



# Capturing the Dynamics of the 1999-2005 Canadian Prairie Drought and Agricultural Impacts

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Fondation canadienne pour les sciences  
du climat et de l'atmosphère (FCSCA)



Environment  
Canada

Environnement  
Canada



# Research Objectives

- Quantify the extent and severity of the 1999-2005 Canadian Prairie drought at a variety of spatial and temporal scales.
- Use drought indices to examine the spatial, temporal patterns, and intensity of the droughts
  - Compare different methodologies to calculate the drought indices
  - Relate drought patterns to agricultural and hydrological impacts
  - Develop methods to document the dynamics of drought migrations



# Drought Indices

- Standard Precipitation Index (SPI)
- Palmer Drought Severity Index (PDSI)
- Palmer Z-Index
- Climate Moisture Index (CMI)



# Input Variables

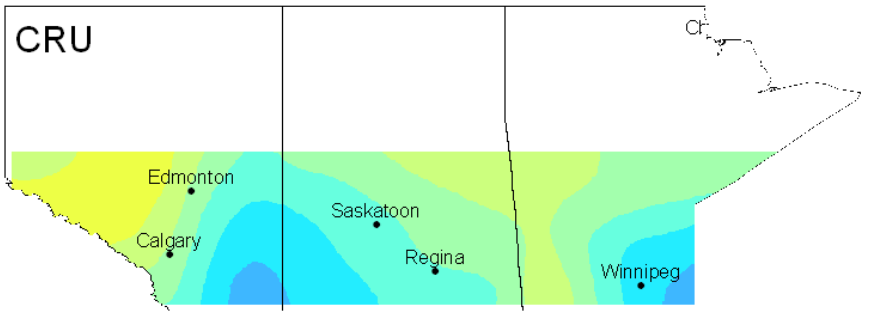
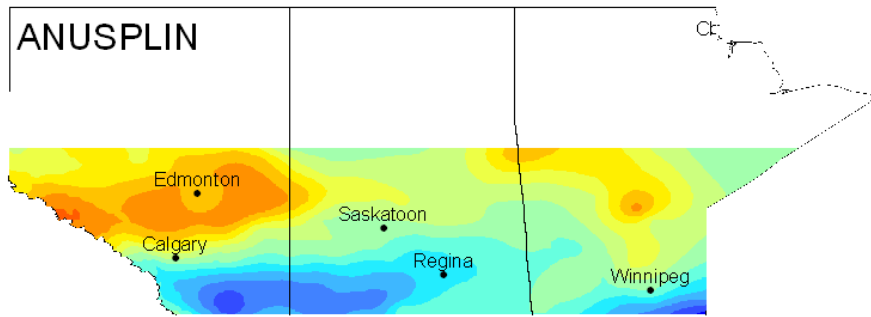
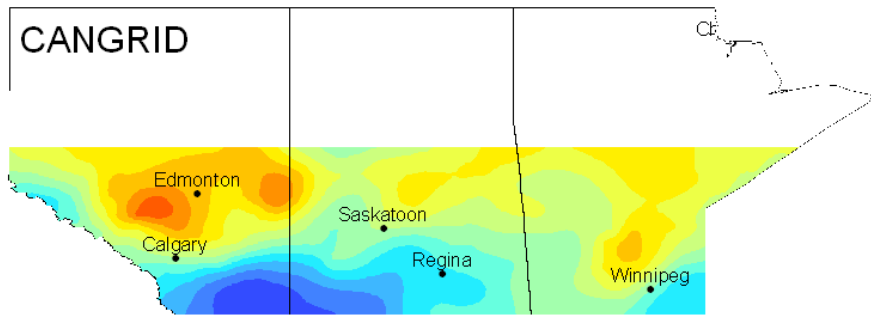
- Gridded datasets of temperature and precipitation
  - Canada
    - Canadian Gridded Climate Data (CANGRID, Environment Canada) – 50km resolution
  - North America
    - Climate Research Unit (CRU TS 2.1, Mitchell and Jones, 2005) – 0.5 degree resolution
    - ANUSPLIN (McKenney et al. 2006) - 10km resolution

# Saskatoon – Ranked 12-month SPI

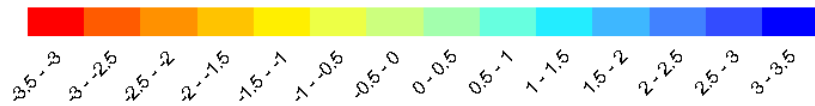
	STATION	CRU	CANGRID	ANUSPLIN
2001	1	39	2	1
1919	2	3	5	4
1924	3	4	3	3
1933	4	10	6	12
1929	5	2	1	5
2002	6	14	29	8
1998	7	8	25	18
1930	8	24	8	19
1952	9	11	19	17
1984	10	38	32	16

- 12-month SPI based on 2001 Agricultural year (September 2000-August 2001)

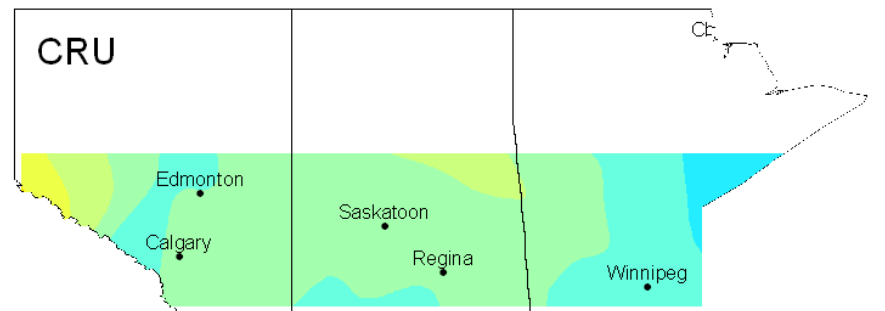
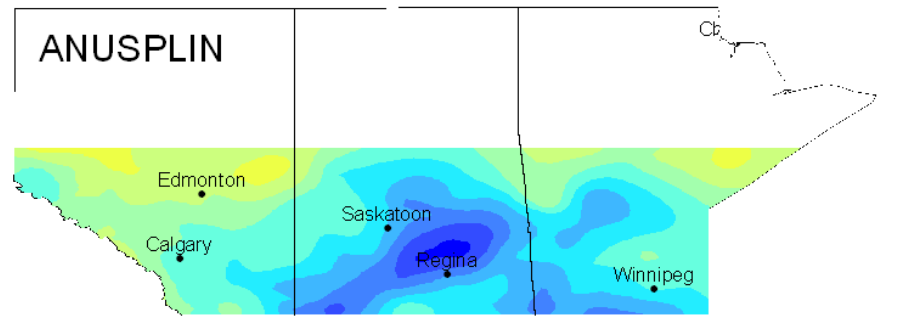
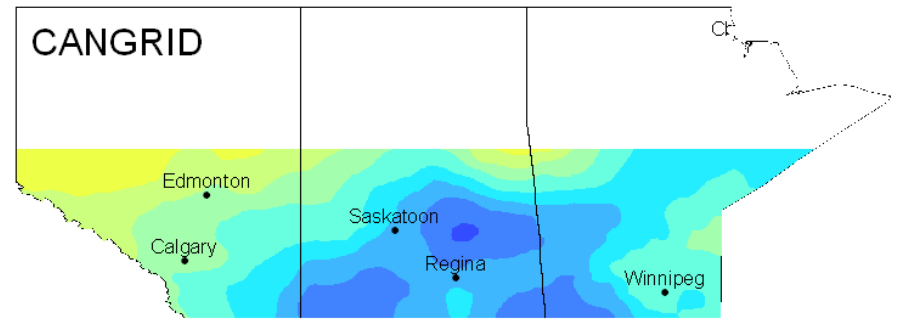
1-month SPI - June 2002



