Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Agriculture and Agri-Food Canada's Drought Monitoring and Information System

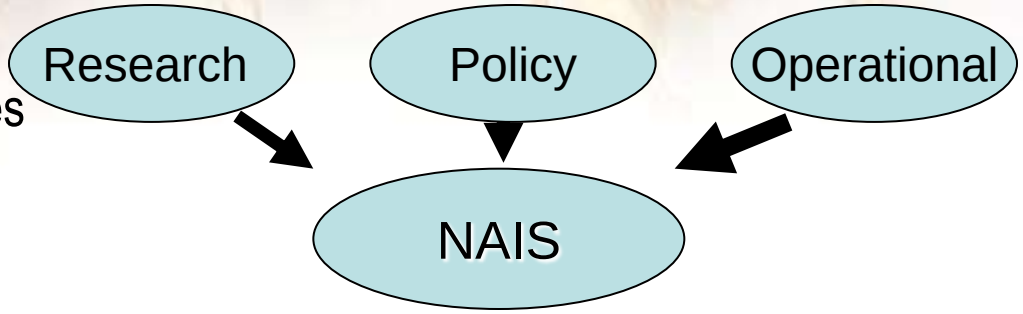
Trevor Hadwen
Agriculture and Agri-Food Canada,
Agri-Environmental Services Branch (AESB)
National Agroclimate Information Service (NAIS)

GEO – DRI Drought Monitoring Workshop
Winnipeg, May 10, 2010

Canada

The National Agroclimate Information Service (NAIS)

Enables AAFC to…..



- Bring together expertise and resources from our operational, research and policy units.

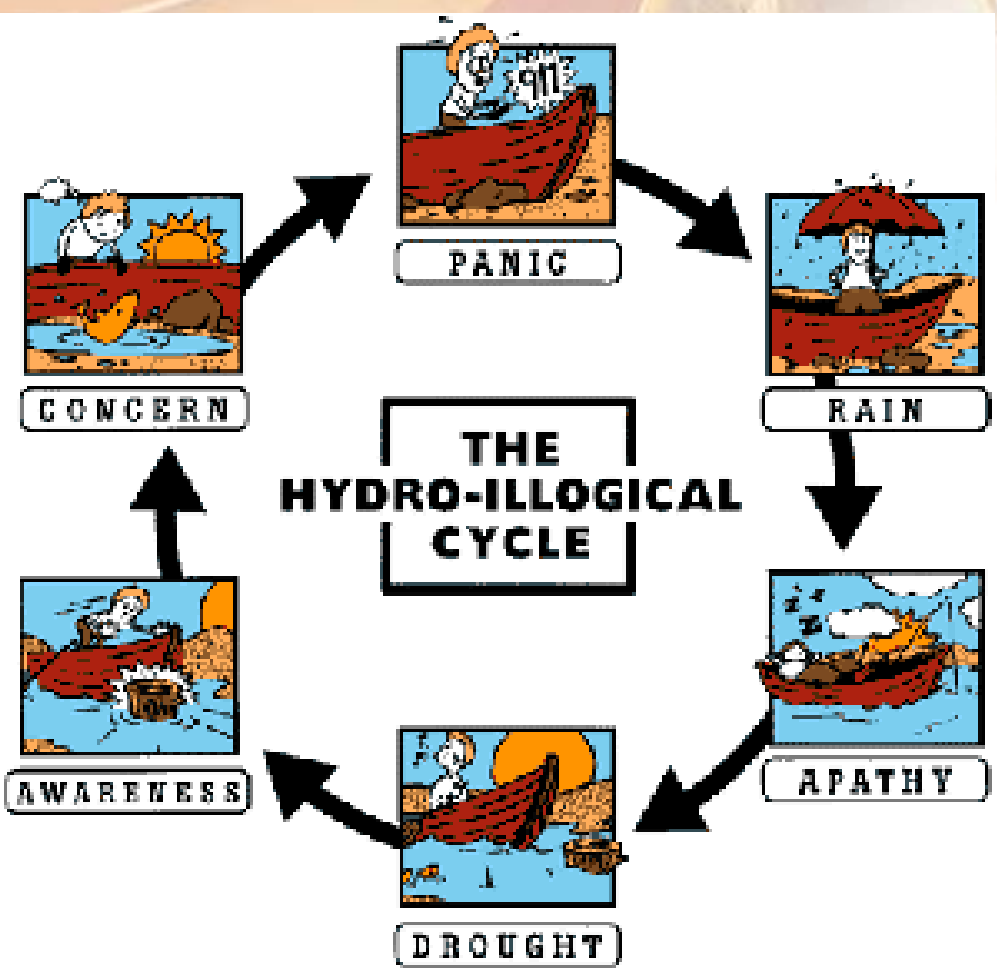
- Provide information to manage risk under climate variability now and in the future.
  - Climate monitoring for agriculture
  - Development of adaptation tools
    - risk management & decision support.
  - End goal is to improve Agriculture Resilience

NAIS Priorities

Addressing 3 Business Areas:

1. **Assess climate related risk to agriculture:**
   - Provide information to reduce climate impacts on the agriculture resource base (Soil, water and biodiversity, socio-economic).
   - Provide Timely monitoring, analysis and reporting of weather and climate related events that affect Canada's agriculture industry,
2. **Improve management of climate related risk**
   - Address client needs by enabling development of high quality, relevant value-added products for decision and policy support to manage climate-related risk.
3. **Improve the industry's ability to adapt to climate change and climate variability**
   - Planned response to climate change by Analyzing and developing climate change scenarios to identify impacts and need for adaptation.
   - Address client needs by contributing analysis and interpretation to support sustainable production, marketing, and policy related to climate change impacts and adaptation

The critical factor in an effective drought response is to be prepared



From National Drought Mitigation Center, Lincoln, Nebraska

- Know where you are now
  - e.g. NADM, Drought Watch, NIDIS
- Add some insight into what's ahead
  - Statistics, longer range forecasts
- Have a suite of tools to reduce impacts/risk and take advantage of opportunities.
  - Policies, strategies, information

Monitoring and Forecasting Unit

Main activities include:

- **The Drought Watch Website**
- Near Real Time Climate Data
- Climate Related Risks Committee
- Ministerial Briefings
- **Prairie On-Farm Water Supply and Forage Conditions Monitoring Program Program**
- **The North American Drought Monitor**
- **Tax Deferral**
- Policy Support
- Program Support

Key Indicators for Monitoring Drought

- climate data (precipitation, temperature)
- soil moisture
- stream flow
- ground water
- reservoir and lake levels
- snow pack
- short, medium, and long range forecasts
- vegetation health/stress and fire danger
- sectoral impacts

Drought Watch Website

Goals:

- **To provide timely information of the impacts of climatic variability on water supply and agriculture in Canada.**
- **To promote practices that reduce drought vulnerability and improve management during a drought.**

The site includes

- **Current Condition and Historical Maps**
- **Climate Profiles**
- **Drought Management Information**
- **Federal Programs**
- **Provincial Links**
- **Related Websites**
- **Farm Stress Information**

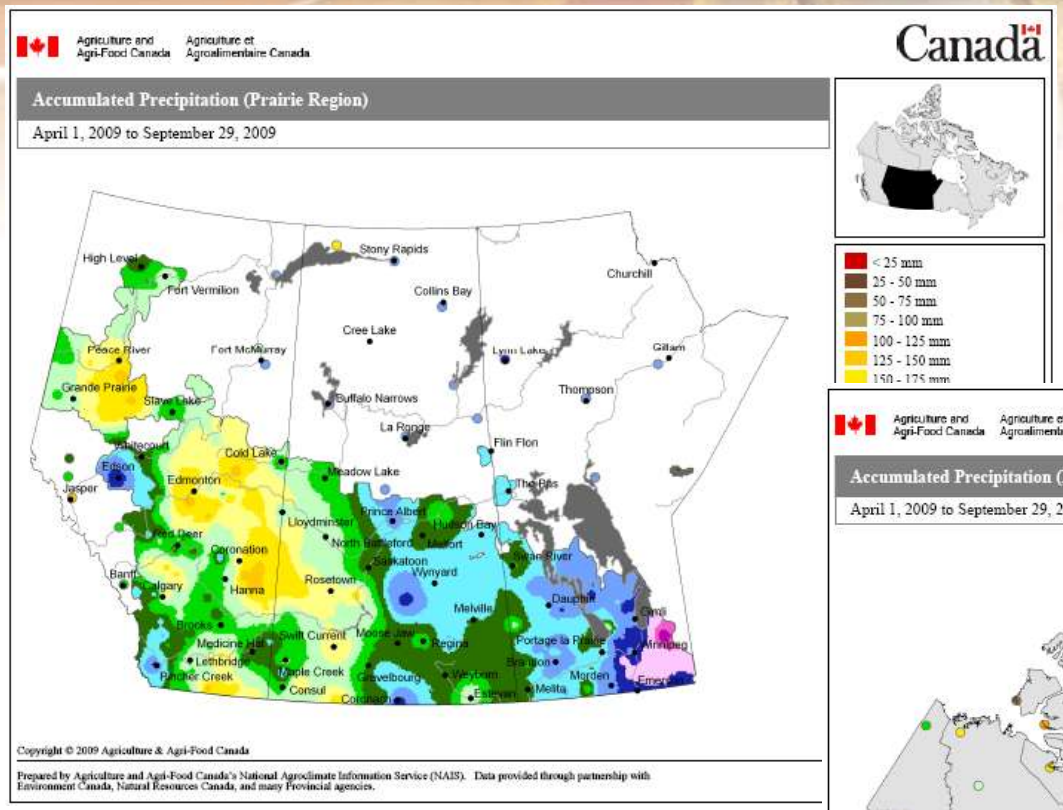
Products include:

