A close-up photograph of dry, cracked soil in a field. The soil is a light brown color and has formed several deep, irregular cracks. Sparse green grass and some dried plant matter are scattered across the surface. The background is slightly out of focus, showing more of the same cracked soil and vegetation.

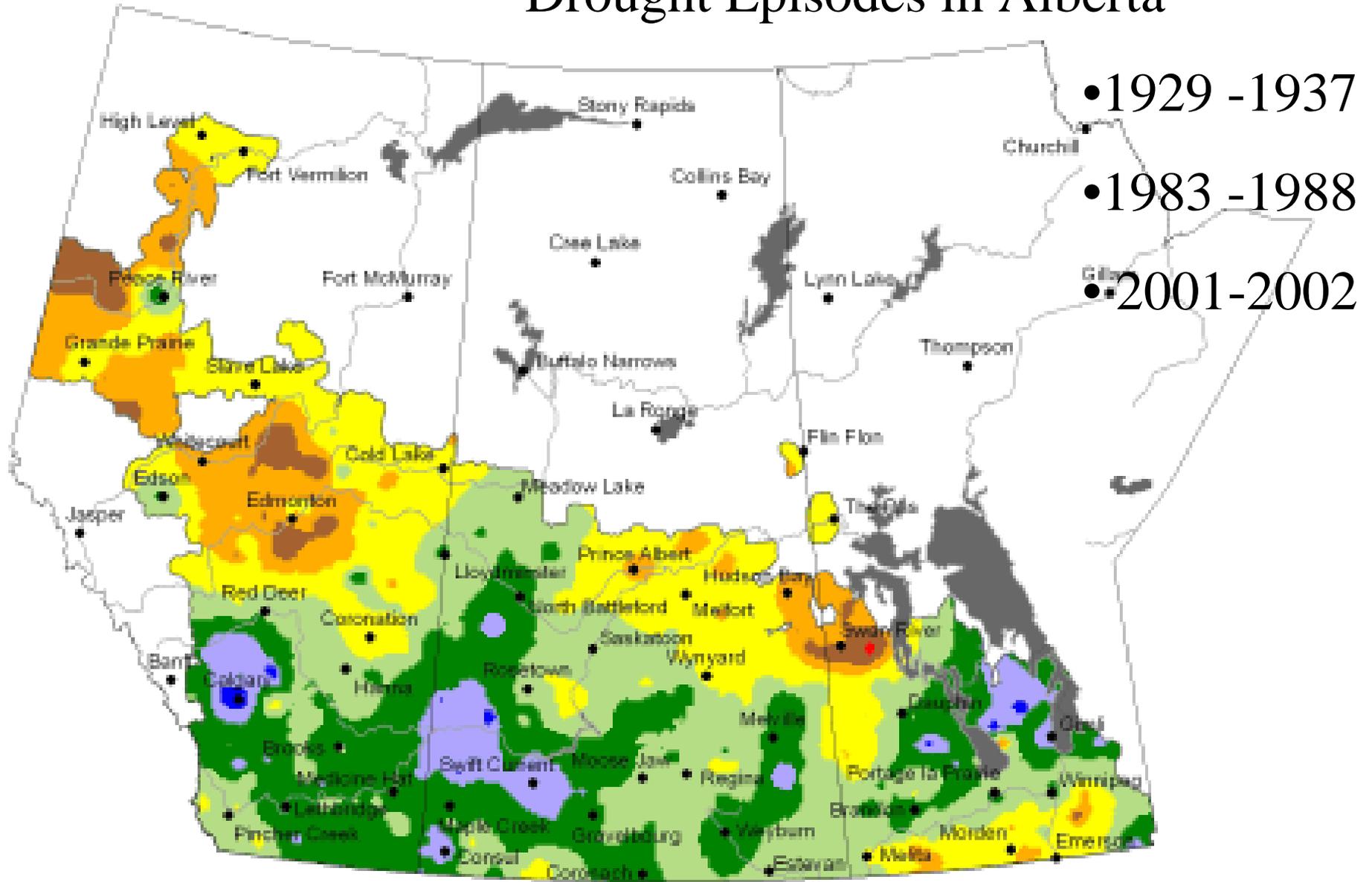
Monitoring Drought on the Canadian Prairies - the Alberta Experience

NADM International Workshop, Oct 15-17, 2008

Daniel Itenfisu and Ralph Wright

Alberta Agriculture and Rural Development

Drought Episodes in Alberta





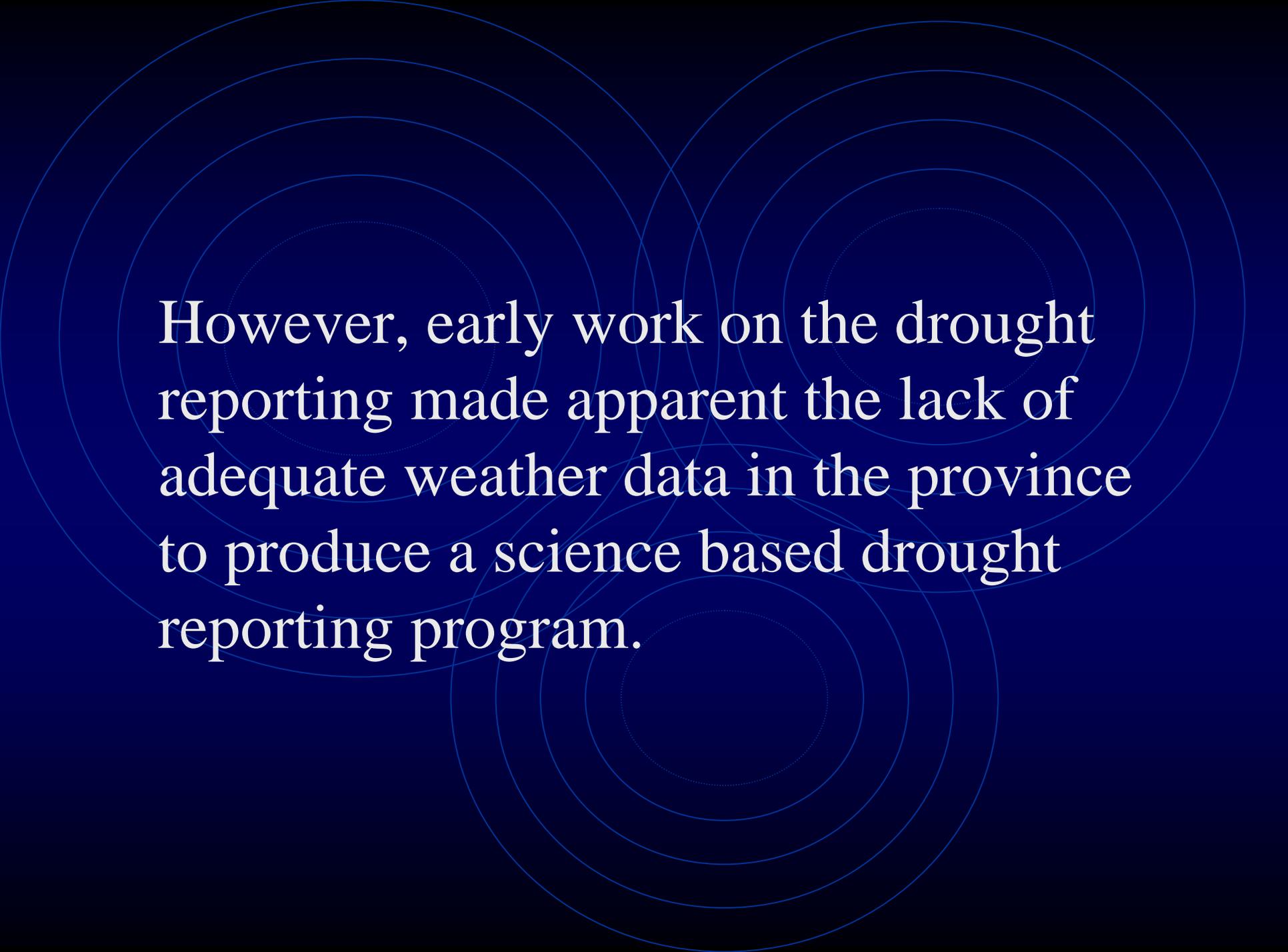
**Paradigm Shift
from
Drought Disaster Response
to
Drought Risk Management**

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**

ADRMP Strategies

- **Science based Drought reporting** — on onset, severity, extent, ending, forecast using existing weather data
- **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 background of the slide features a dark blue color with several overlapping, concentric circles in a lighter blue shade. The circles are centered in the upper and lower portions of the frame, creating a subtle, geometric pattern.

However, early work on the drought reporting made apparent the lack of adequate weather data in the province to produce a science based drought reporting program.

Monitoring

Alberta's Near Real Time Meteorological Networks

Near Real Time Meteorological Stations in Alberta

Networks

-  Agricultural Drought Monitoring (AGDM)
-  Agricultural Climate Monitoring (AGCM) - new expansion in progress
-  Irrigation Management Climate Information Network (IMCIN)
-  Others - AENV, MSC, AAFC