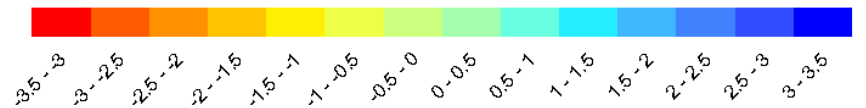
Standard Precipitation Index



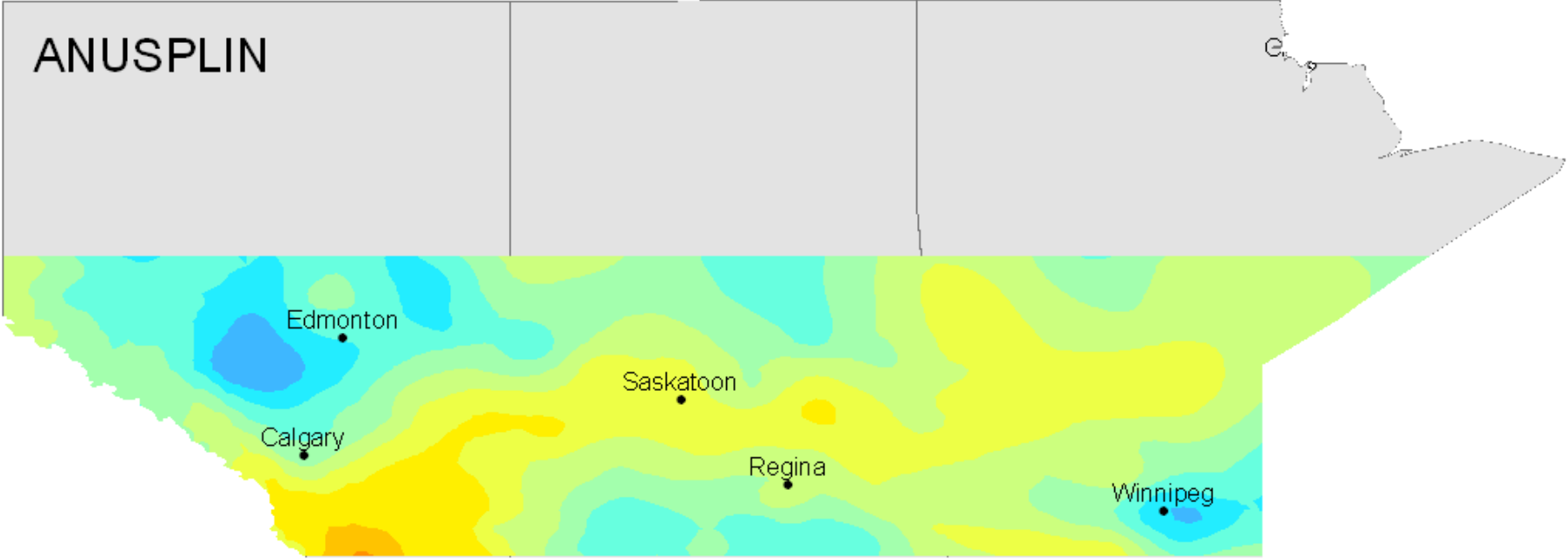
1-month SPI - August 2002



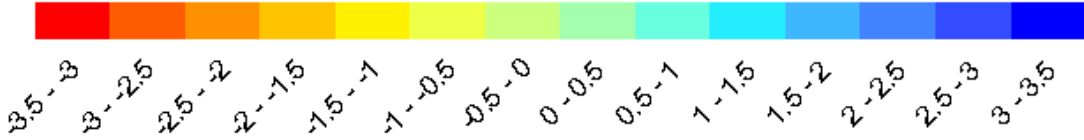
Standard Precipitation Index



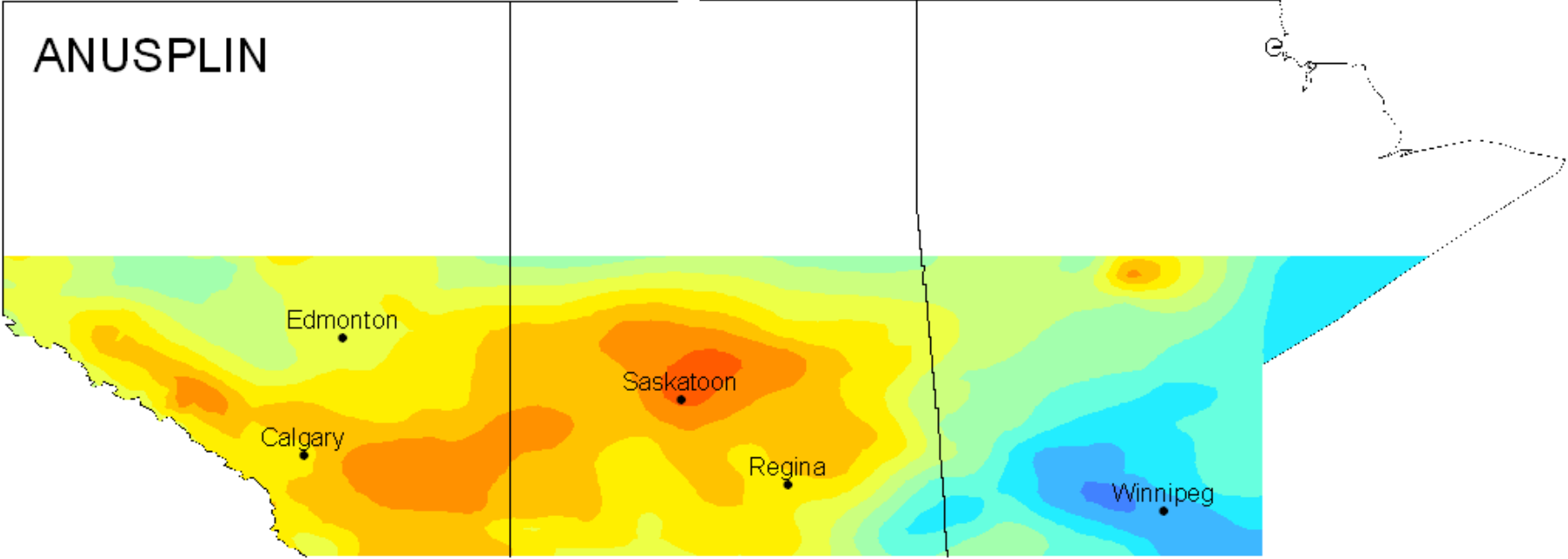