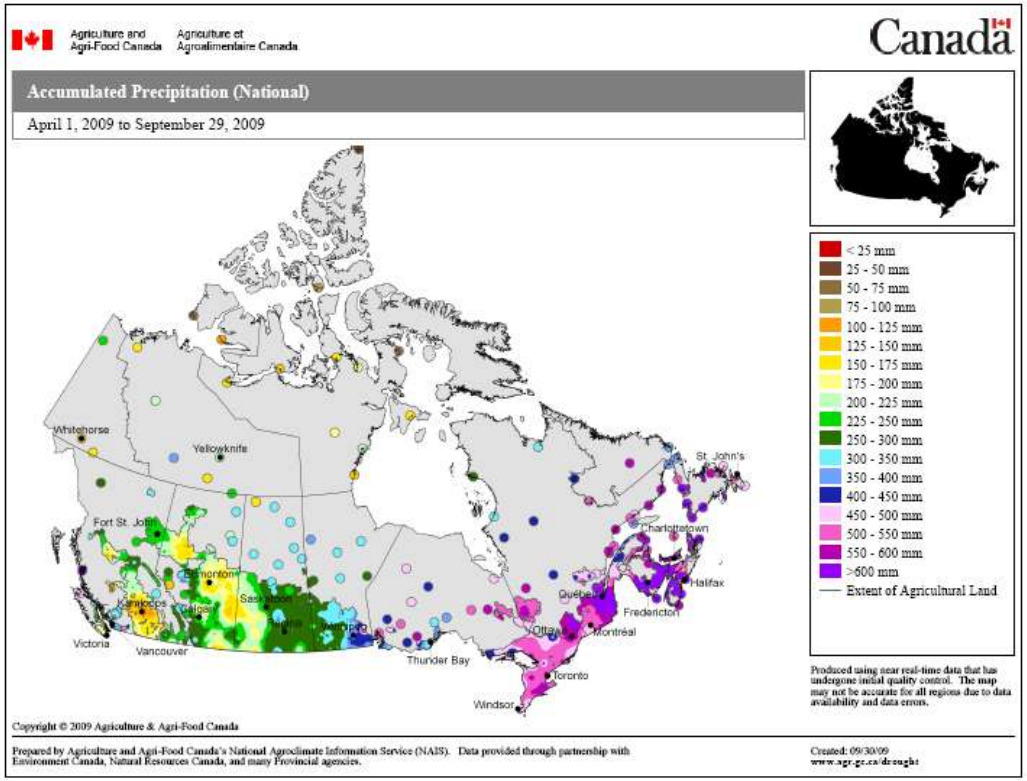
- **Seasonal and annual Products for Moisture indicators**
- **Rolling Percent of Average Precipitation**
  - 7-day out to 5 years
- **Rolling Accumulated**
  - 7-day out to 5 years
- **Dry Spell indicator**
  - 7, 14, 30, 60… days with < 0.5 mm
  - Consecutive days with < 0.5 mm
- **Departure from Normal Precipitation (Rolling)**
  - Set time periods (7-day out to 5 years)
  - Seasonal
- **Temperature**
  - Max/Min temperature over 7-days
  - Heat waves / Dry spells
- **Growing Degree Days (Base 0, 5, 10, and 15)**
- **Corn Heat Units**