 20 km buffer

 Agricultural Regions



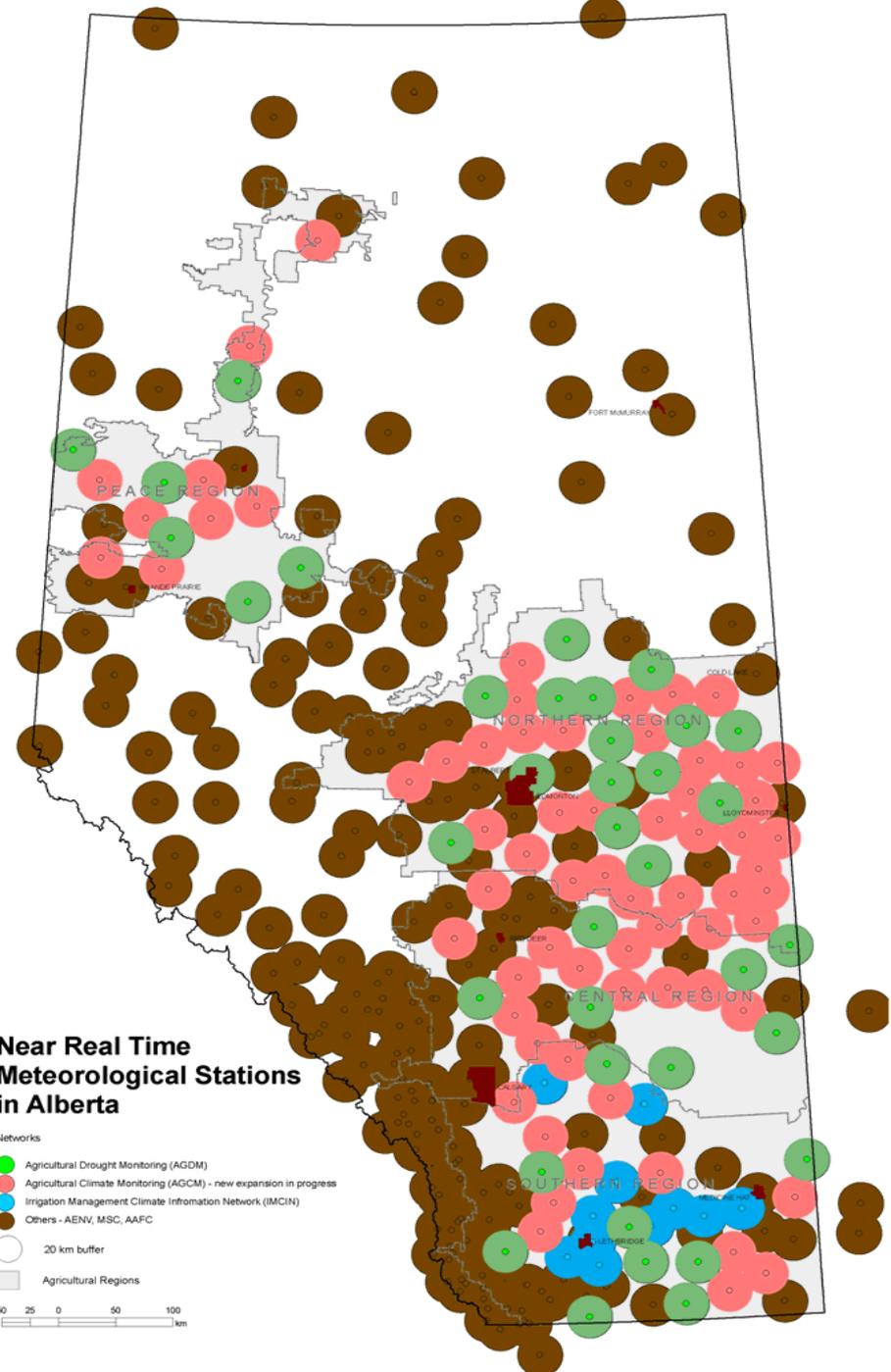
Near Real Time Meteorological Stations in Alberta

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 Agricultural Regions



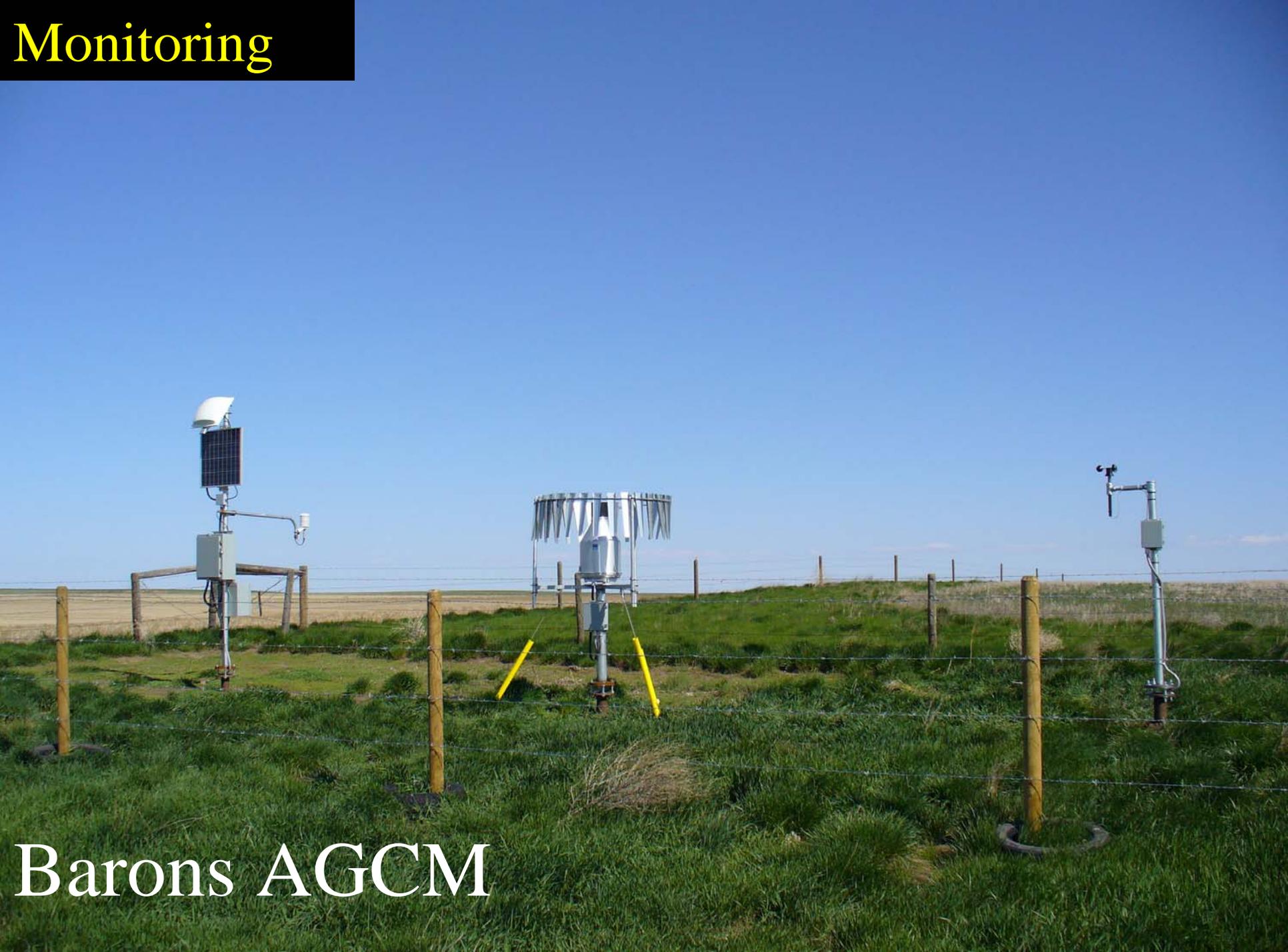
Monitoring

Barnwell AGDM



Monitoring

Barons AGCM

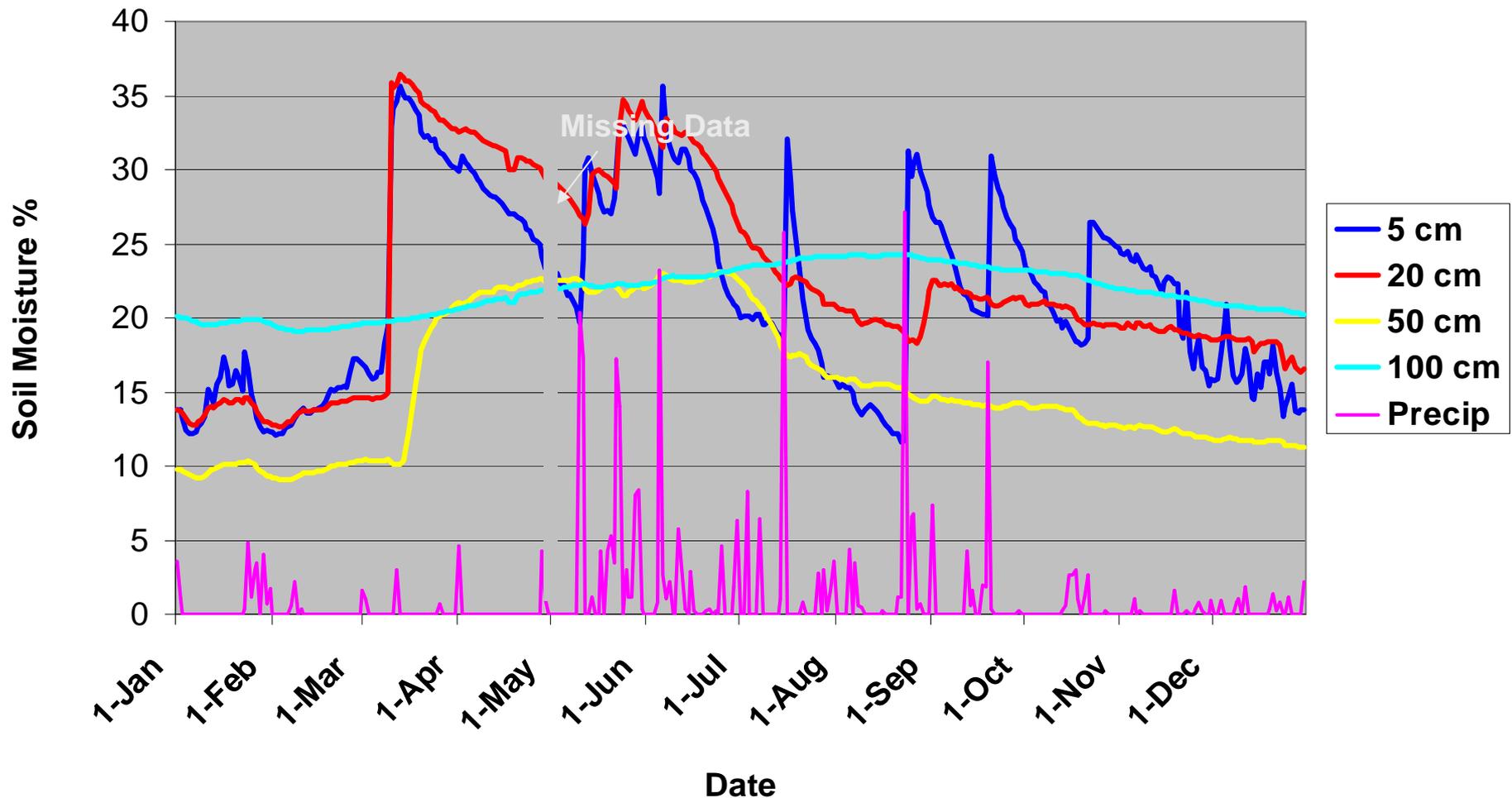


List of Parameters (Hourly)