# July 2000 12-month SPI



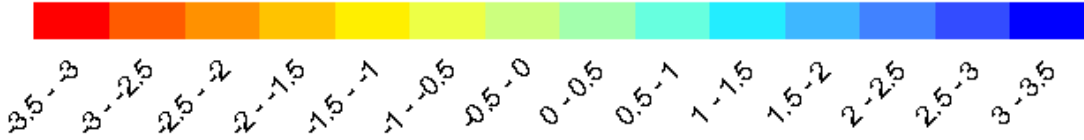
**Standard Precipitation Index**



# August 2001 12-month SPI

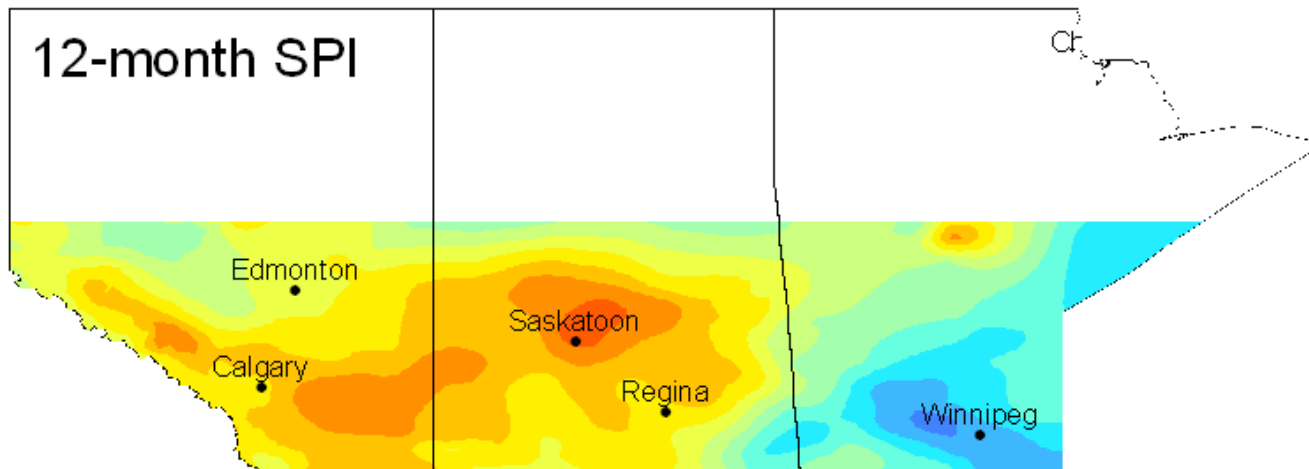


**Standard Precipitation Index**

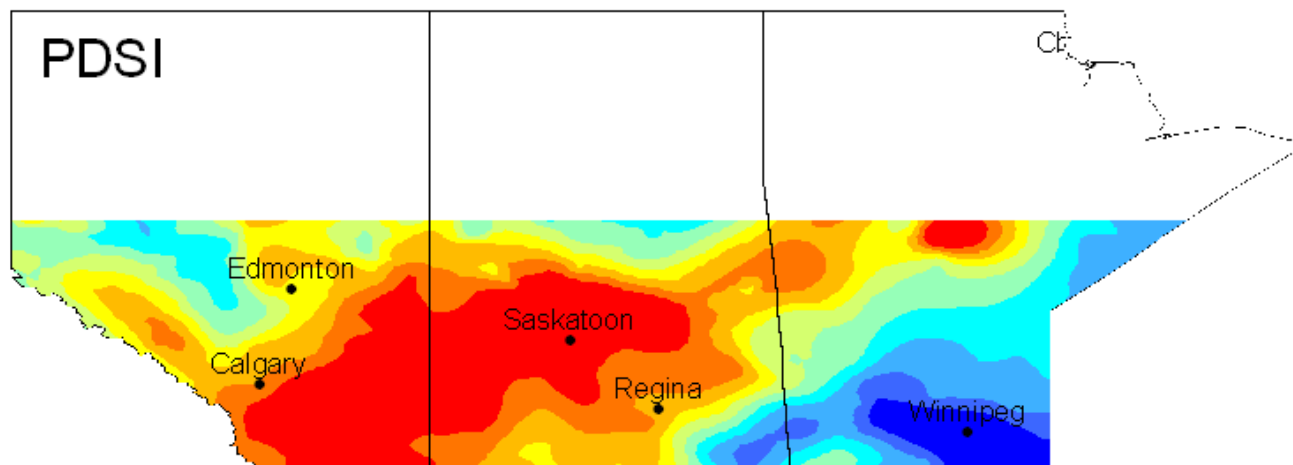
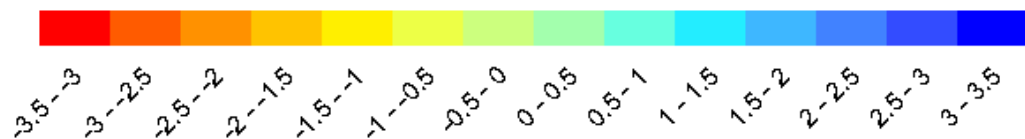