Over 500 maps produced daily

www.agr.gc.ca/drought

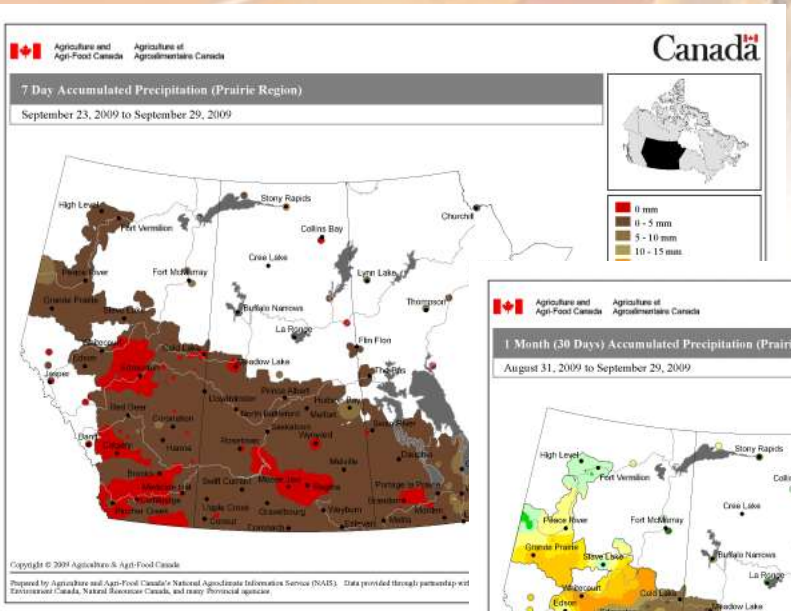
National and Regional Products

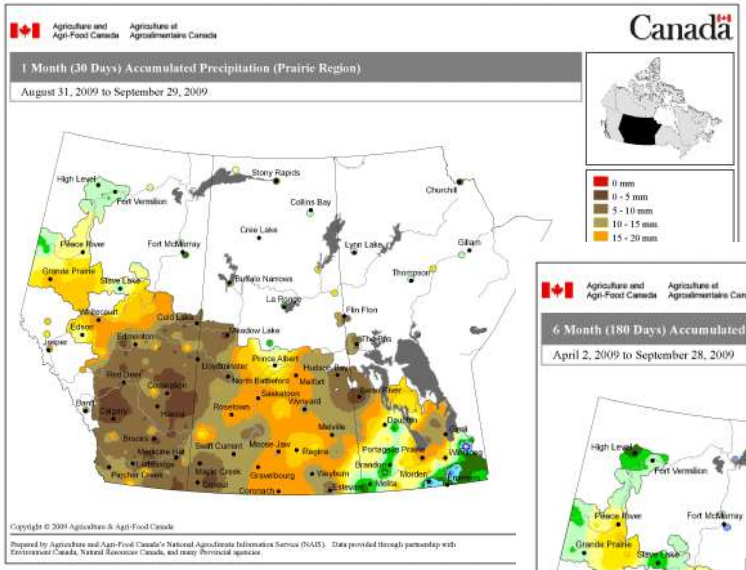


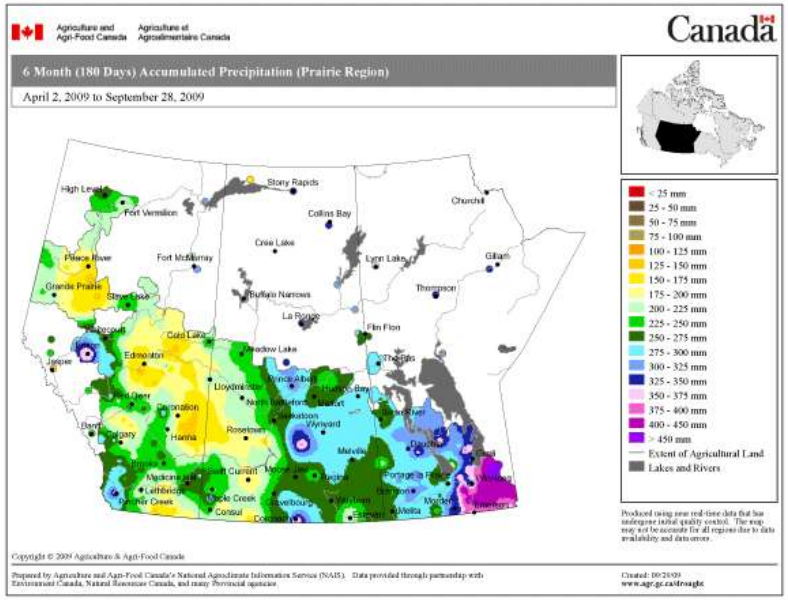


Canada is broken down into 5 regions

Time Specific Products



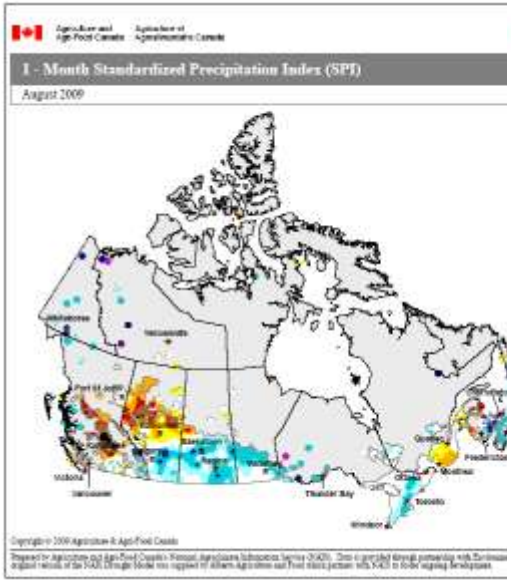


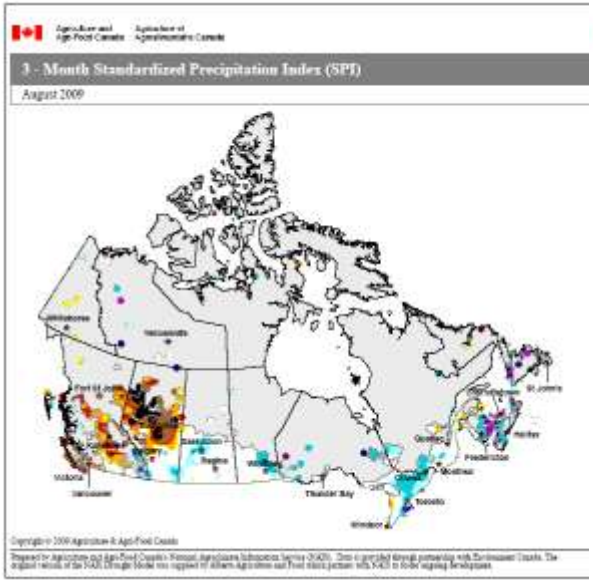


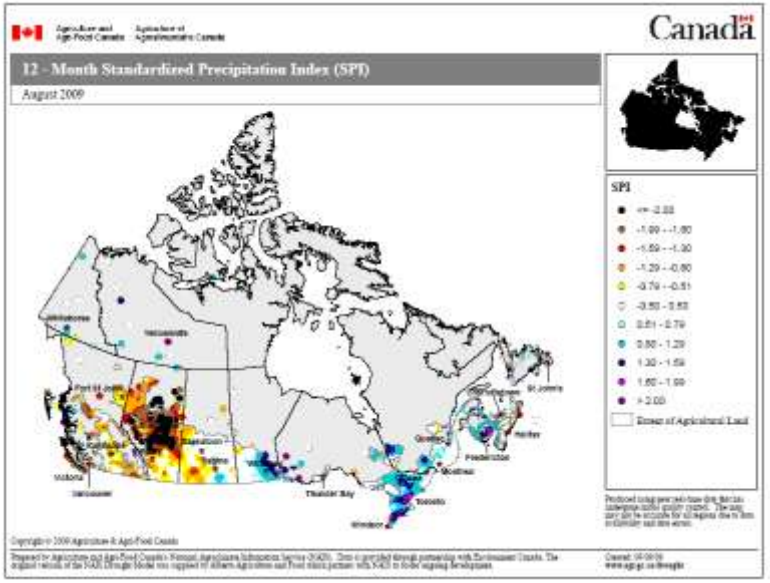
- Agricultural year
- Growing season
- Winter season

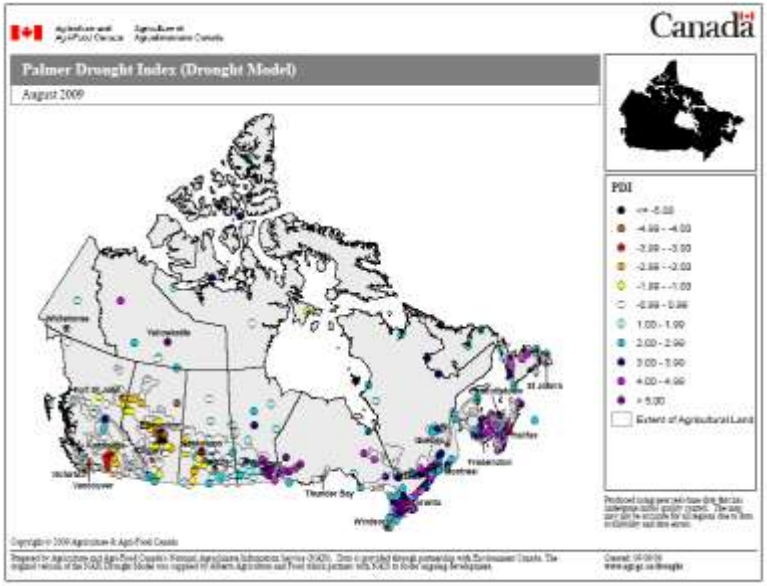
- Percentiles
- Percent of normal
- Accumulated PPT
- Departure from average

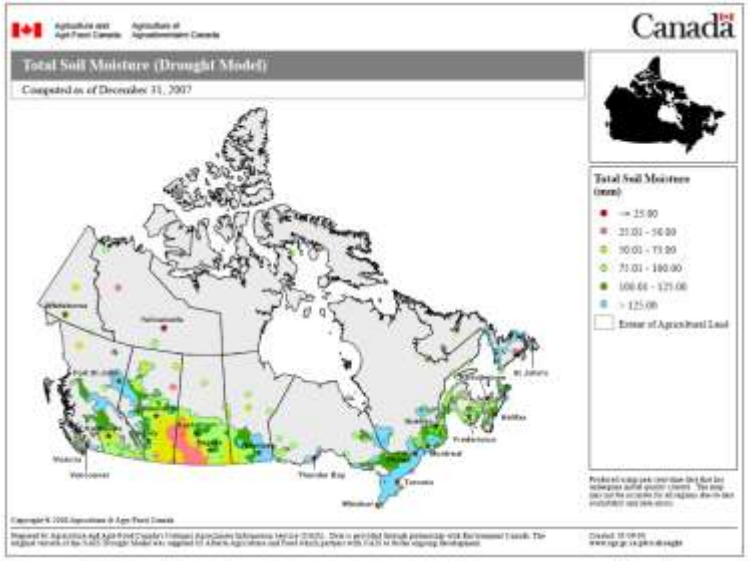
National Drought Model: SPI, PDSI and Modeled Soil Moisture