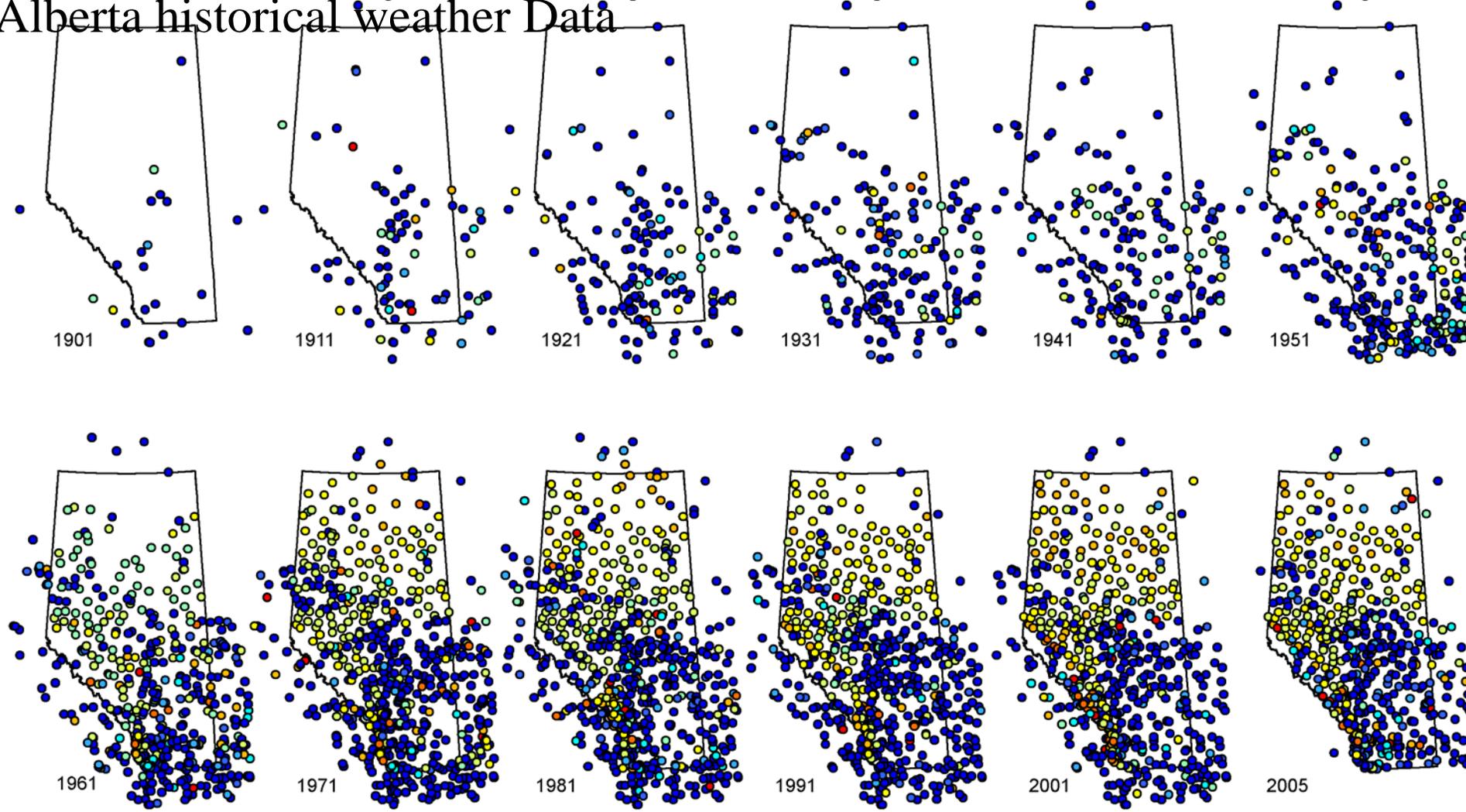
- Precipitation (all season)
- Temperature
- Humidity
- Wind Speed and Direction (@ 2, 10 m)
- Solar Radiation
- Soil Moisture and Temperature (@ 5, 20, 50 and 100 cm)

Monitoring

Soil Moisture at Onefour: 2004



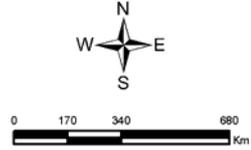
Alberta historical weather Data



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 | ● 0.51 - 0.60 |
| ● 0.11 - 0.20 | ● 0.61 - 0.70 |
| ● 0.21 - 0.30 | ● 0.71 - 0.80 |
| ● 0.31 - 0.40 | ● 0.81 - 0.90 |
| ● 0.41 - 0.50 | ● 0.91 - 1.00 |



Second Generation QAQC:

Providing quality assurance, quality control and missing data filling

Stations Maintenance

ID	Name	Network	Alias	Commission Date				
10540	Abee AGDM	AGDM	ABEE		Alberta Agriculture and R...	GOES	2008-09-11	
15219	Acadia Valley AGCM	AGCM	AVAL	2008-05-05	Alberta Agriculture and R...	GOES	2008-08-25	
11799	Akamina Pass	ANV	AKAM		Alberta Environment	GOES	2008-07-29	
10310	Albert Hall AGCM	AGCM	ALBE		Alberta Agriculture and R...	GOES	2008-07-29	
6039	Alliance AGCM	AGCM	ALLI	2007-02-22	Alberta Agriculture and R...	GOES	2008-07-29	
10585	Andrew AGDM	AGDM	ANDR		Alberta Agriculture and R...	GOES	2008-07-29	
9882	Athabasca AGCM	AGCM	ATHA		Alberta Agriculture and R...	GOES	2008-07-29	
877	Atlee AGCM	AGCM	ATLE		Alberta Agriculture and R...	GOES	2008-07-31	
9927	Atmore AGDM	AGDM	ATMO		Alberta Agriculture and R...	GOES	2008-07-29	
907	Azure	ANV	AZUR		Alberta Environment	GOES	2008-07-30	
1288	Banff CS	EC	WBA		Environment Canada	UNKN	2008-08-12	
2004	Banff Springs	EC	BANF		Environment Canada	UNKN	2008-07-30	
9211	Barnwell AGDM	AGDM	BARN		Alberta Agriculture and R...	GOES	2008-07-29	
9681	Barons AGCM	AGCM	BARO		Alberta Agriculture and R...	GOES	2008-07-29	
2015	Barhead CS	EC	BARR		Environment Canada	UNKN	2008-07-30	
10159	Bassano AGCM	AGCM	BASO		Alberta Agriculture and R...	GOES	2008-07-29	
12025	Battle River Headwaters	ANV	BAHW		Alberta Environment	GOES	2008-07-29	
2024	Beauvais Park	ANV	BEAU		Alberta Environment	UNKN	2008-07-30	
15721	Beaverlodge RCS	EC	BEAV		Environment Canada	UNKN	2008-07-30	
10176	Beiseker AGCM	AGCM	BEIS		Alberta Agriculture and R...	GOES	2008-07-29	
6048	Bellshill AGCM	AGCM	BELL	2007-03-22	Alberta Agriculture and R...	GOES	2008-07-29	
6054	Big Valley AGCM	AGCM	BIGV	2007-04-07	Alberta Agriculture and R...	GOES	2008-07-29	
12319	Black Diamond	ANV	BDIA	2008-04-30	Alberta Environment	GOES	2008-07-30	
9747	Blood Tribe Ag. Project IM...	IMCIN	BTAP		Alberta Agriculture and R...	GOES	2008-07-29	
11019	Bodo AGDM	AGDM	BODO		Alberta Agriculture and R...	GOES	2008-07-29	
15729	Bow Island	EC	BOWI		Environment Canada	UNKN	2008-07-30	
10045	Bow Island North IMCIN	IMCIN	BISL		Alberta Agriculture and R...	GOES	2008-07-29	
11773	Bow Summit (New)	ANV	BSUM		Alberta Environment	GOES	2008-08-01	
2032	Bow Valley	EC	BOWV		Environment Canada	UNKN	2008-07-30	
6012	Broken Plate	AGDM	BRET		Alberta Agriculture and R...	AGDM	2008-08-26	

Information | **Sensor Elements** | Images

Station: Abee AGDM

Station Detail

Name: * Abee AGDM

Aliases: EC_ID: 3010010, WMO_ID: 71285, AENV_ID: ABEE, TC_ID: XAF

Commissioned: []

Station Type: AGDM

Network: * Agriculture Drought Monitoring N...

Operator: Alberta Agriculture and Rural Dev...

Organization: Alberta Agriculture and Rural Dev...

Comment...

Location

Latitude (dec degrees): * 54.2773

Longitude (dec degrees): * 112.9654

Elevation (metres): 664.00

Easting: 632414.36

Northing: 6013880.87

Technicians: Aldo Dimaria

River Basin: []

Province: Alberta

Transmission Detail

Trans Type: * GOES

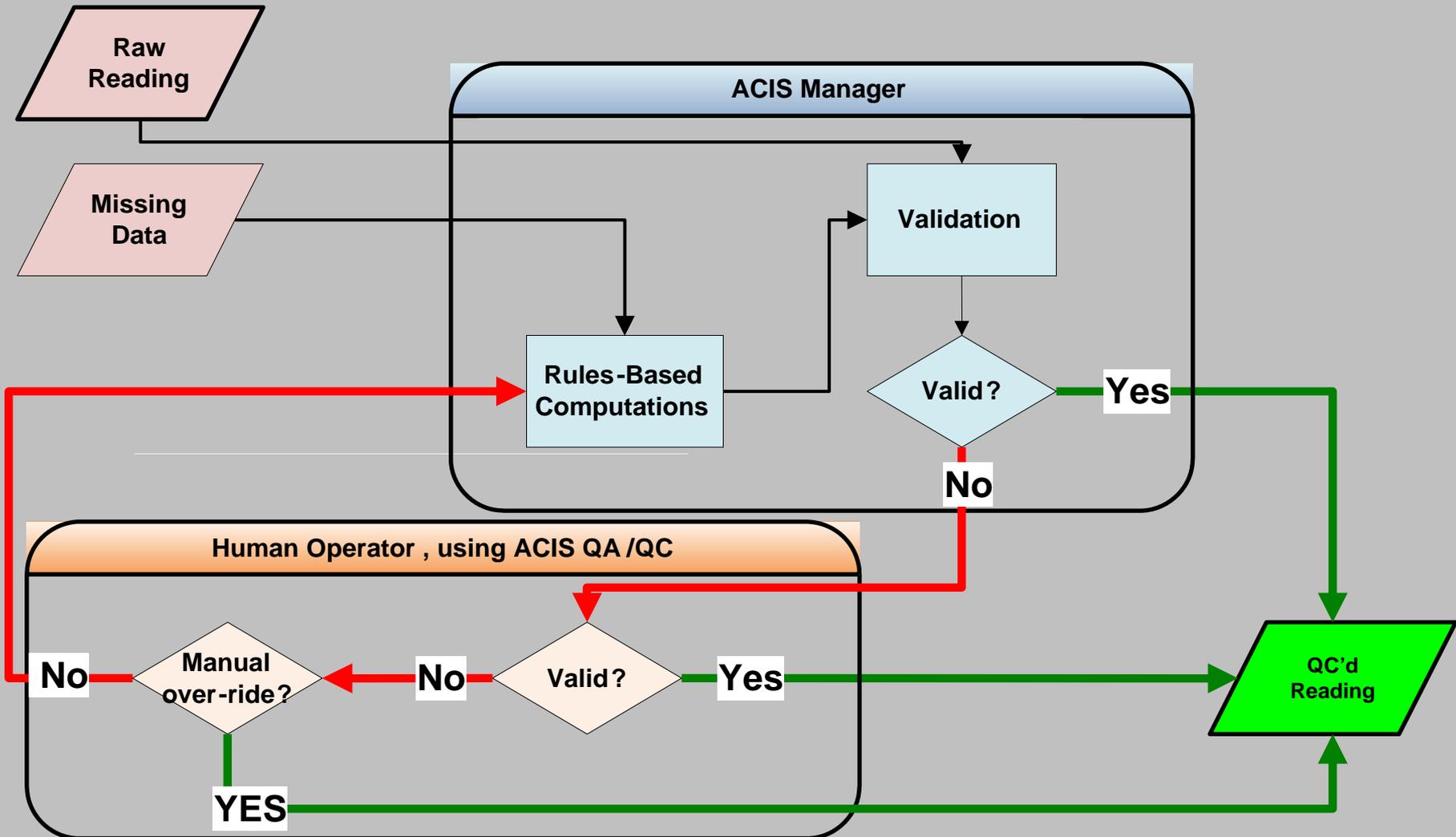
References: Transmit Channel : 175E, Transmit Time : 0:18:30, Transmit Window : 0:00:15