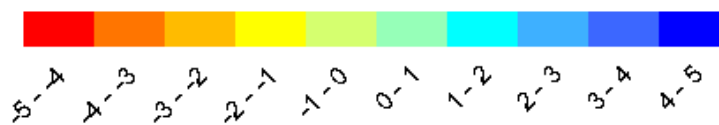
August 2001



Standard Precipitation Index

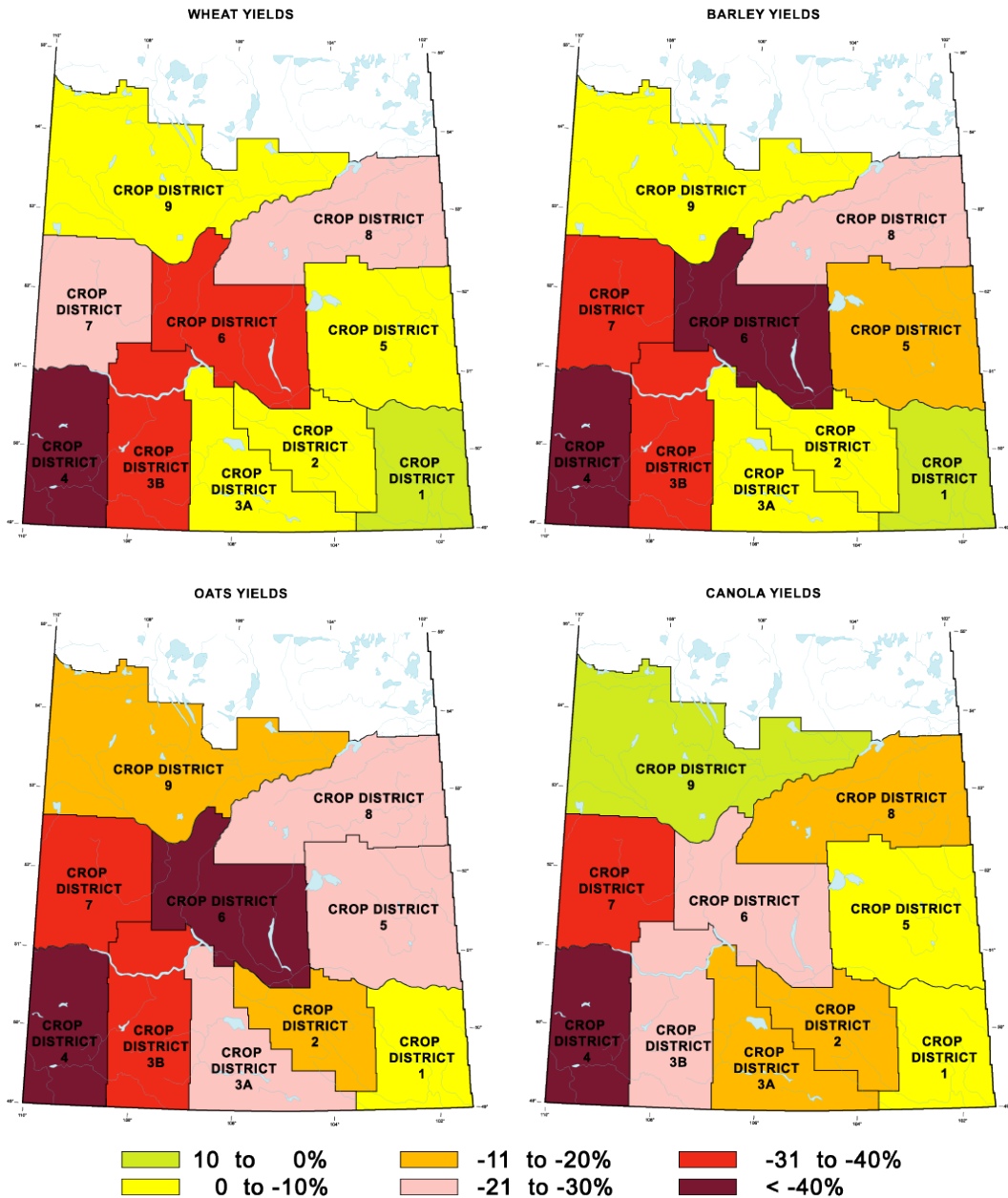


Palmer Drought Severity Index



# Spatial Patterns of Crop Production in 2001 Drought

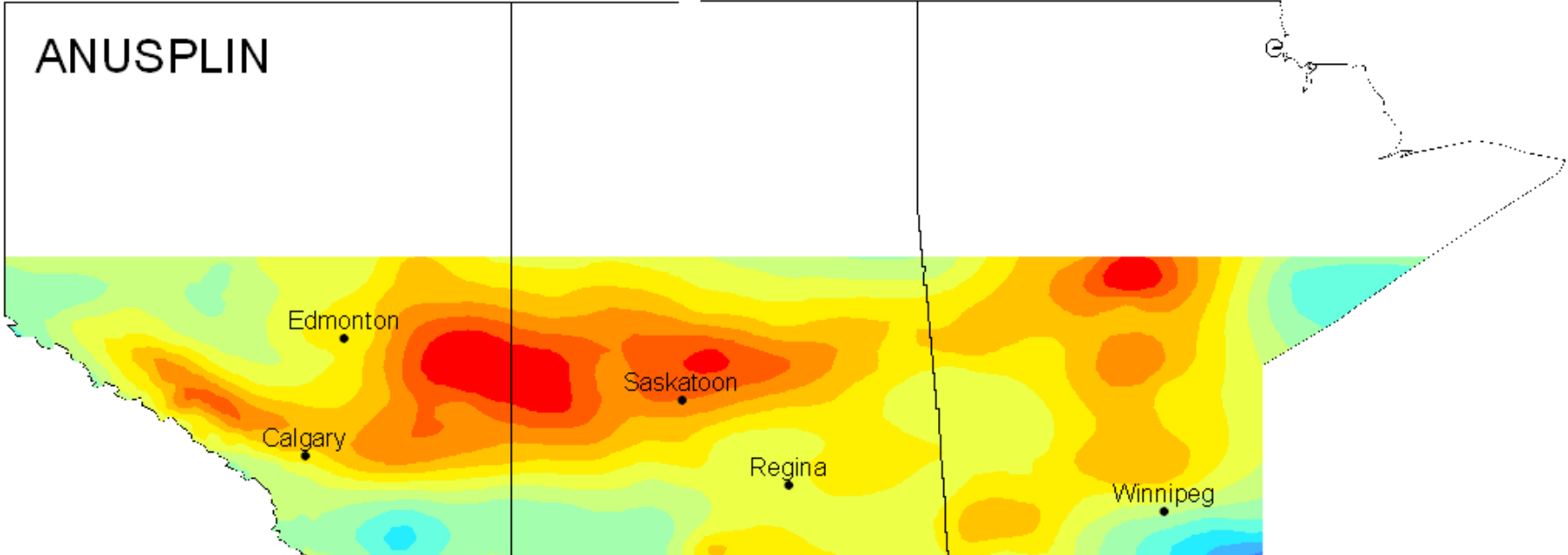
(Wittrock 2001)