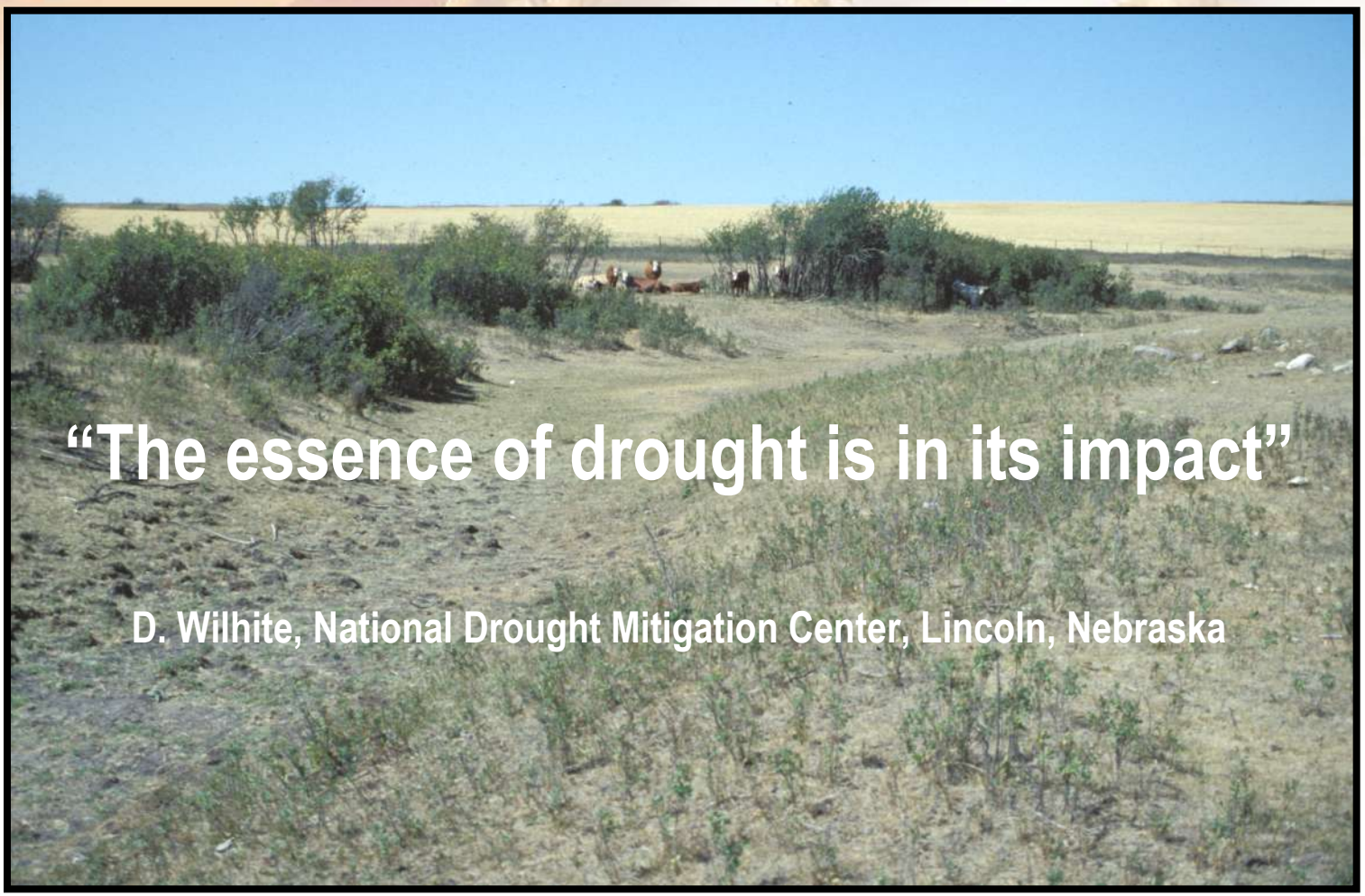
Drought – more than just lack of rainfall

Drought can mean many different things to different people

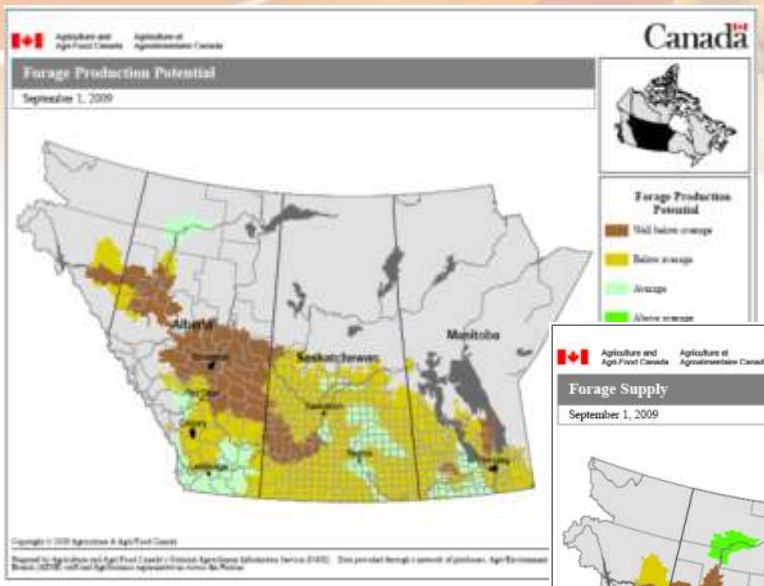
- Depending on:
  - their normal climate
  - their needs
- Main categories of drought are
  - meteorological
  - agricultural
  - hydrological
  - (socioeconomic)

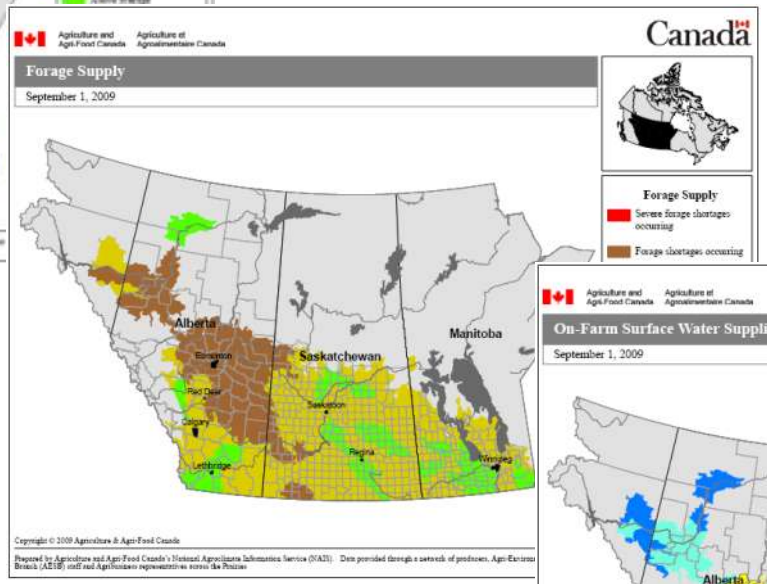
Most Drought indices measure meteorological drought

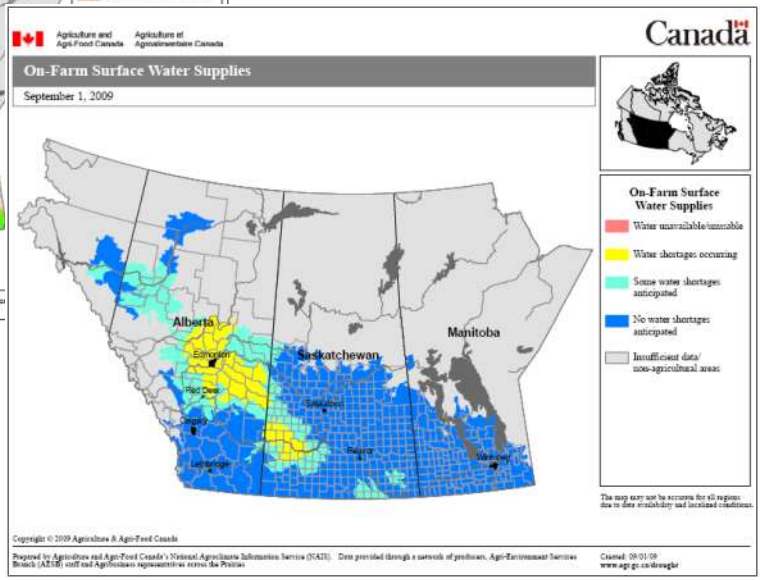
The availability of water depends largely on rainfall, (but) the concept of drought cannot be divorced from the use to which water is put. Gibbs & Maher (1967):