Season Start: []

Season End: []

Freq: Hourly

QAQC Flow Logic Diagram



Date: All

September 2008

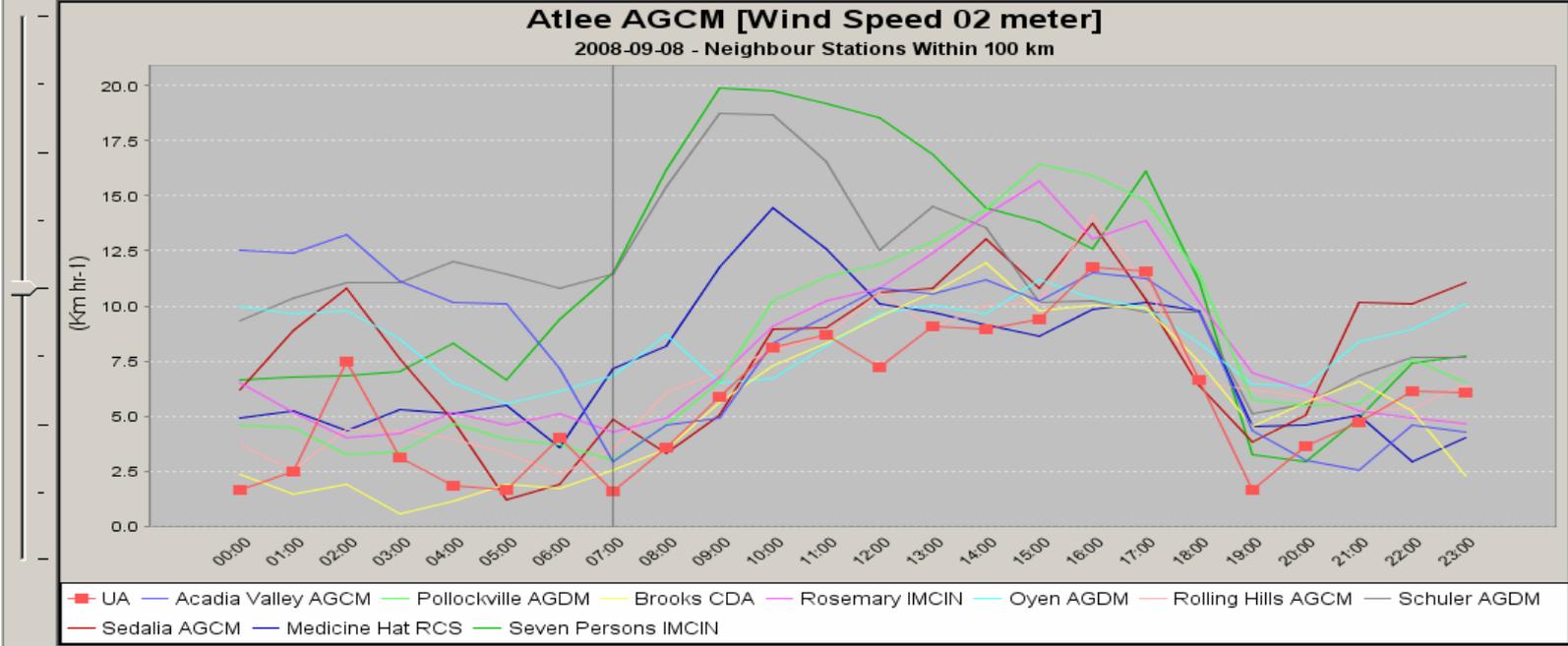
Sun	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

HOURLY:2008-09-08:10298

Information | Validation | **Suspect** | Summary Data | Final Data

4 : Suspect - Neighbour - Graph | 2 : Suspect - Neighbour - Table | 2 : Suspect - Sensor - Graph | 1 : Suspect - Sensor - Table

Suspect - Neighbour - Graph | Atlee AGCM [UA]



Accept	Source Code	Validation Code	Station ▼	Sensor ▼▼	Time S...	Reading Raw	Reading	Timestamp	Validation Message
REJECTED	ACTUAL	SUSPECT	Acadia Valley AGCM	Radiation Incoming	02:00	-0.00100	-0.00100	2008-09-08	range check, solar radiation out of range: -0.0010 less than 0
REJECTED	MISSING	SUSPECT	Acadia Valley AGCM	Wind Direction 10 meter	11:00			2008-09-08	Reading not found
REJECTED	ACTUAL	SUSPECT	Akamina Pass	Snow Depth	08:00	-3.00000	-3.00000	2008-09-08	range check, snow depth out of range: -3.0 less than -1.0
REJECTED	ACTUAL	SUSPECT	Akamina Pass	Snow Depth	10:00	-2.00000	-2.00000	2008-09-08	range check, snow depth out of range: -2.0 less than -1.0
REJECTED	ACTUAL	SUSPECT	Akamina Pass	Snow Depth	11:00	-4.00000	-4.00000	2008-09-08	range check, snow depth out of range: -4.0 less than -1.0
REJECTED	ACTUAL	SUSPECT	Akamina Pass	Snow Depth	13:00	-2.00000	-2.00000	2008-09-08	range check, snow depth out of range: -2.0 less than -1.0
REJECTED	ACTUAL	SUSPECT	Akamina Pass	Snow Depth	14:00	-2.00000	-2.00000	2008-09-08	range check, snow depth out of range: -2.0 less than -1.0
REJECTED	ACTUAL	SUSPECT	Akamina Pass	Snow Depth	15:00	-2.00000	-2.00000	2008-09-08	range check, snow depth out of range: -2.0 less than -1.0
REJECTED	ACTUAL	SUSPECT	Akamina Pass	Snow Depth	16:00	-2.00000	-2.00000	2008-09-08	range check, snow depth out of range: -2.0 less than -1.0
REJECTED	ACTUAL	SUSPECT	Akamina Pass	Snow Depth	17:00	-2.00000	-2.00000	2008-09-08	range check, snow depth out of range: -2.0 less than -1.0
REJECTED	ACTUAL	SUSPECT	Atlee AGCM	Wind Speed 02 meter	07:00	1.60900	1.60900	2008-09-08	constant check, possible sensor malfunction: 1.609 found
REJECTED	ACTUAL	SUSPECT	Atmore AGDM	Precipitation Wieghing (PR)	00:00	297.600	298.9	2008-09-08	difference check, evaporation possible: difference=1.3 toler
REJECTED	ACTUAL	SUSPECT	Atmore AGDM	Precipitation Wieghing (PR)	01:00	297.500	298.9	2008-09-08	difference check, evaporation possible: difference=1.4 toler
REJECTED	ACTUAL	SUSPECT	Atmore AGDM	Precipitation Wieghing (PR)	02:00	297.400	298.9	2008-09-08	difference check, evaporation possible: difference=1.5 toler
REJECTED	ACTUAL	SUSPECT	Atmore AGDM	Precipitation Wieghing (PR)	03:00	297.400	298.9	2008-09-08	difference check, evaporation possible: difference=1.5 toler
REJECTED	ACTUAL	SUSPECT	Atmore AGDM	Precipitation Wieghing (PR)	04:00	297.600	298.9	2008-09-08	difference check, evaporation possible: difference=1.3 toler

Accept Reject

The AgroClimatic Information Service (ACIS)

Web based delivery of :

- Network station meta data and data,
- Drought reports (bi-monthly to monthly)
- Maps for summary of weather parameters and drought indices.

- About the Ministry
- Find Staff
- ACIS Main Page
- Quick Map Viewer
- Climate Mapper
- Weather Mapper
- Station Viewer
- About

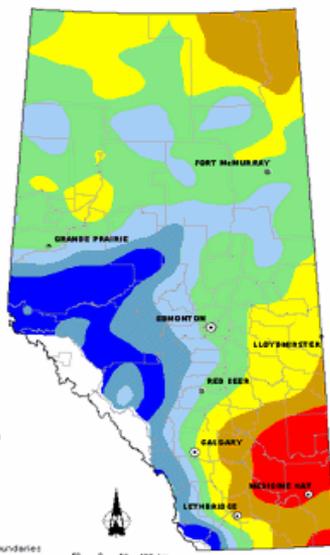
AgroClimatic Information Service (ACIS)

Sign up for our E-Newsletter

Welcome to ACIS, an interactive tool that helps producers, farm consultants, and researchers create maps. These maps describe Alberta's weather, climate and related agriculture features to help with your long-term planning and decision-making throughout the growing season.

You can navigate directly to the viewers by selecting the tabs at the top of the page.

To learn more about using the viewer, choose one of the categories below.



Annual total precipitation, 1971 to 2000

Precipitation (mm)

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

ACIS Case Studies

Learn how you can use ACIS to find the length of the growing season, determine the driest area in the province, and monitor crop growth.

[View case studies](#)

ACIS Viewers Explained

Find out about the features of each viewer and take a quick tour to learn the functions of this tool.

[Viewers explained](#)

ACIS Help

Not sure what that rectangular button does? Want to know how to run a query? View the Help section for brief explanations on the functions of the viewers.

[Help](#)

To learn the functions of this tool, take a [quick tour](#).