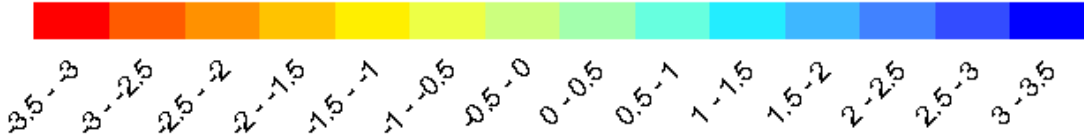
Data source: Saskatchewan Agriculture and Food

Percent Above / Below 10-year Average (1991 - 2000 average bu/ac)

June 2002  
12-month SPI

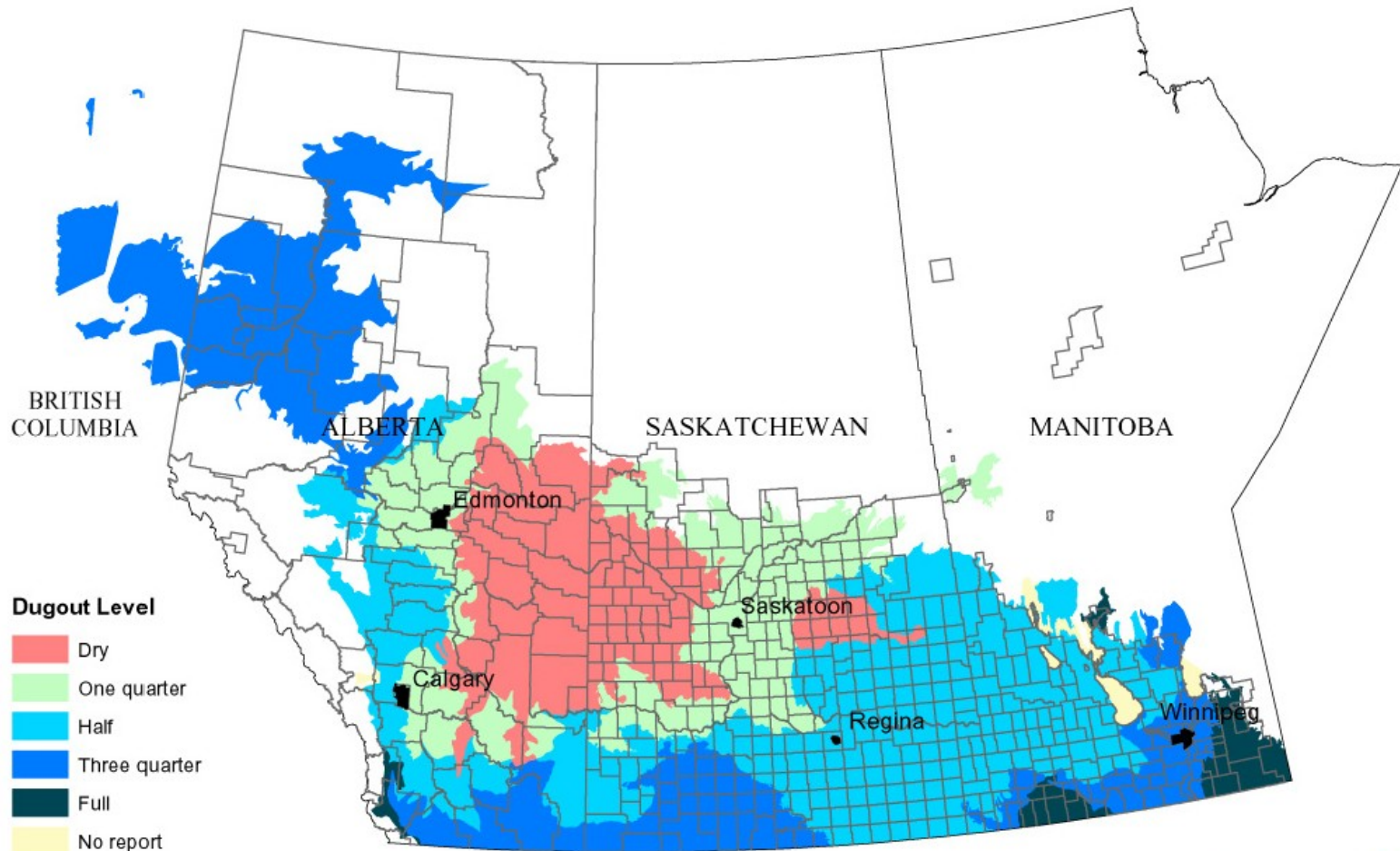


Standard Precipitation Index