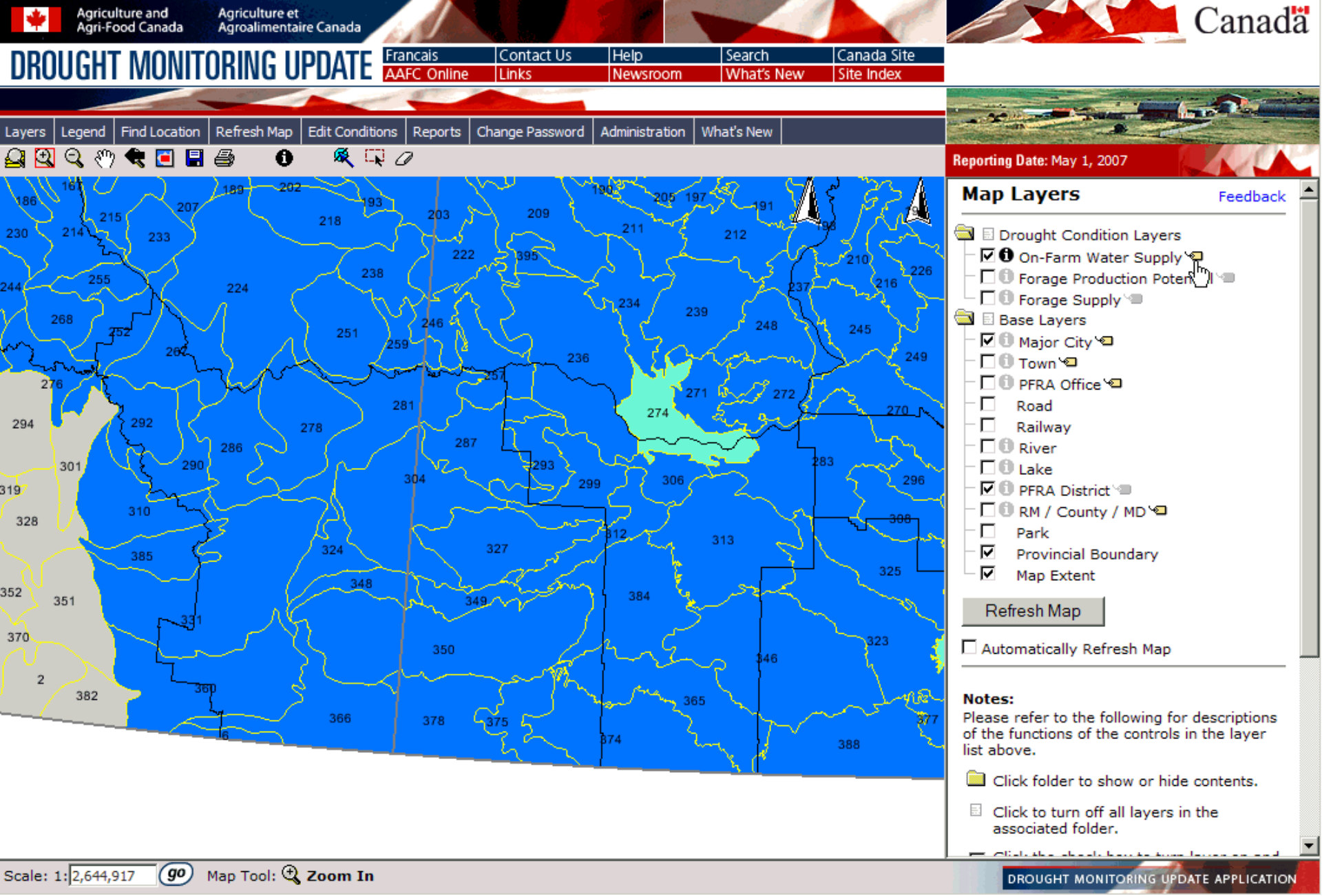

“The essence of drought is in its impact”
D. Wilhite, National Drought Mitigation Center, Lincoln, Nebraska

Prairie Monitoring Program





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What's New
Reporting Date: May 1, 2007
Map Layers
Feedback
Drought Condition Layers
On-Farm Water Supply
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Please refer to the following for descriptions of the functions of the controls in the layer list above.
Click folder to show or hide contents.
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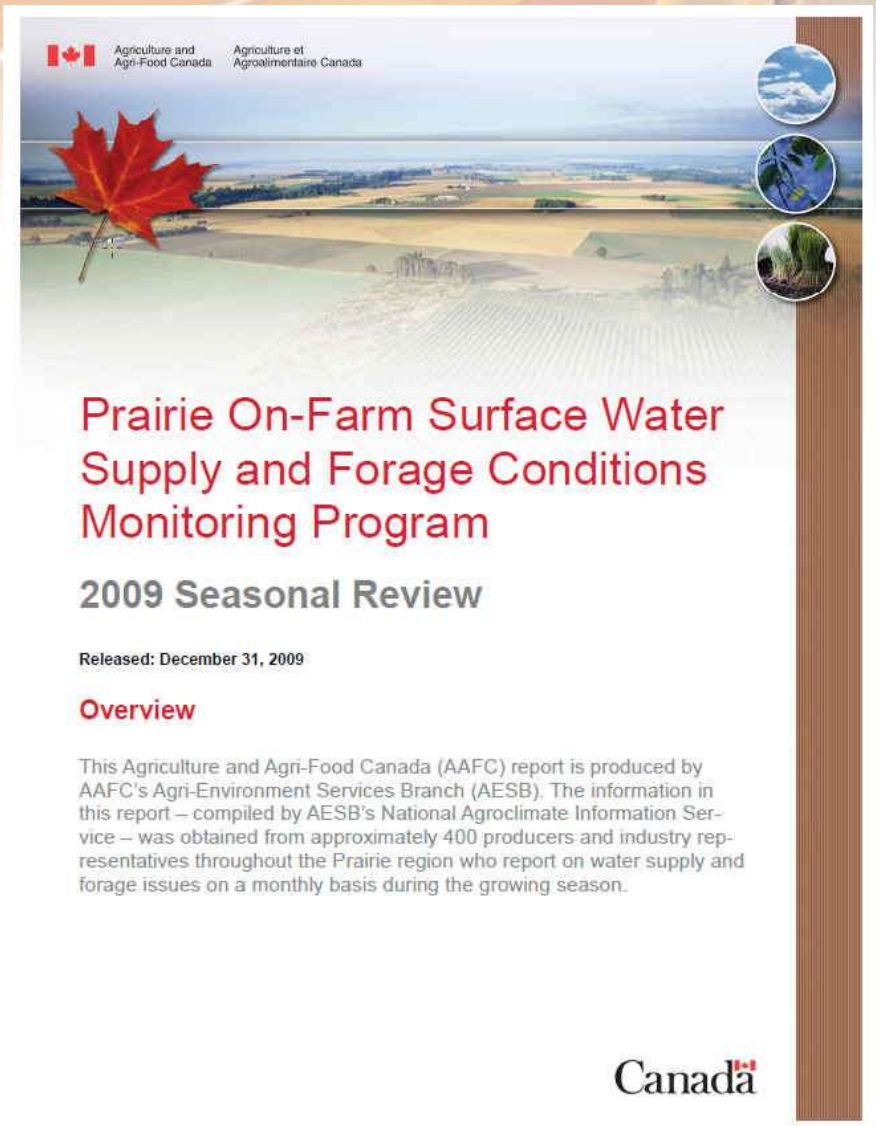
Map Tool: Zoom In
DROUGHT MONITORING UPDATE APPLICATION

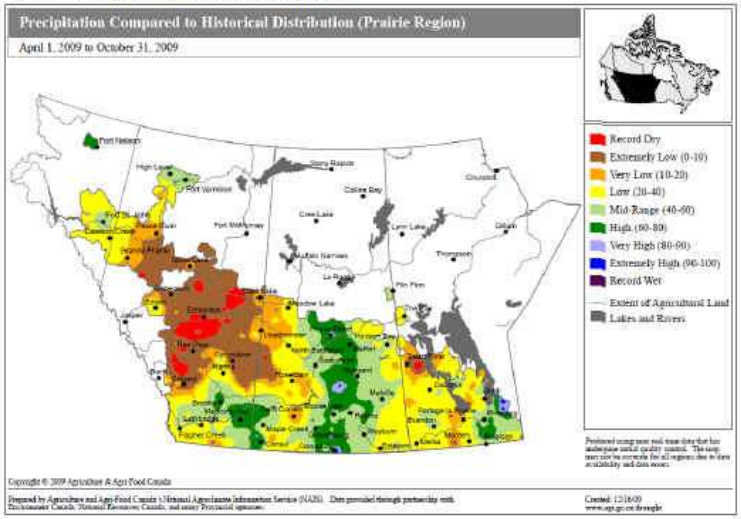
Quantifying the Impacts of Drought



The 2009 Extended Growing Season

The 2009 extended growing season (April 1-October 31) can be summarized in one short statement, "too cold and too dry". Cooler than normal temperatures throughout the season, and record low precipitation accumulation from April through June resulted in poor growing conditions. As noted in the map below (*Map 1*), large regions of northern and central Alberta and western Saskatchewan were mired in severe drought conditions over this past year. In contrast to drought conditions in the western Prairies, eastern Manitoba dealt with excess moisture.

Map 1 - Extended Growing Season Percentile Map



The onset of the 2009 Drought can be traced back to the 2008 growing season, when abnormally dry conditions struck much of central and northern Alberta. During the 2008-09 fall and winter period (September 2008 to March 2009), precipitation was classified as 'Extremely Low' or 'Record Dry' across central Alberta and west-central Saskatchewan (*Map 2*). Much of Alberta and Saskatchewan received below normal precipitation, with the exception of southern areas of Saskatchewan.