Agriculture and Food

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Location: [Alberta Government Home](#) > [RopinTheWeb Home](#) > ACIS

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AgroClimatic Information Service Climate Mapper

Query Legend Related Information

Step 1: Select a Category:

Step 2: Year: Growing Season (Apr 1 - Sep 30)

Step 3: Select a Time Period

Step 4: Select Color Scheme

Step 5: Modify Label and Map Colors

Min	Max	Color	Label
<input type="text" value="100"/>	<input type="text" value="150"/>	<input type="text" value="Red 3"/>	<input type="text"/>
<input type="text" value="150"/>	<input type="text" value="200"/>	<input type="text" value="Red 1"/>	<input type="text"/>
<input type="text" value="200"/>	<input type="text" value="250"/>	<input type="text" value="Orange 1"/>	<input type="text"/>
<input type="text" value="250"/>	<input type="text" value="300"/>	<input type="text" value="Yellow 1"/>	<input type="text"/>
<input type="text" value="300"/>	<input type="text" value="400"/>	<input type="text" value="Light Blue 1"/>	<input type="text"/>
<input type="text" value="400"/>	<input type="text" value="500"/>	<input type="text" value="Blue 2"/>	<input type="text"/>
<input type="text" value="500"/>	<input type="text" value="652"/>	<input type="text" value="Purple 2"/>	<input type="text"/>

TOOLS

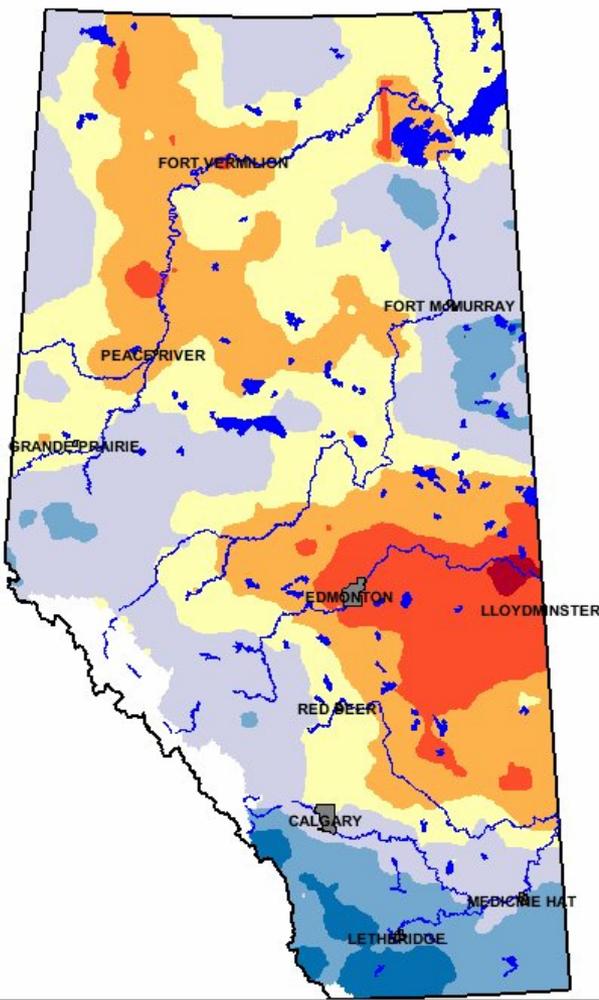


-- Select a Climate Element --

- Precipitation (mm)
- Mean Temperature (C)
- Minimum Temperature (C)
- Maximum Temperature (C)
- Relative Humidity (%)
- Radiation (MJ/m^2)
- Wind Speed (Km/H)

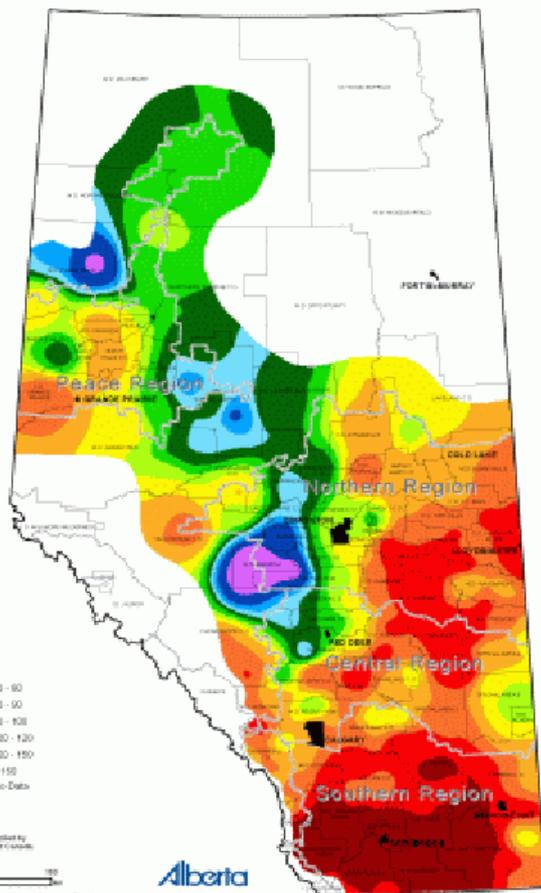
---- Select a Grouping ----

- Year
- Growing Season (Apr 1 - Sep 30)
- Quarter
- Month



Climate Mapper





Quick Viewer



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AgroClimatic Information Service Quick Map Viewer

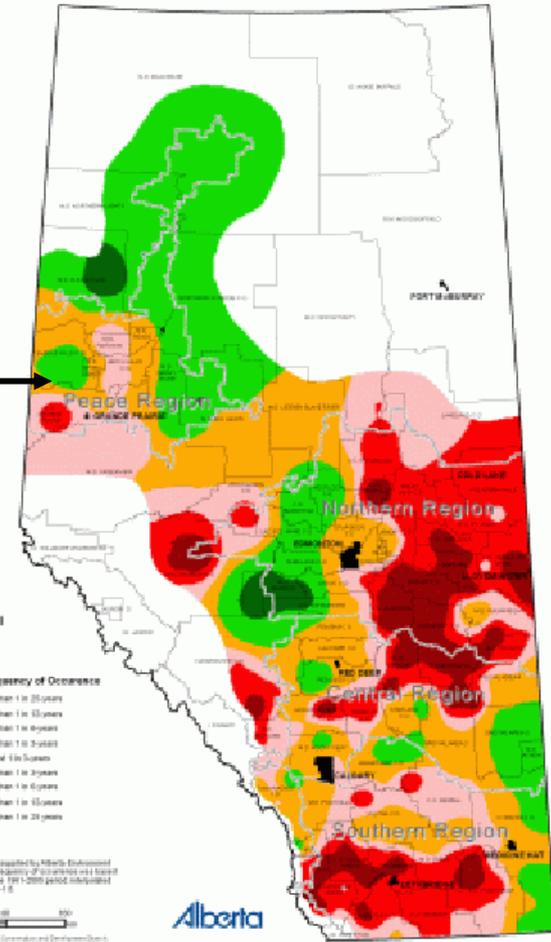
TOOLS

Precipitation Accumulation Relative to Normal (Long-Term) 030-day 2007 Jul 28

[view larger map](#)

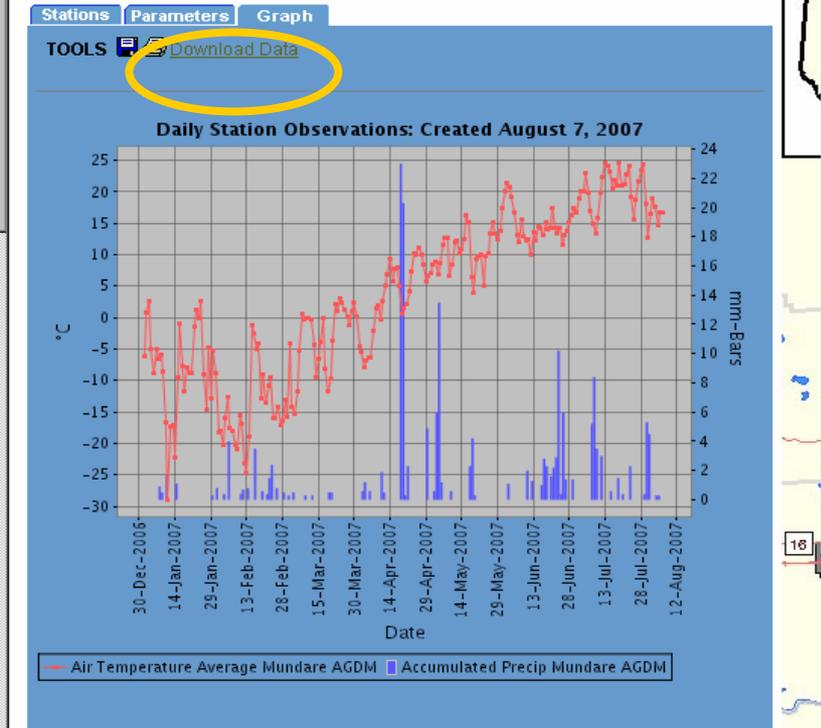
New **Precipitation** Soil Moisture Drought Index Atlas Pests

- Collapse All
- [-] Accumulation (total)
 - [+] 030-day
 - [+] 090-day
 - [+] 180-day
 - [+] 365-day
 - [+] Growing Season
 - [+] Cold Season
 - [+] Cumulative
 - [+] Monthly
 - [+] Monthly Average (1971-2000)
- [-] Accumulation Relative to Normal (Long-Term)
 - [+] 030-day
 - [+] 090-day
 - [+] 180-day
 - [+] 365-day
 - [+] Growing Season
 - [+] Cold Season
 - [+] Monthly
 - [+] Percent of Average (Long-Term)
 - [+] Snow Pack on Stubble Fields



Quick Viewer

AgroClimatic Information Service
 Station Viewer



Near Real Time Data Provided by Alberta Environment, Environment Canada and Alberta Agriculture and Food.
 Note: Raw data has undergone QA/QA and data filling. It is preliminary in nature and is subject to change under further review. All values are daily observations.
 Data Current to: Aug 06, 2007

Microsoft Excel - station_viewer_data[2].csv
 File Edit View Insert Format Tools Data
 Analyze PUP 2000 Window Help Column Fit

Station	Date	Accumulated Precip (mm-Bars)
Mundare AC	1-Jun-07	0
Mundare AC	2-Jun-07	1.099991
Mundare AC	3-Jun-07	0
Mundare AC	4-Jun-07	0
Mundare AC	5-Jun-07	0
Mundare AC	6-Jun-07	0
Mundare AC	7-Jun-07	0
Mundare AC	8-Jun-07	0
Mundare AC	9-Jun-07	0
Mundare AC	10-Jun-07	2
Mundare AC	11-Jun-07	0
Mundare AC	12-Jun-07	1.299988
Mundare AC	13-Jun-07	0
Mundare AC	14-Jun-07	0



Station Viewer



Agriculture and Food

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AgroClimatic Information Service Quick Map Viewer