# Dugouts are an Important Source of Farm Water

Dugout Levels for 9 September 2002

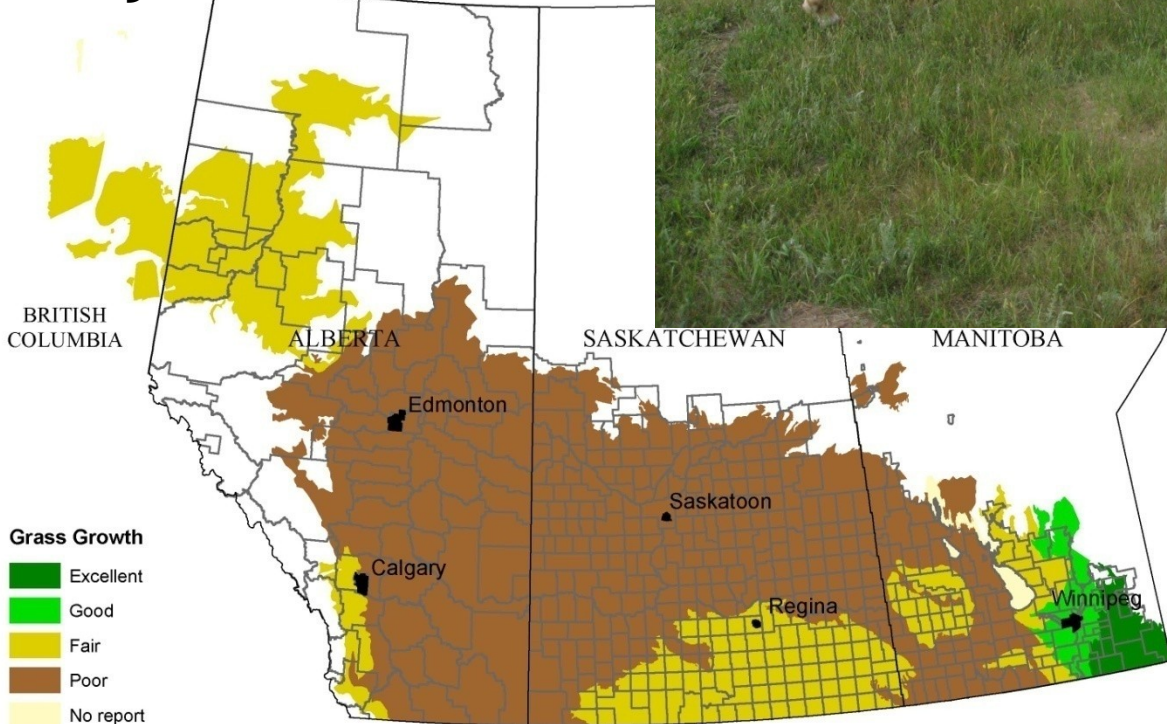


# Grasslands Suffer During Droughts

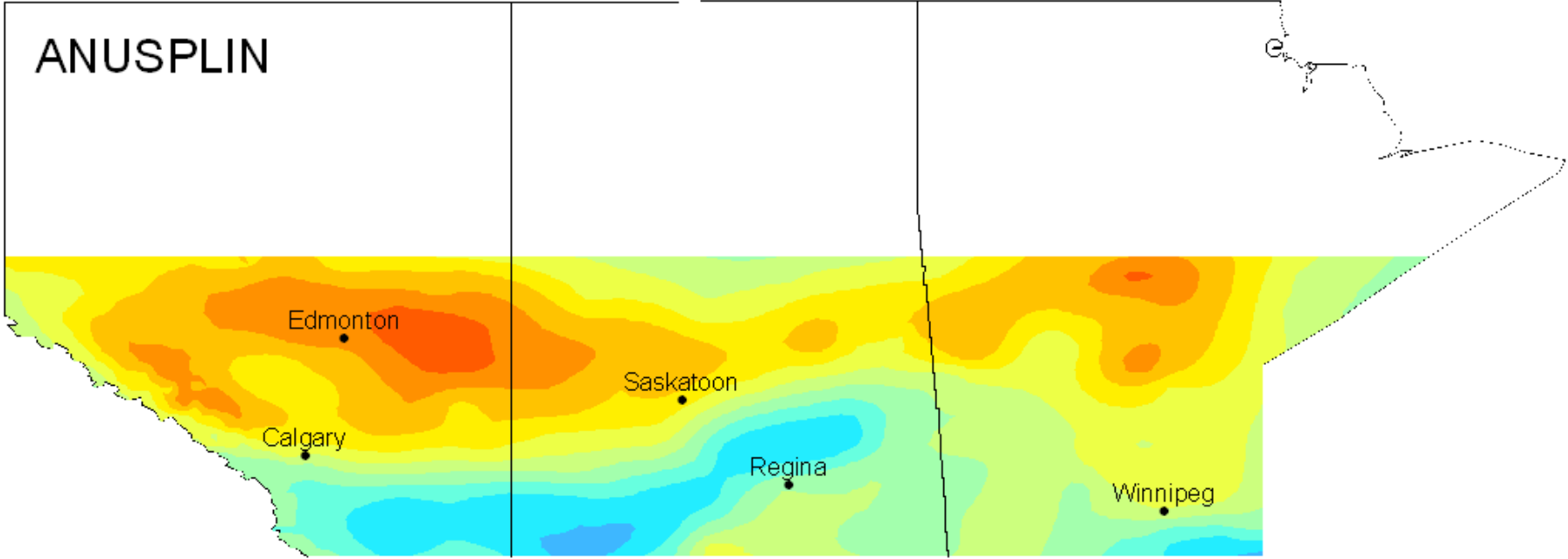
## Grasslands Support Livestock Production



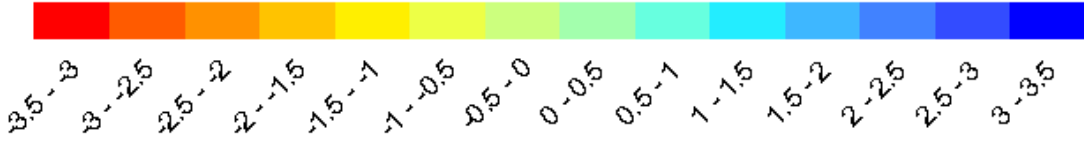
### Grass Growth on Pastures for 6 June 2002