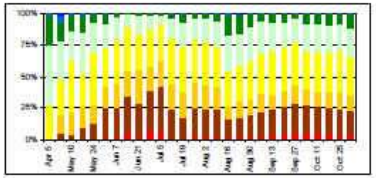
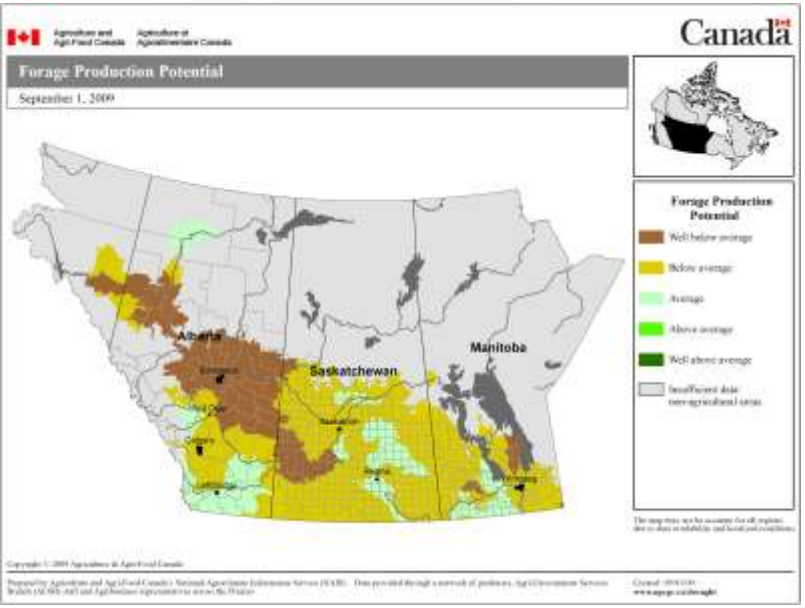
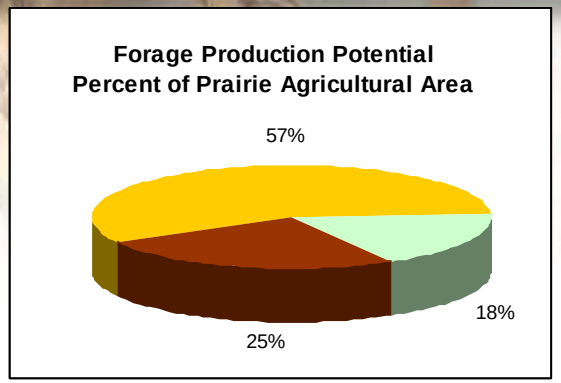


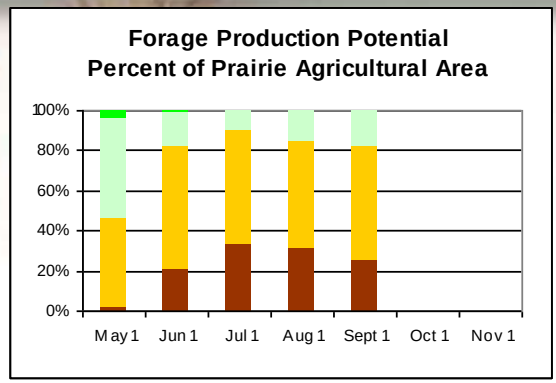
Figure 1 - Precipitation Compared to Historical Distribution: % of Agricultural Area (Seasonal Trend)

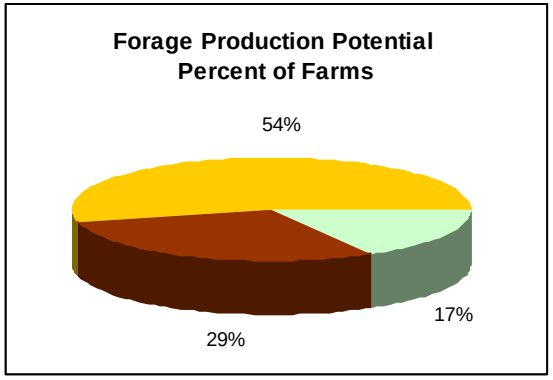
The winter of 2008-09 brought cooler than normal temperatures and below normal snowfall amounts across much of the Prairies. Central and southern regions of Alberta and Saskatchewan received less than 60% of normal precipitation, further reducing potential spring soil moisture. Many of these regions had minimal snow cover, including areas east of Coronation, where the ground was bare even