New Precipitation **Soil Moisture** Drought Index Atlas Pests

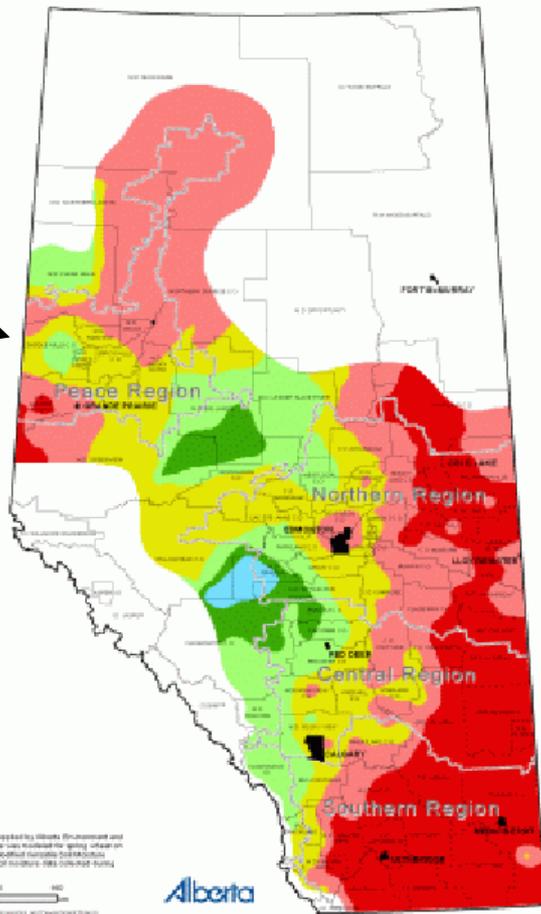
Collapse all

- Soil Moisture (modeled)
 - Spring Wheat
 - Reserves Relative to Normal (Long-Term)
 - Departure from Average (Long-Term)
 - Average (Long-Term)
 - Current
 - 2007 Jul 28**
 - 2007 Jul 22
 - 2007 Jul 14
 - 2007 Jul 08
 - 2007 Jul 02
 - 2007 Jun 24
 - 2007 Jun 18
 - 2007 Jun 10
 - 2007 May 27
 - 2007 May 14
 - 2007 May 06
 - 2007 Apr 30
 - 2007 Apr 24
 - 2007 Apr 11
 - 2007 Apr 02
 - 2007 Mar 31
 - 2007 Mar 15
 - 2007 Feb 28
 - 2007 Feb 15
 - 2007 Jan 31
 - 2007 Jan 15
 - 2006 Dec 31
 - 2006 Dec 15

TOOLS

Soil Moisture (modeled) Spring Wheat Current 2007 Jul 28

[view larger map](#)



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AgroClimatic Information Service Quick Map Viewer

[New](#) | [Precipitation](#) | [Soil Moisture](#) | [Drought Index](#) | [Atlas](#) | [Pests](#)

Collapse all

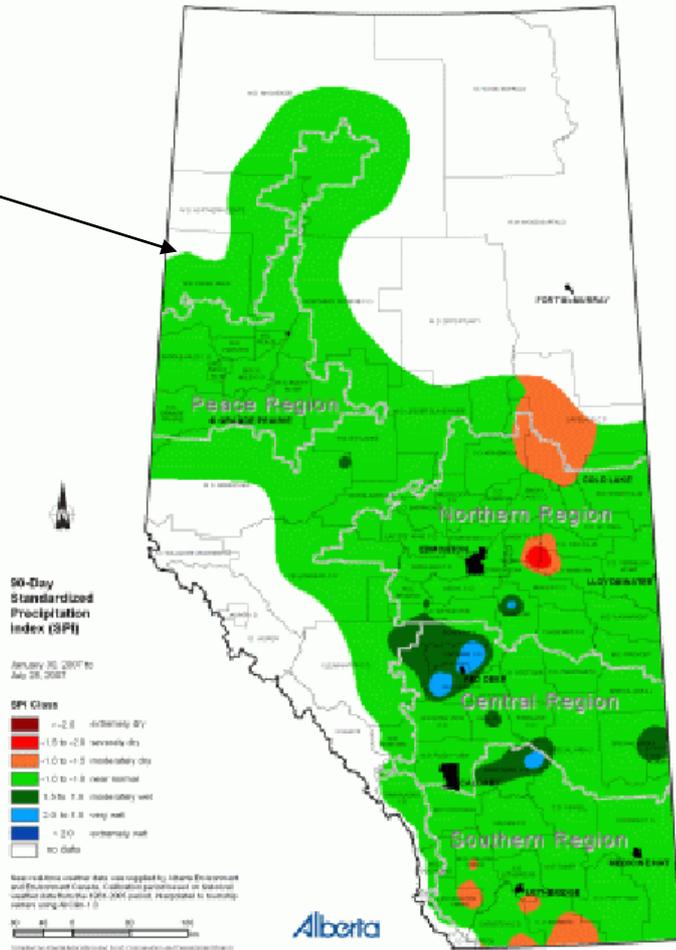
- 365-day Standardized Precip. Index (SPI)
- 90-day Standardized Precip. Index (SPI) Trend
- 90-day Standardized Precip. Index (spi)

- 2007 Jul 28
- 2007 Jul 14
- 2007 Jul 08
- 2007 Jul 02
- 2007 Jun 24
- 2007 Jun 18
- 2007 Jun 10
- 2007 May 27
- 2007 May 14
- 2007 May 06
- 2007 Apr 30
- 2007 Apr 24
- 2007 Apr 11
- 2007 Apr 02
- 2007 Mar 31
- 2007 Mar 15
- 2007 Feb 28
- 2007 Feb 15
- 2007 Jan 31
- 2007 Jan 15
- 2006 Dec 31
- 2006 Dec 15
- 2006 Nov 30
- 2006 Nov 15
- 2006 Oct 31
- 2006 Oct 15
- 2006 Sep 30

TOOLS

Drought Indices 90-day Standardized Precip. Index (spi) 2007 Jul 28

[view larger map](#)

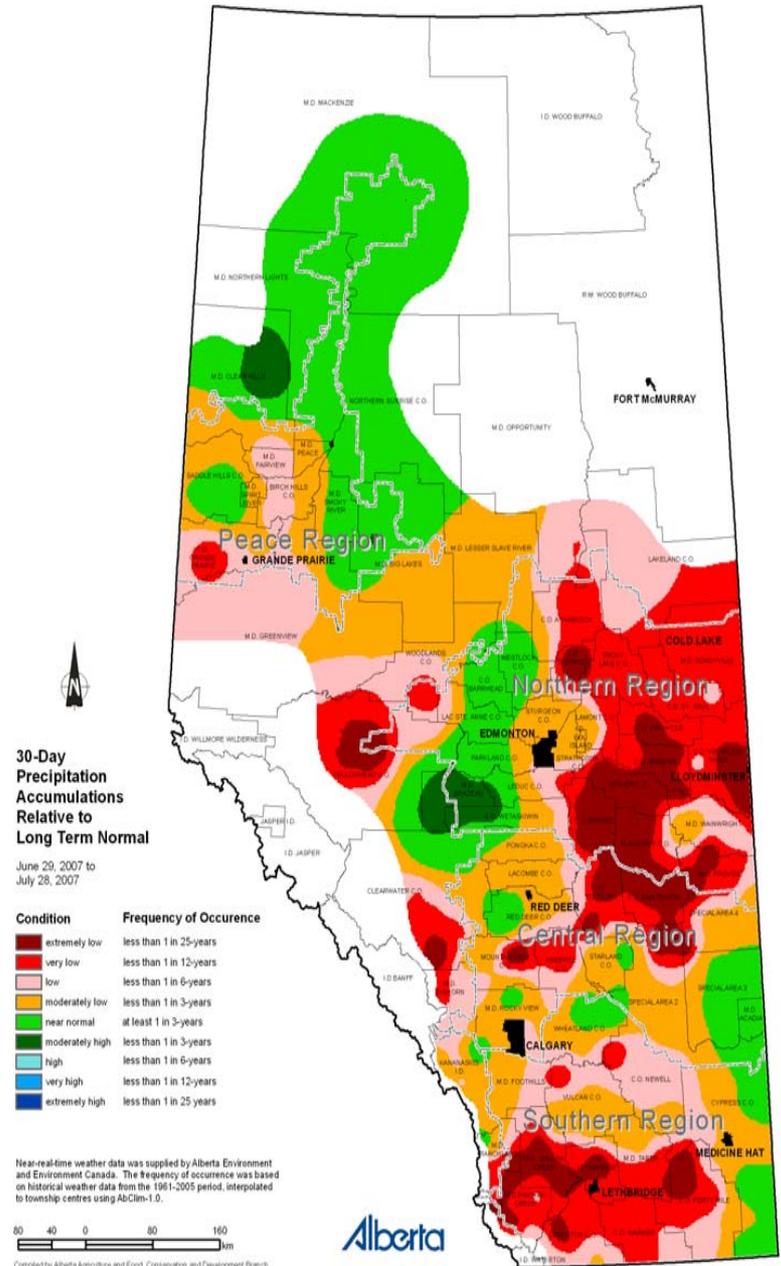
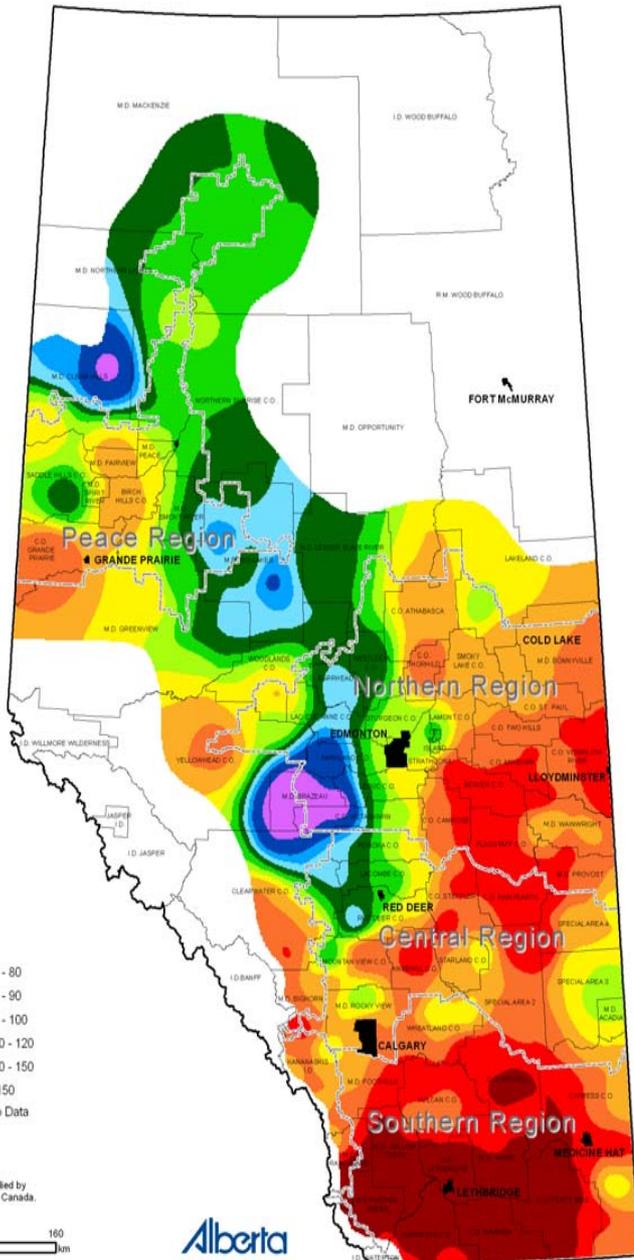