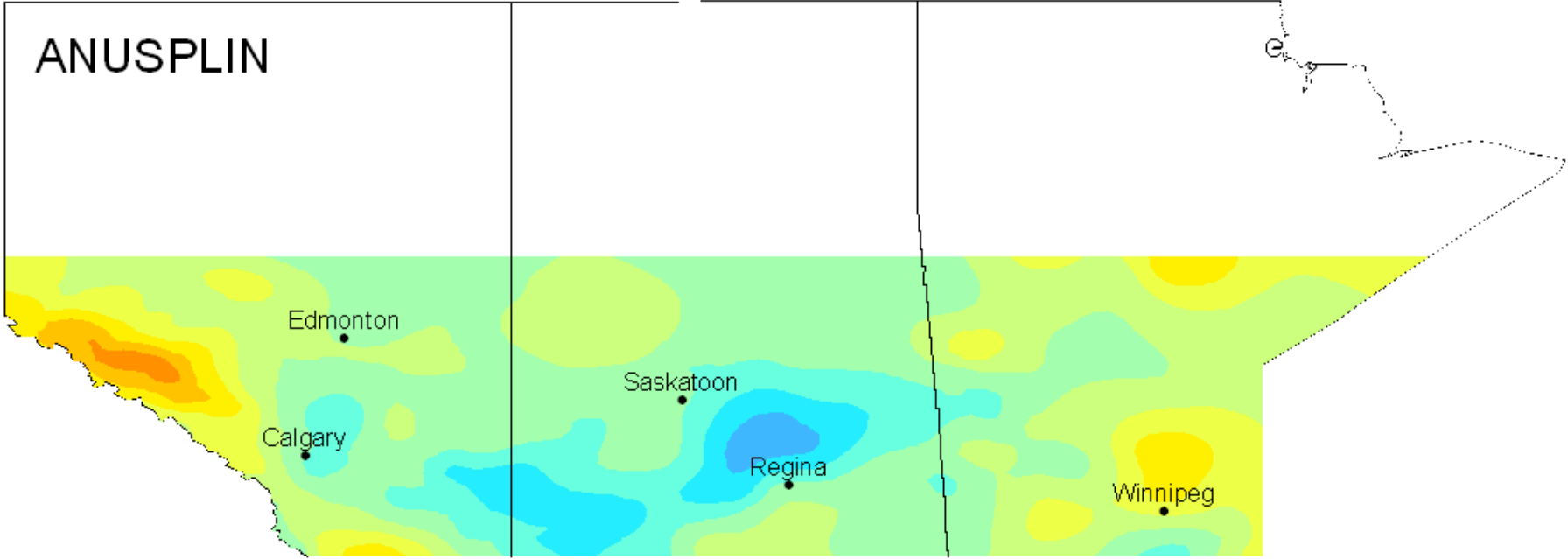
# August 2002 12-month SPI



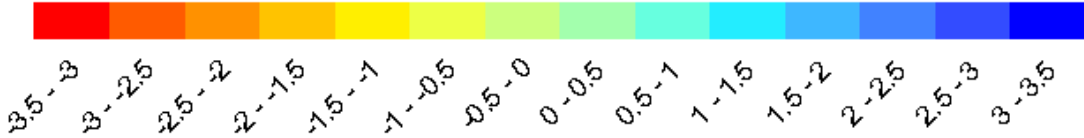
**Standard Precipitation Index**



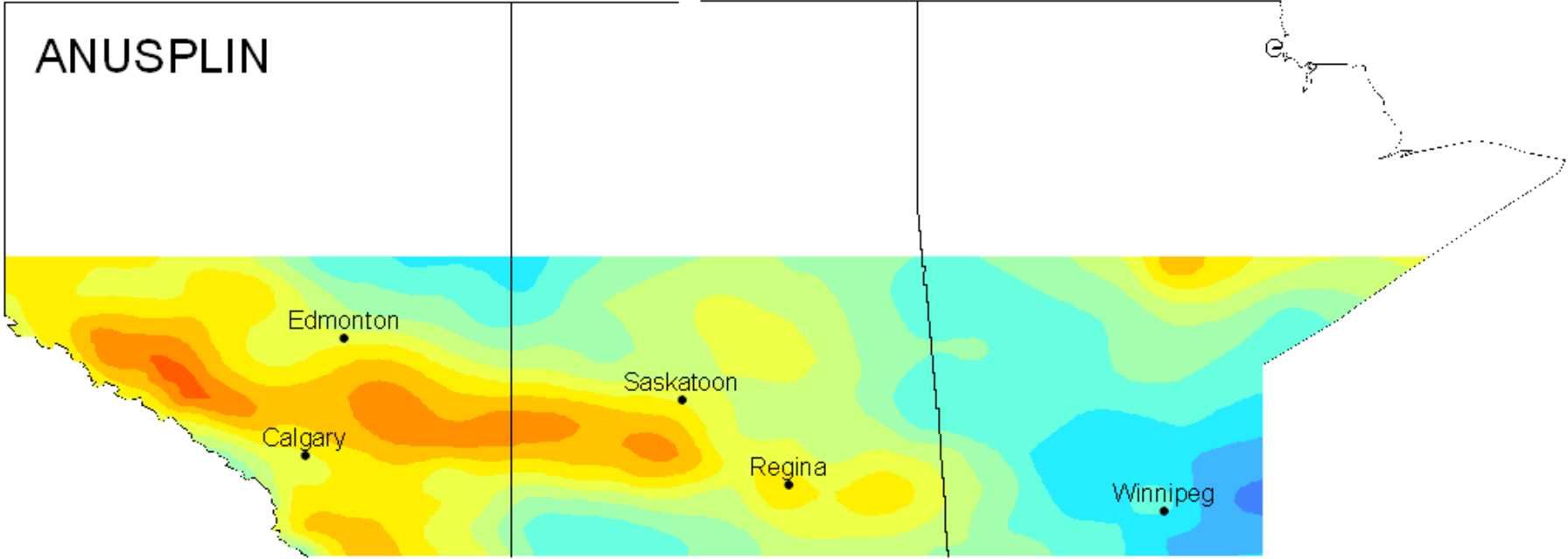
July 2003  
12-month SPI



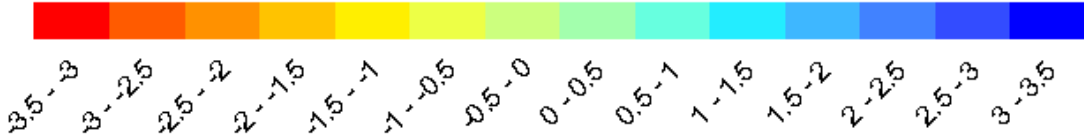
Standard Precipitation Index



May 2004  
12-month SPI