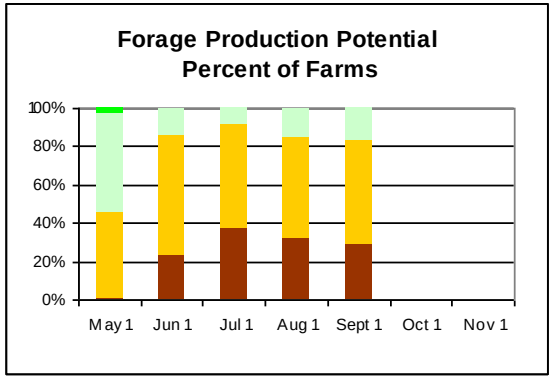
Quantifying the Impacts of Drought

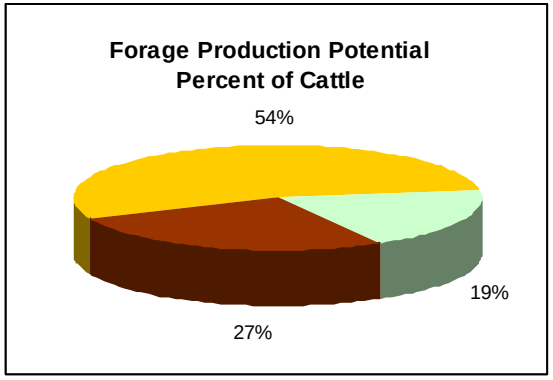


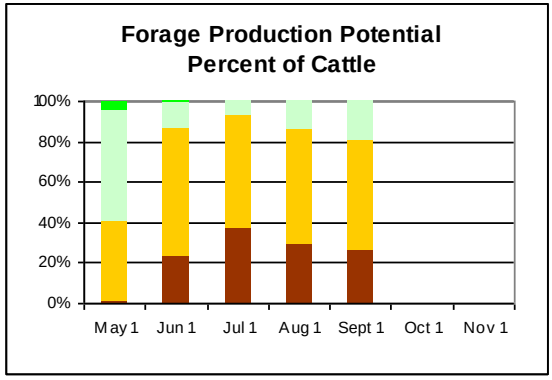








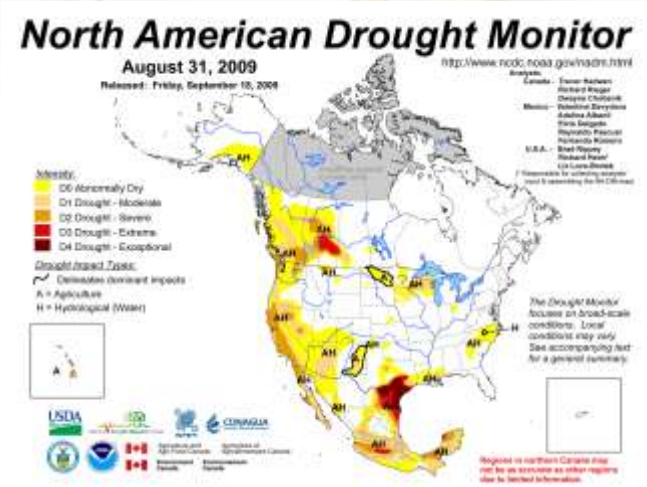


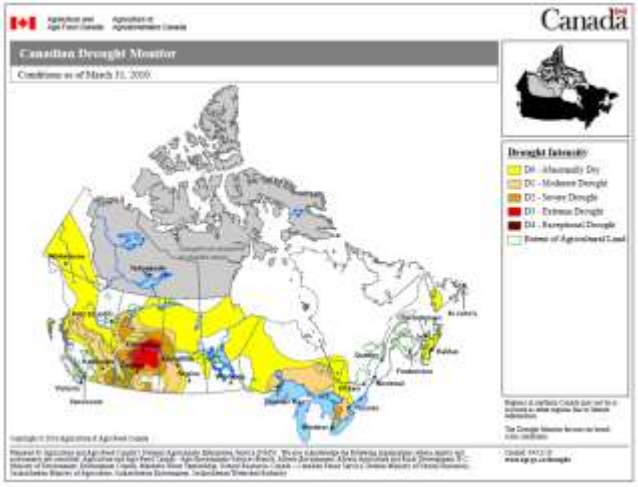


International Collaboration and Drought Analysis

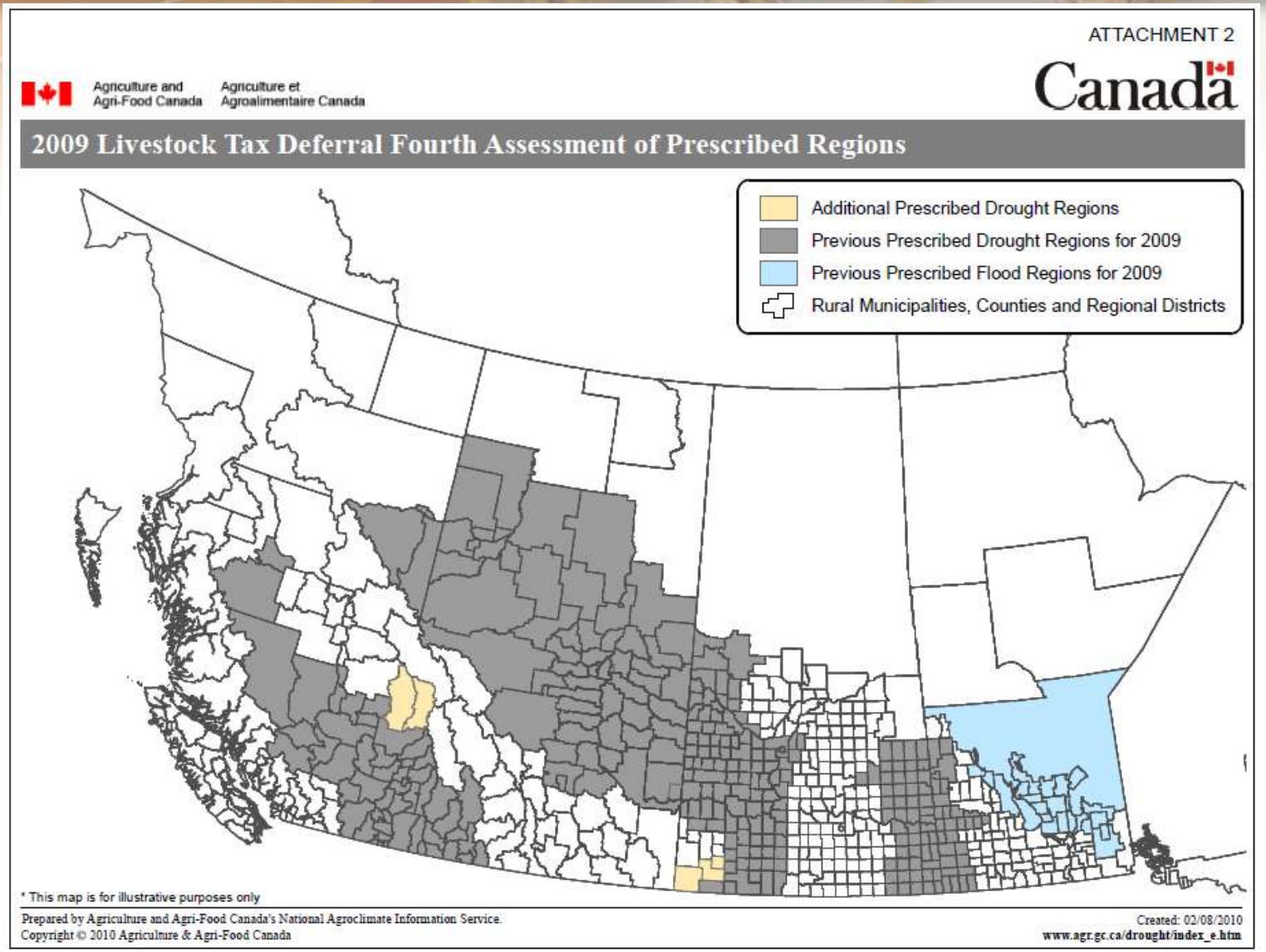
The North American and Canadian Drought Monitors

- A **consolidation of indices and indicators** into one comprehensive national/continental drought map
- **Convergence of evidence**
- Tries to capture
  - the drought's magnitude (duration + intensity)
  - spatial extent and impacts
  - Assessment of current conditions
- Incorporate local expert input
- Objective as possible

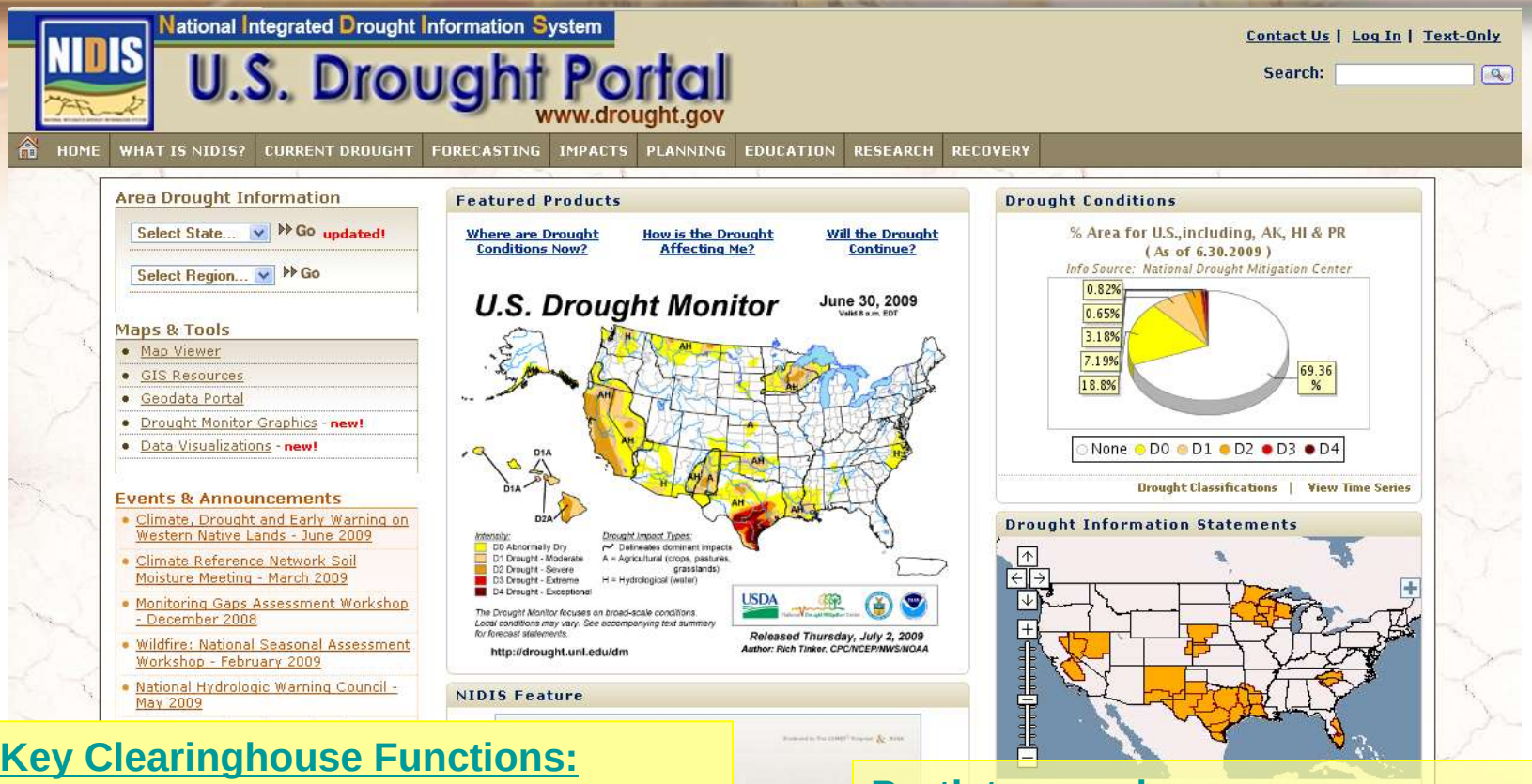




2009 Prescribe Drought Regions for Tax Deferral



The NIDIS U.S. Drought Portal (www.drought.gov)



Key Clearinghouse Functions:

Credible, Accessible, Timely Information on

Where are drought conditions now?
Does this event look like other events?
How is the drought affecting me?
Will the drought continue?
Where can I go for help?

