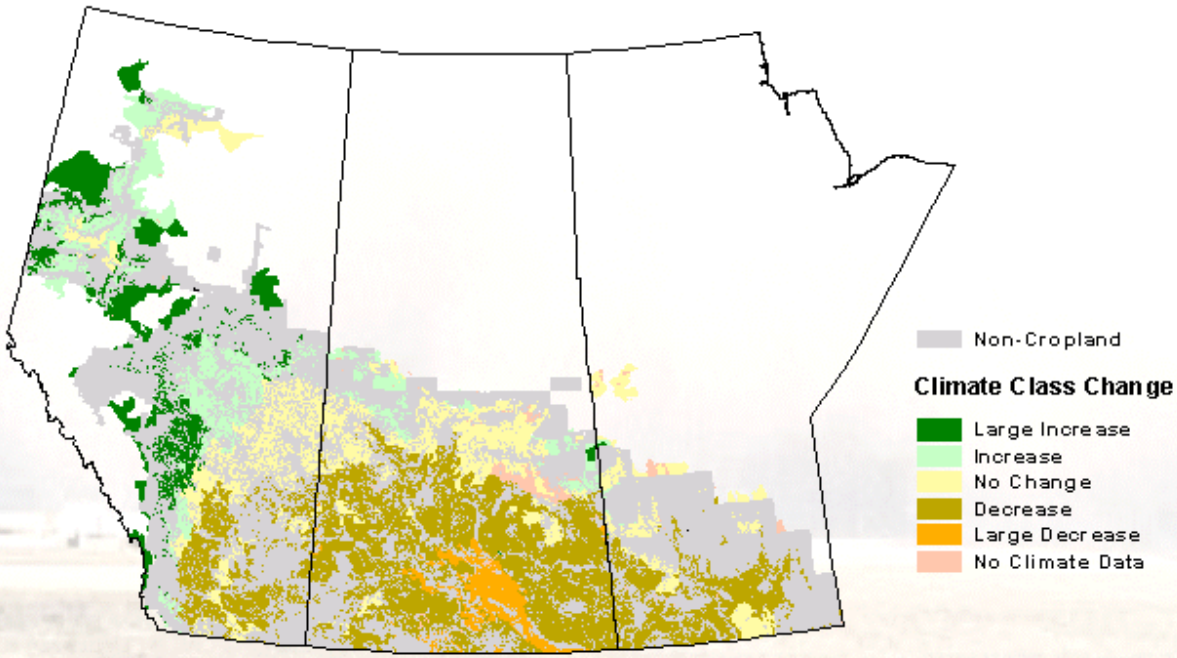
LSRS Results

- Rating class and subclasses for climate, soil and landscape
- Limiting class

http://sis.agr.gc.ca/cansis/publications/manuals/lsrs.html

The magnitude of climate change was compared to the 1996 Agricultural Census…

Magnitude of Climate Class Change (Agricultural Cropland Area)