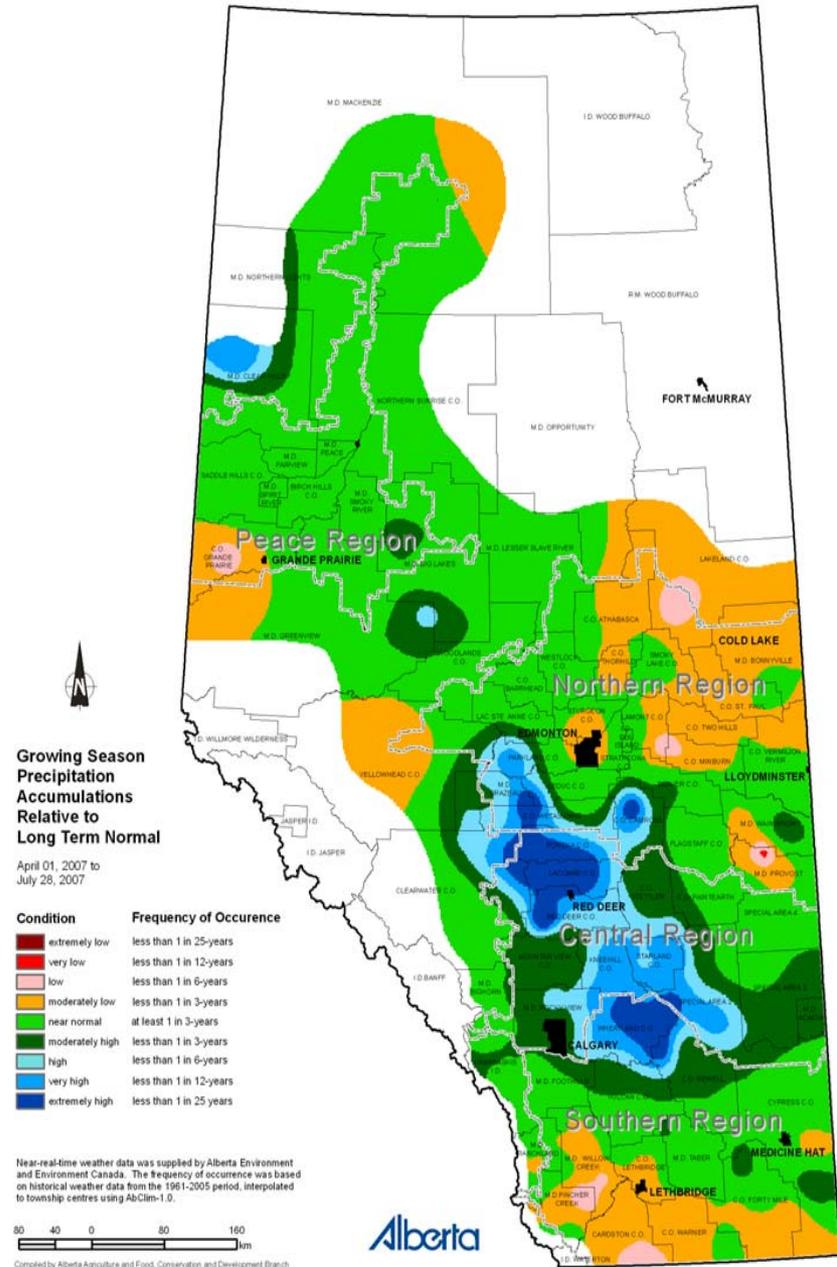
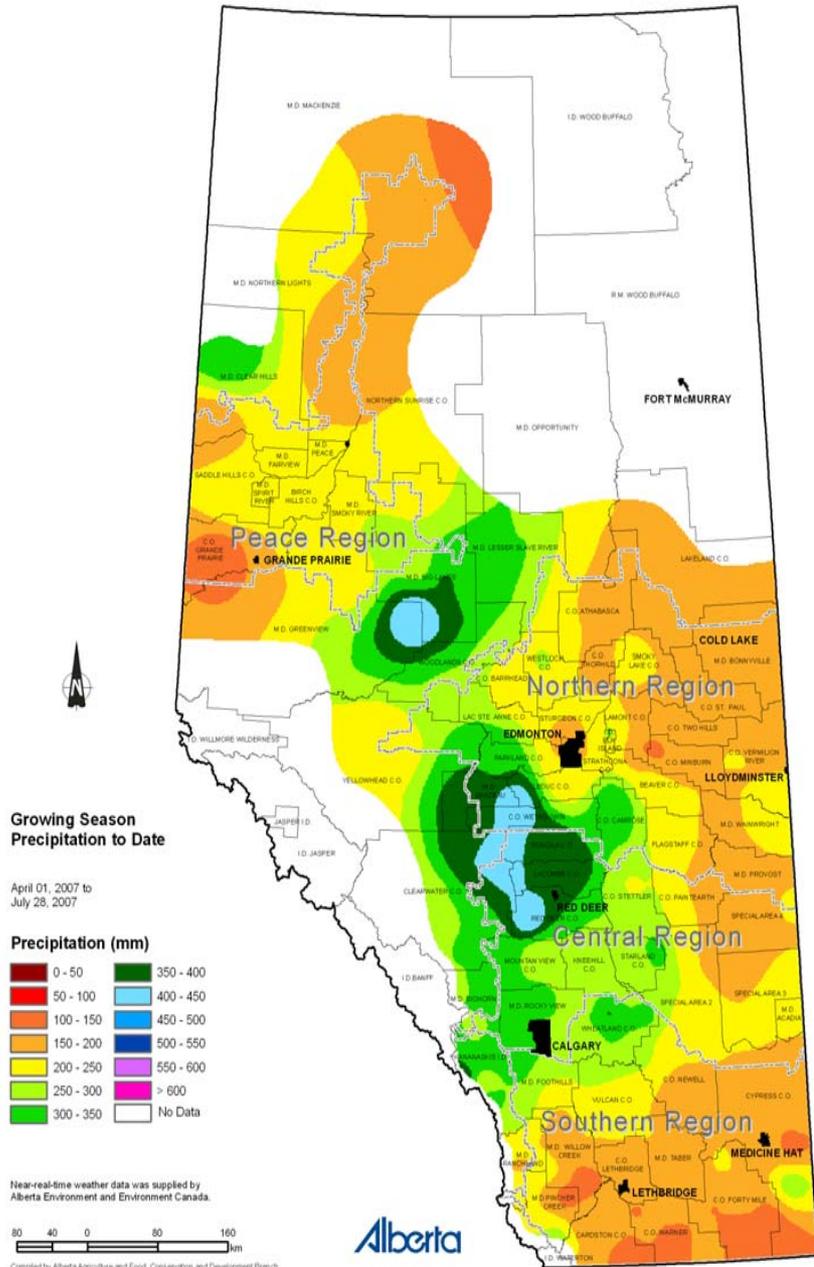
Quick Viewer

