Monitoring drought and assessing agricultural drought impacts in Alberta

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Leedale AEDM
Alberta is known for its recurrent droughts.

Precipitation Accumulations Relative to Long Term Normal

Years 1997 to 2008

The frequency of occurrence was calculated using historical weather data from the 1951-2007 period, interpolated to township centres using Ab-Clim-1.1.

Compiled by Alberta Agriculture and Rural Development, Environmental Stewardship Division, Technology and Innovation Branch.
Created by ACOE, 2009.
In the early 1990s the province recognized the need for the formation of the Agricultural Drought Risk Management Plan (ADRMP).
The AB Agriculture Drought Risk Management Plan (ADRMP)

- The plan provides a framework for a coordinated, pro-active approach to mitigate the effects of drought in the agricultural areas of Alberta.

- Partners - Alberta Agriculture, Alberta Environment, AFSC, PFRA, Counties
Paradigm Shift

Drought Disaster Response

Drought Risk Management
ADRMP Plan Strategies

- **Drought Monitoring and Reporting** — analysis of severity, extent, onset, ending, forecast of drought
- **Drought Preparedness** — taking action before a drought to increase the level of readiness by all stakeholders.
- **Drought Response** — taking action during and immediately following a drought to reduce its impacts.
• The reporting system soon recognized the inadequacy of the existing weather data in the province.

• Initiated the development of a Standard Automated weather station network across Alberta.
AB NRT drought monitoring weather stations network

- Started with 36 AGDM stations in 2002

Currently
The Alberta Agro-Meteorological Network
120 Stations
NRT Network
Before 2002
Agricultural area had poor coverage!

History and Current Status
Near Real Time Stations
- 2002 to 2003
ARD, Fed’s added 36 AGDM stations
Near Real Time Network

-2003 to 2004
ARD added
11 IMCIN stations
Near Real Time Network

-2003 ARD and AENV added 5 AEDM stations
Near Real Time Network

-2007 to 2008
ARD, AFSC, AENV, Fed’s added 67 AGCM scalable stations
Near Real Time Network

-2007
AENV added 5 AGCM style stations
History and Current Status

Near Real Time Network

- 2008
  AENV & ARD added 4 AGDM style stations

- 2009-2010
  ARD and University Research added 4 stations
Parameters measured and Sensors

- Temperature and Humidity (HMP)
  - 10 Gill shield
  - Stevenson Screen

- GEONOR T-200b Precipitation Gauge with Alter shield

- Solar Radiation

- Wind Speed and Wind Direction
  - 2m Met one or RM young
  - 10m RM young

- Soil Moisture (@ 5, 20, 50, 100 cm)
  - Theta Probe MLX-2

- Soil Temperature (@ 5, 20, 50, 100 cm)
  - 107B

- Snow Depth
  - SR-50
ARD also makes use of:

- NRT reported weather data from other networks in the province
- The historical weather data for the province (starting 1961)
Alberta Historical Weather Data

Snap shot of stations across time, with the completeness of each station recorded as density.
For example: 0.6 implies that the station contains 60% of the data for the year, and 40% missing observations.

Station Completeness Index
- 0.05 - 0.10
- 0.11 - 0.20
- 0.21 - 0.30
- 0.31 - 0.40
- 0.41 - 0.50
- 0.51 - 0.60
- 0.61 - 0.70
- 0.71 - 0.80
- 0.81 - 0.90
- 0.91 - 1.00
QAQC and Data-Filling for Near Real-Time weather Data

Provide a computer-assisted quality assurance and quality control and data filling
Quality Control and Quality Assurance
AgroClimatic Information Service (ACIS)

Welcome to ACIS, an interactive tool that helps producers, farm consultants and researchers view weather forecasts, current and historic maps, and access weather data received from more than 270 weather stations in and around Alberta. This service was developed to describe Alberta's weather, climate and related agriculture features to help with your long-term planning and decision-making throughout the year.

You can navigate directly to the viewers by clicking the links below.

**Weather Forecasts.** View seven day forecasts or several locations as issued by Environment Canada.

**ACIS Maps.** View maps describing precipitation patterns as far back as 1961. Includes total accumulations, extreme occurrences, percent of average and frequency of occurrence. Also included are maps of soil moisture, temperature, drought indices, snow packs and more. Over 30 maps are added each week, tracking current conditions.

**Station Data.** Graph, compare and download quality controlled data in near-real-time for more than 270 stations dating back to April 2005. Also included are other data sets like precipitation and temperature normals, temperature extremes, growing degree days, corn heat units and more.
Any One Can Make Pretty Maps!

- It may be misleading
- Garbage In = Garbage Out
Prior
2002
Stations
Density?
Standardized Map Legends: Frequency of Occurrence (1961 to 2008)

- Precipitation
  - 30-day
  - 90-day
  - 180-day
  - 365-day
  - Monthly
- Growing Season (Apr 1 to Sep 30)
- Cold Season (Oct 1 to Mar 31)

- Temperature
  - Monthly
- Snow Pack
- Soil Moisture
  - Spring Wheat
  - Pasture
Drought indicators used

1. Precipitation summaries relative to long term normal,
2. Soil moisture models for wheat and Pasture,
3. Standardized Precipitation Index (SPI)
2009 Agricultural drought impacts

- Crop reports
- ARD drought management decisions check lists and drought response Toolbox

• Provide water pumping and Water Rationing.
• Assess available feed supplies and reduce livestock inventory
• Implement a water hauling program.
• Provide information to affected farmers on financial management and stress management
• Implement a feed/livestock freight assistance program.

• Government plans - Recommend Tax Deferral.
2009 Agricultural drought impacts

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• In AB 38 counties are affected by different level of drought
• AFSC weather based insurance paid more than 54 million to producers
• Work is under way that may pay out under the Canada AB pasture initiatives
AB have put in place a NRT drought monitoring and reporting system that is capable of characterizing drought conditions in the province forming the basis for drought preparedness and drought response actions in the province.
Thank-you?