Portlet example:

NWS River Forecast Center

Ohio River Water Resources Outlook-
Ecosystem recovery

VegDRI – An Integrated Approach

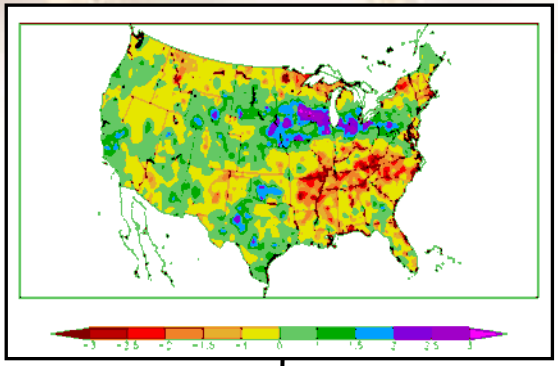
Remote Sensing Component

Satellite-based 1-km NDVI (normalized difference vegetation index) observations provide spatially detailed information regarding the general state and condition of vegetation.

Variables:
- percent annual seasonal greenness (PASG)
- start of season anomaly (SOSA)

+

Climate Component



Measure of 'broad scale' geographic patterns of dryness.

Variables:
- standardized precipitation index (SPI)
- Palmer drought severity index (PDSI)

+

Biophysical Component

Environmental characteristics that influence climate-vegetation interactions.

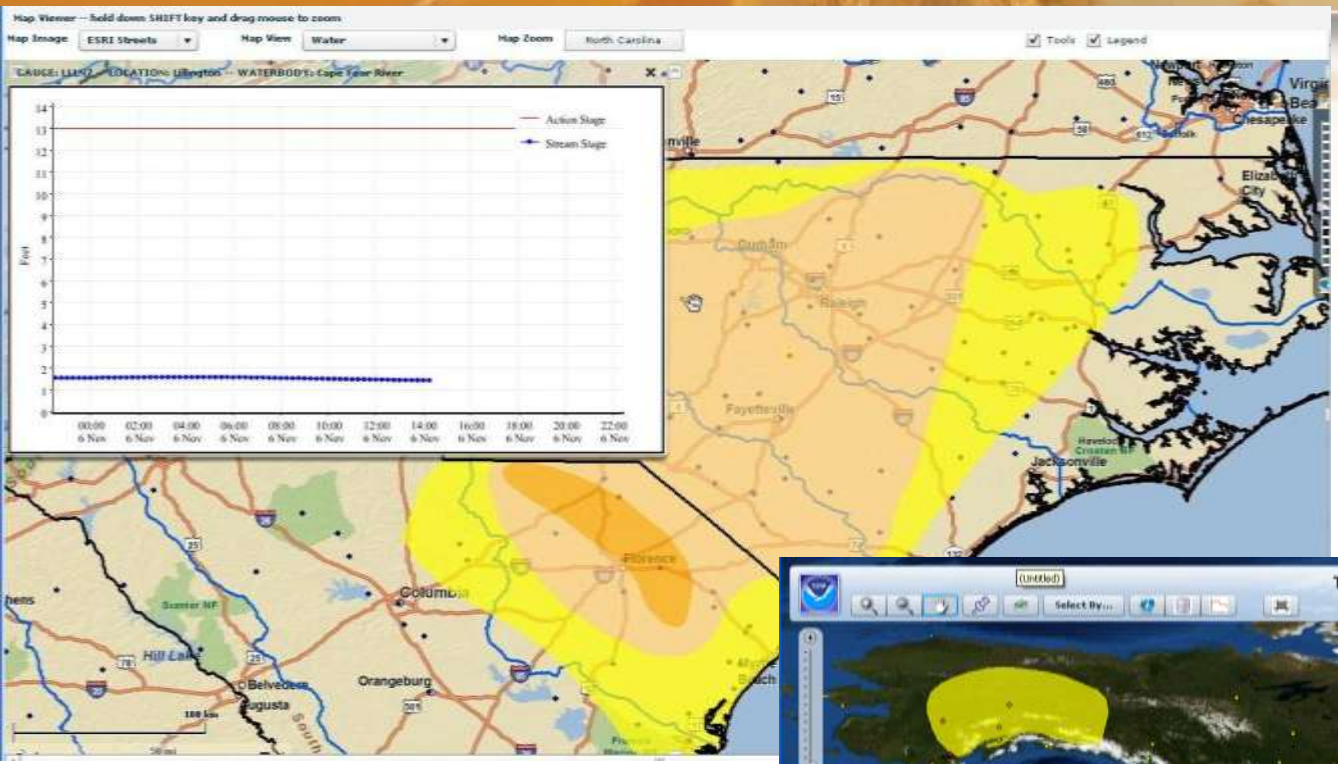
Variables:
- land use/land cover type
- soil characteristics
- elevation
- ecological setting

Brown, J.F., **B.D. Wardlow**, T. Tadesse, M.J. Hayes, and B.C. Reed, 2008. The vegetation drought response index (VegDRI): a new integrated approach for monitoring drought stress in vegetation. *GIScience and Remote Sensing*, 45(1):16-46.

National Drought Mitigation Center | USGS science for a changing world | High Plains Regional Climate Center | RMA

Drought Impact Report

NIDIS - Data Services Tied To Mapping Service



Thank You

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Canada

Current Situation

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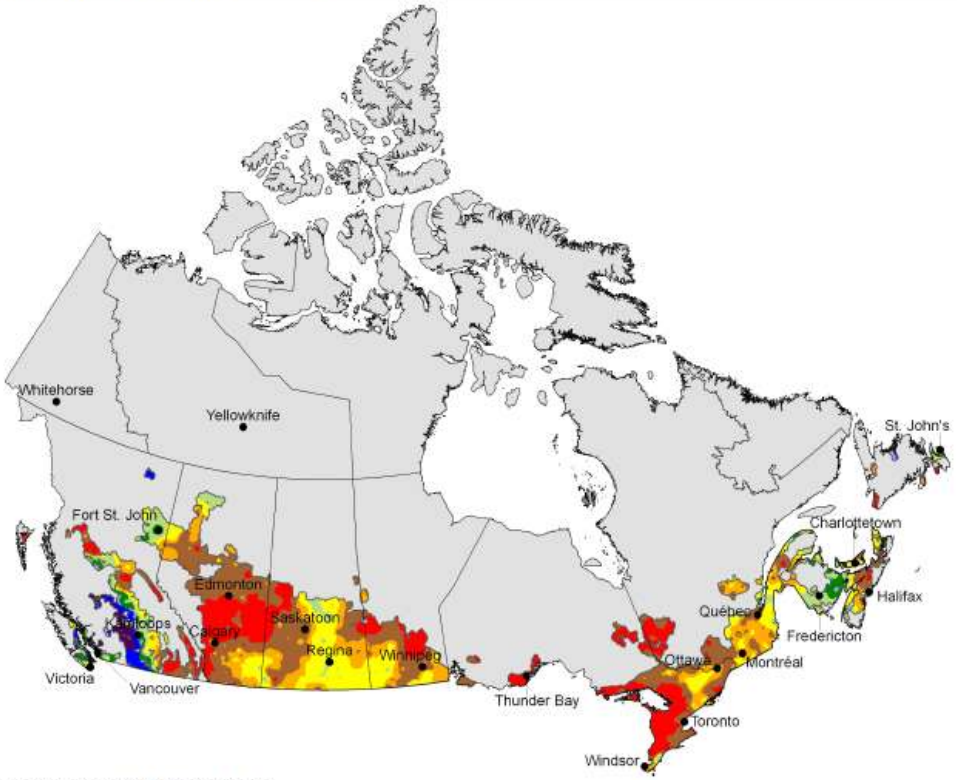
Canada

Precipitation Compared to Historical Distribution (National)

September 1, 2009 to March 31, 2010



- Record Dry
- Extremely Low (0-10)
- Very Low (10-20)
- Low (20-40)
- Mid-Range (40-60)
- High (60-80)
- Very High (80-90)
- Extremely High (90-100)
- Record Wet
- Extent of Agricultural Land

Produced using near real-time data that has undergone initial quality control. The map may not be accurate for all regions due to data availability and data errors.

Prepared by Agriculture and Agri-Food Canada's National Agroclimate Information Service (NAIS). Data provided through partnership with Environment Canada, Natural Resources Canada, and many Provincial agencies.

Created: 04/06/10
www.agr.gc.ca/drought

The Importance of Drought Early Warning Systems

- allows for ***early*** drought detection
- improves response (***proactive***)
- ***"triggers"*** actions within a drought plan
- a critical ***mitigation*** action
- ***foundation*** of a drought plan