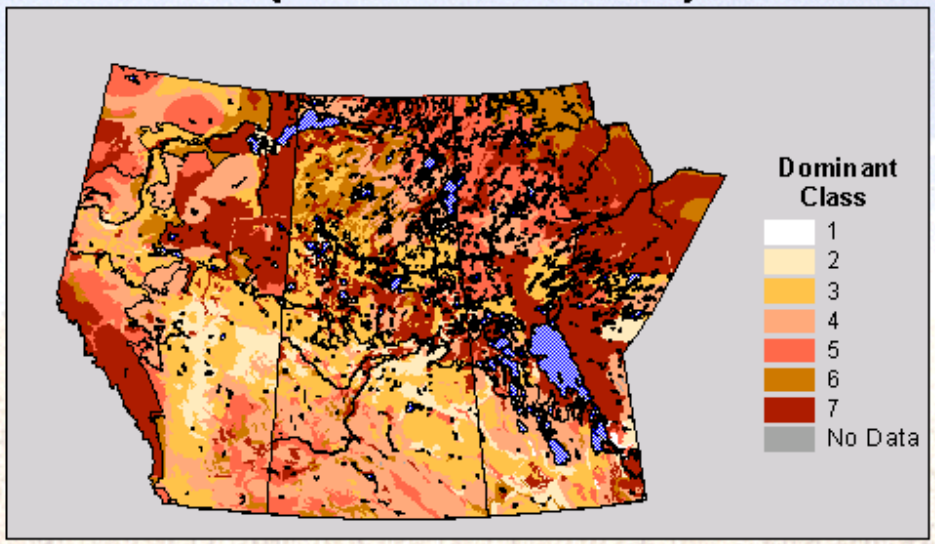


- Agricultural Census was available by SLC polygon spatial scale

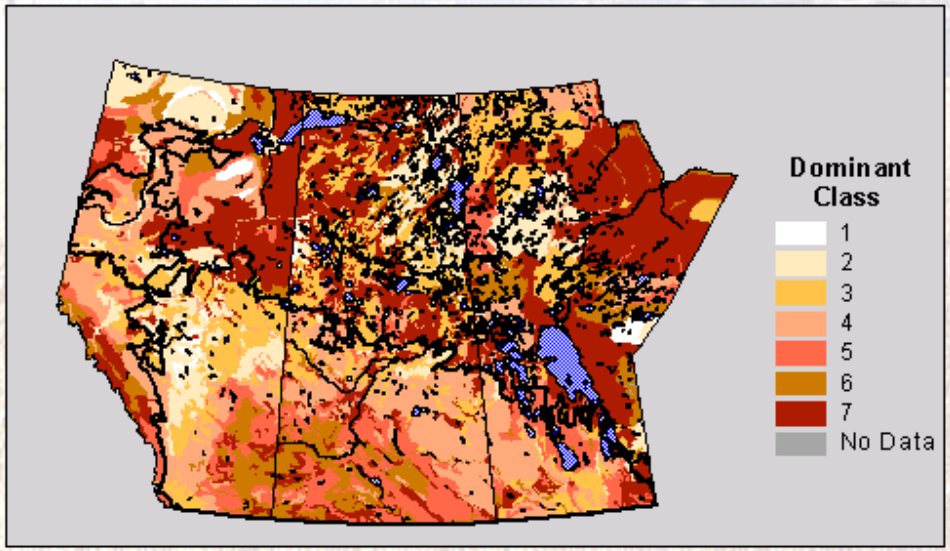
Hiley, J.C. 1999. Farmers work with nature's bounty. In Gaye, W., ed., Canadian agriculture at a glance. Statistics Canada, Ottawa, ON, Canada. No. 96-325-XPB. Pp. 191-195.

LSRS limiting classes were compared…

1961-90 LSRS Limiting Factor (Dominant Class)

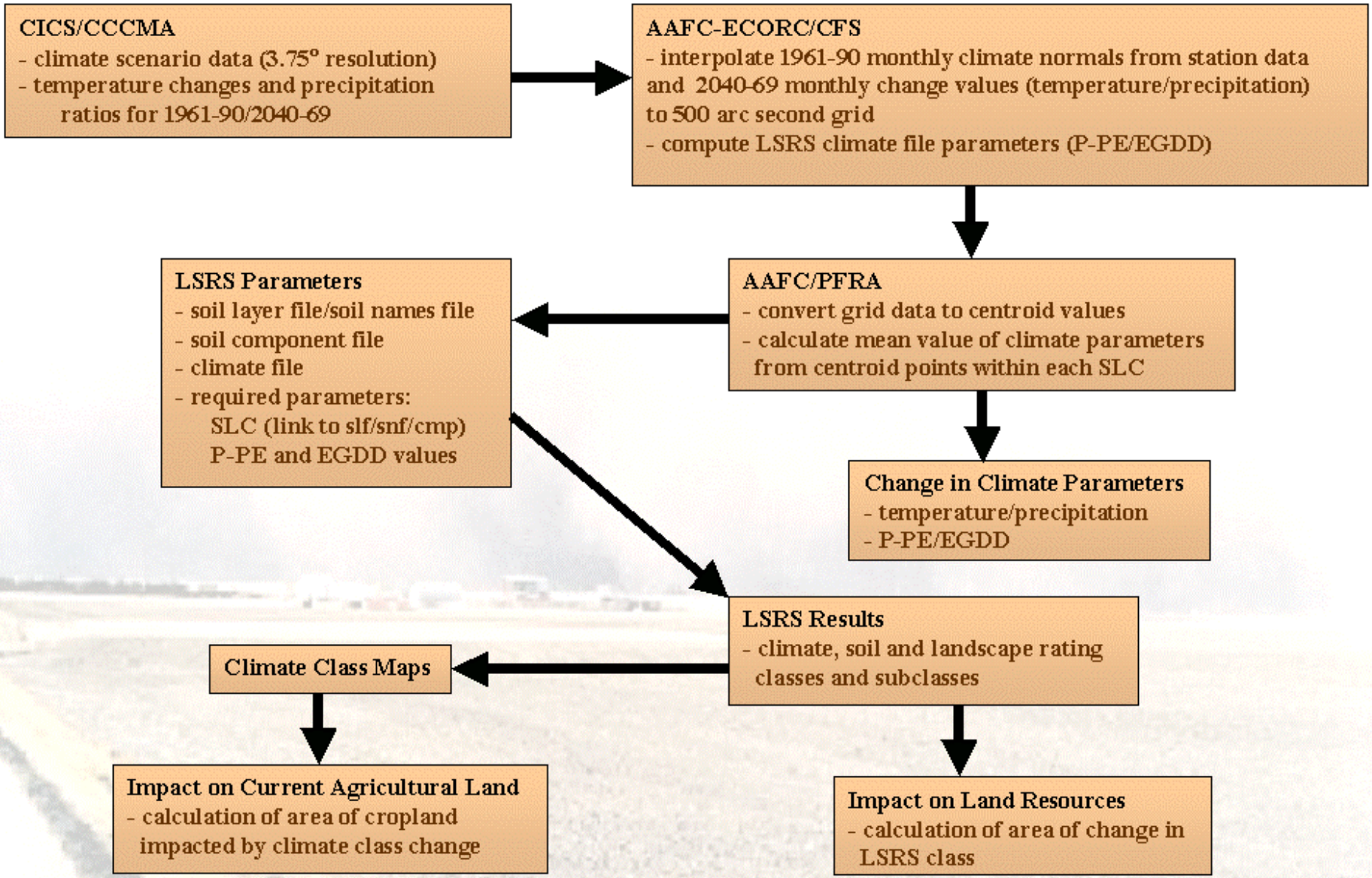


2040-69 LSRS Limiting Factor (Dominant Class)



- Based on the most limiting factor for the dominant component from: climate, soil and landscape ratings.

This process could be applied to other climate scenarios…



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