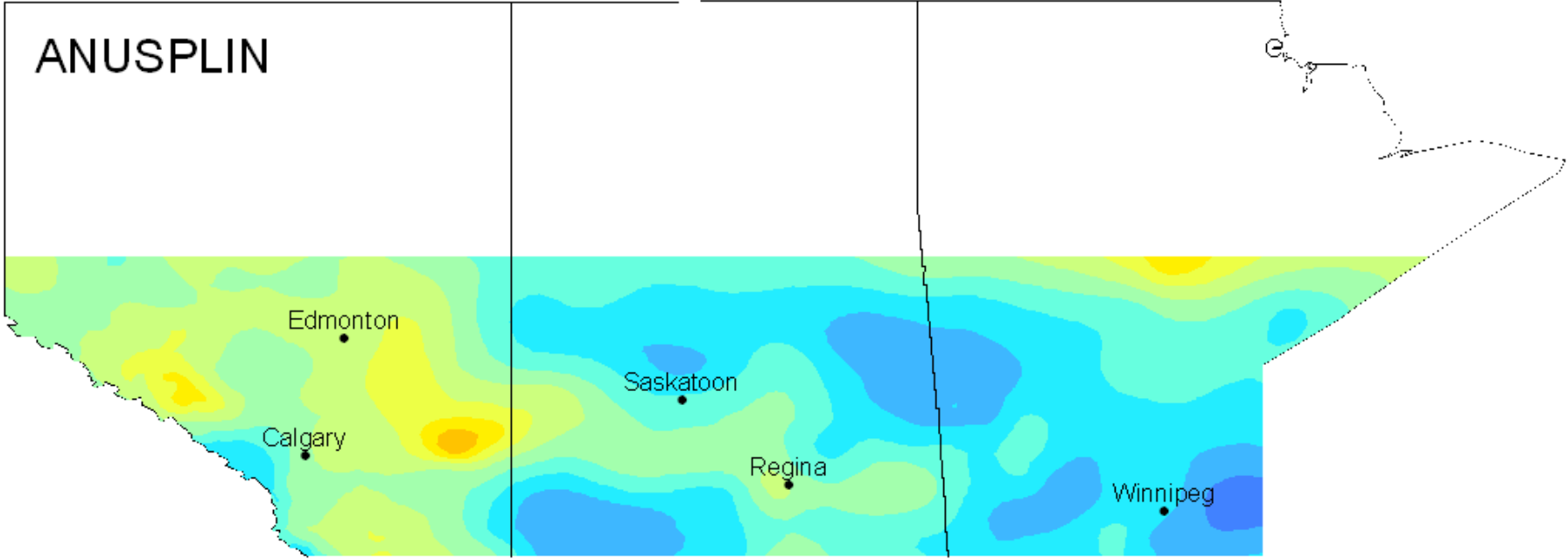


Standard Precipitation Index

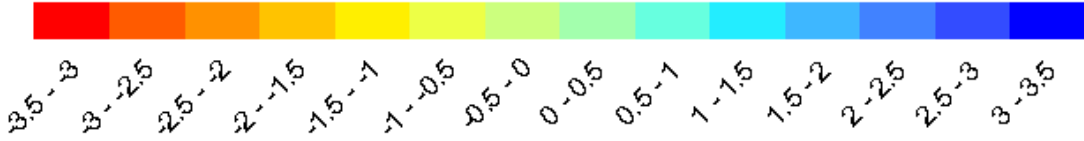




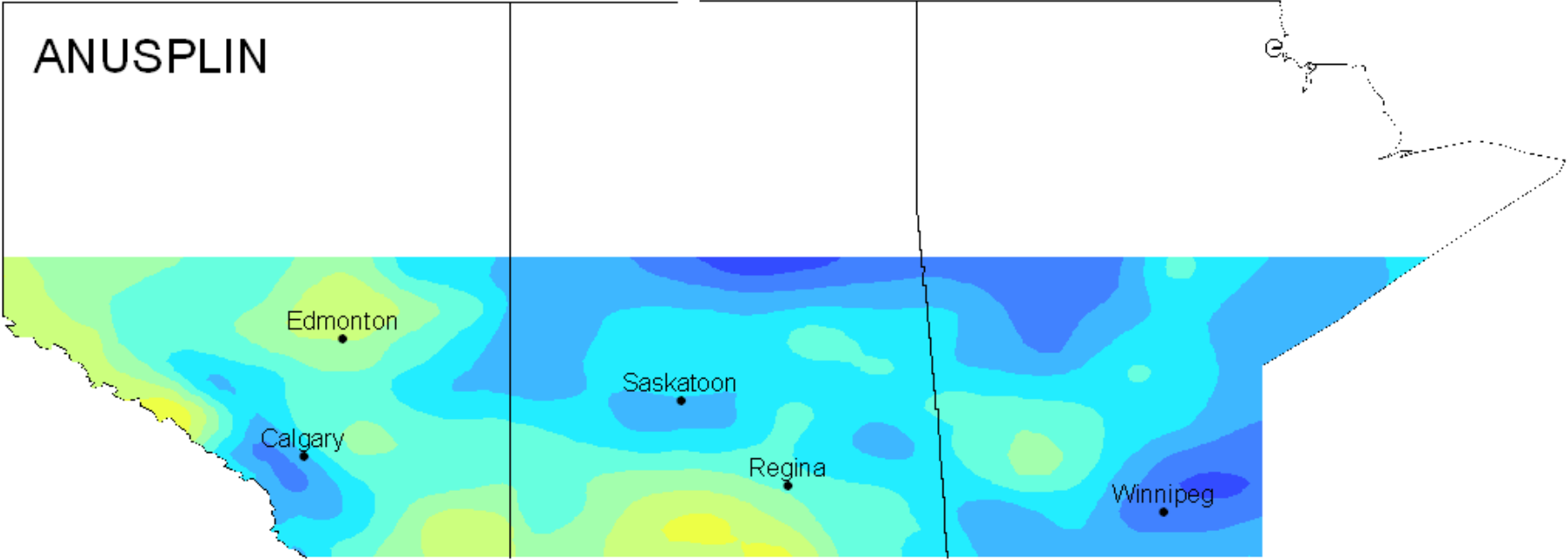
# August 2004 12-month SPI



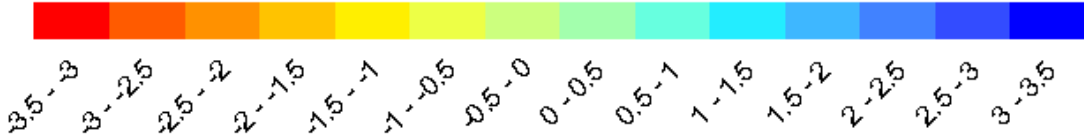
**Standard Precipitation Index**



# August 2005 12-month SPI



**Standard Precipitation Index**



Jan 1999 12-month SPI