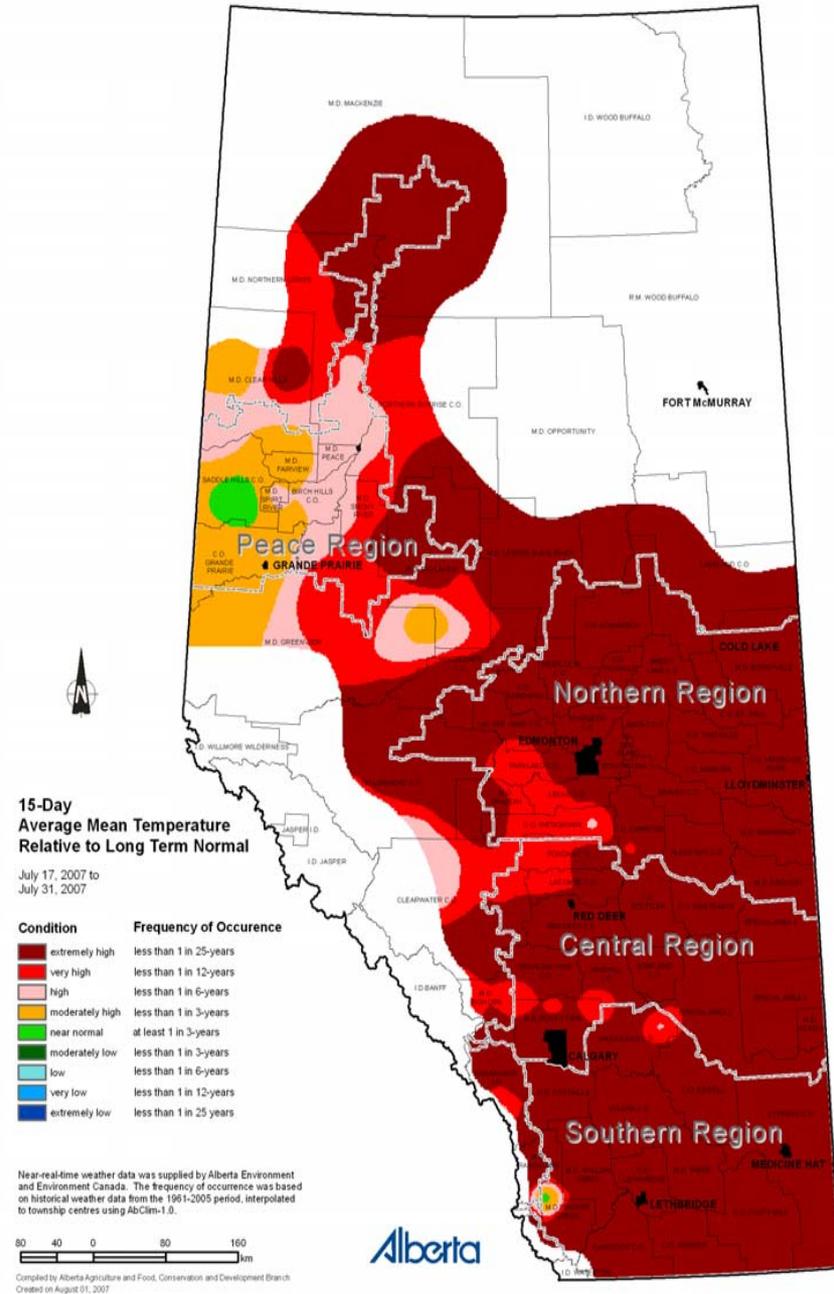
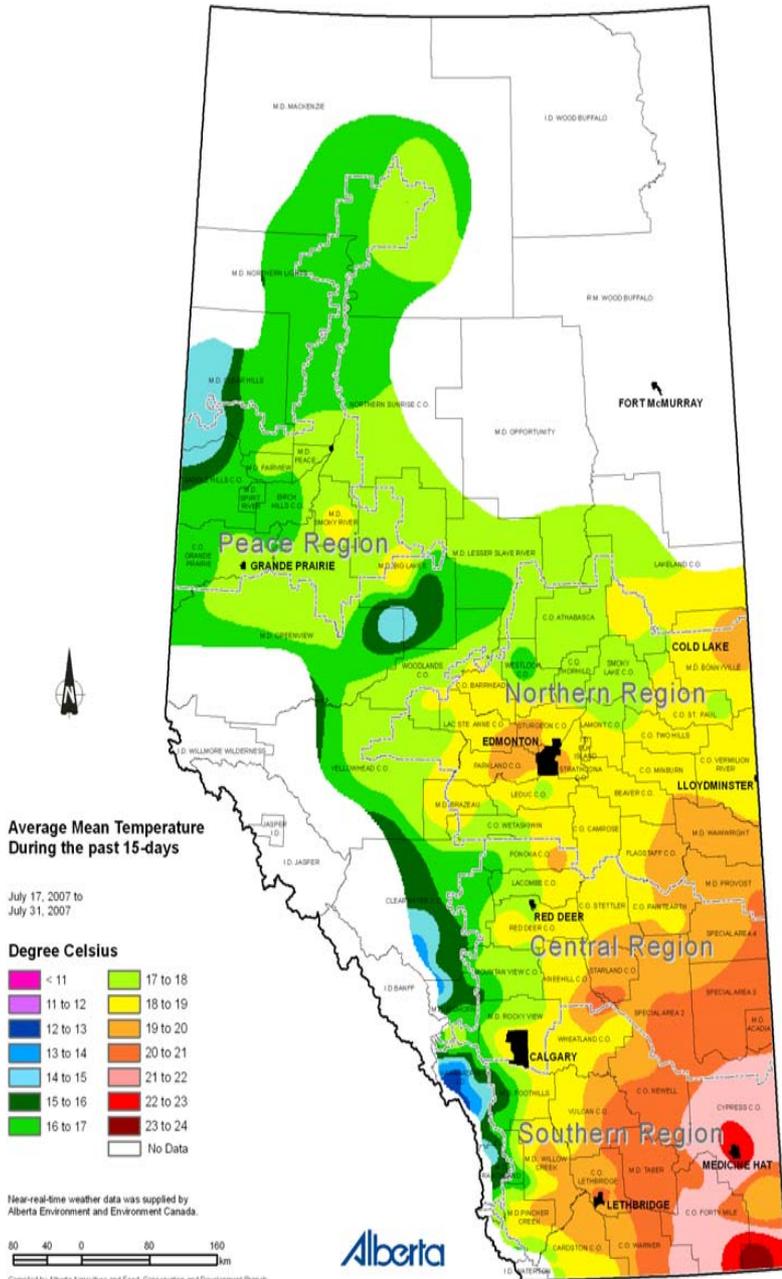
Standardized Map Legends: Frequency of Occurrence (1961 to 2005)

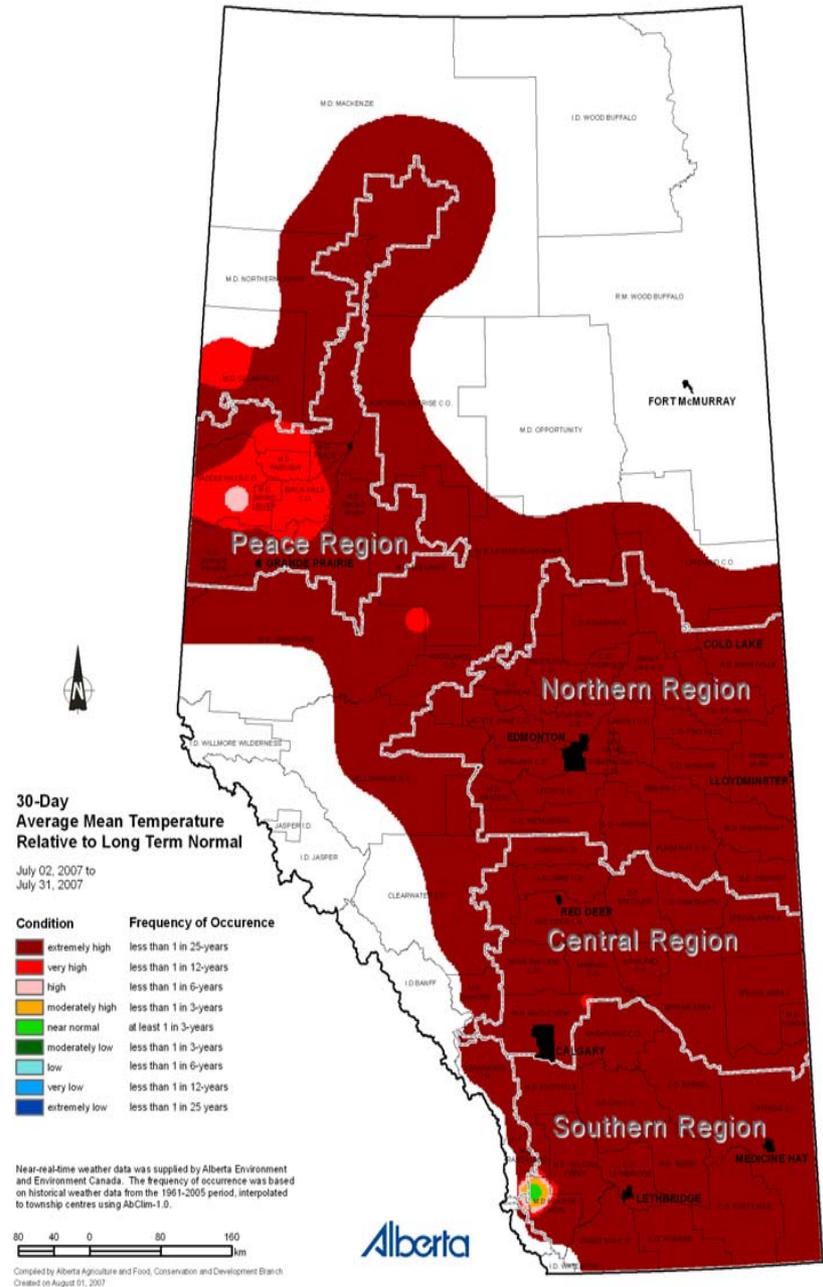
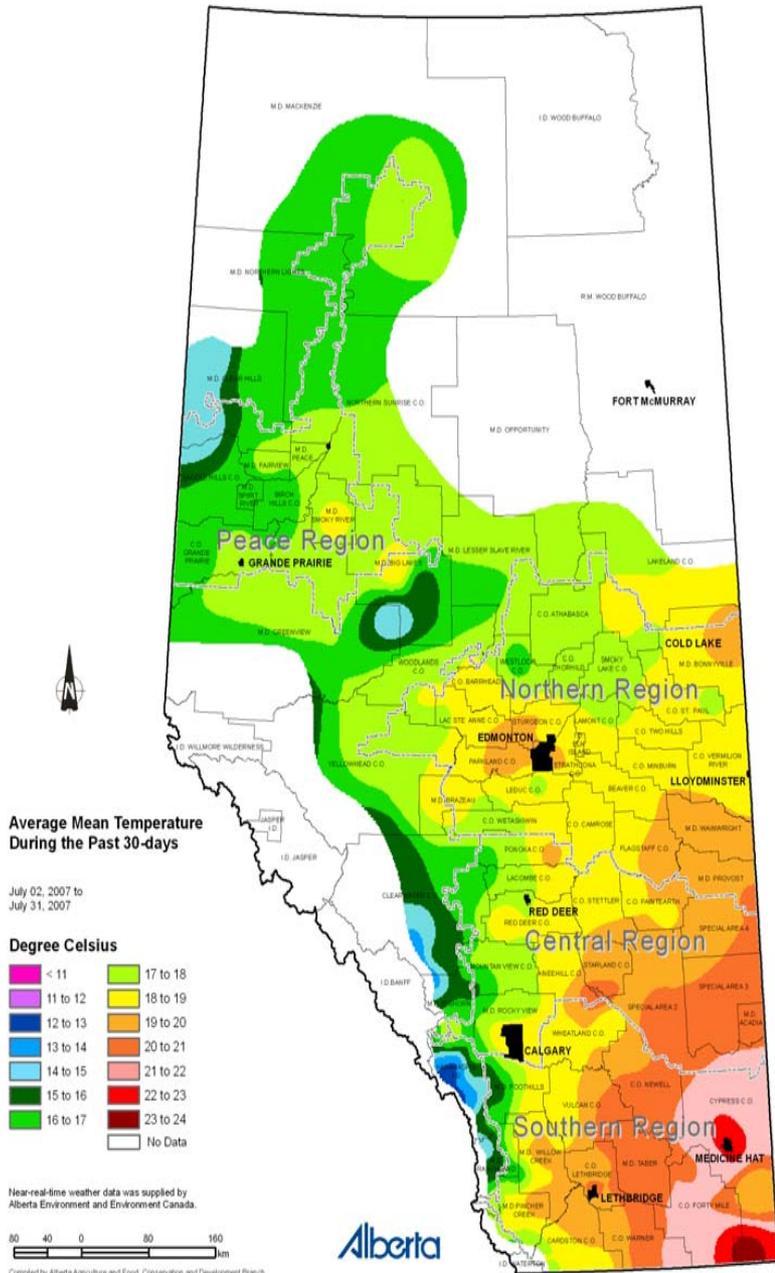
- Precipitation
 - 30-day
 - 90-day
 - 180-day
 - 365-day
 - Monthly
 - Growing Season (Apr 1 to Sep 30)
 - Cold Season (Oct 1 to Mar 31)
- Temperature
 - Monthly
- Snow Pack
- Soil Moisture
 - Spring Wheat
 - Pasture

Condition	Frequency of Occurrence
 extremely low	less than 1 in 25-years
 very low	less than 1 in 12-years
 low	less than 1 in 6-years
 moderately low	less than 1 in 3-years
 near normal	occurs 1 in 3-years
 moderately high	less than 1 in 3-years
 high	less than 1 in 6-years
 very high	less than 1 in 12-years
 extremely high	less than 1 in 25 years





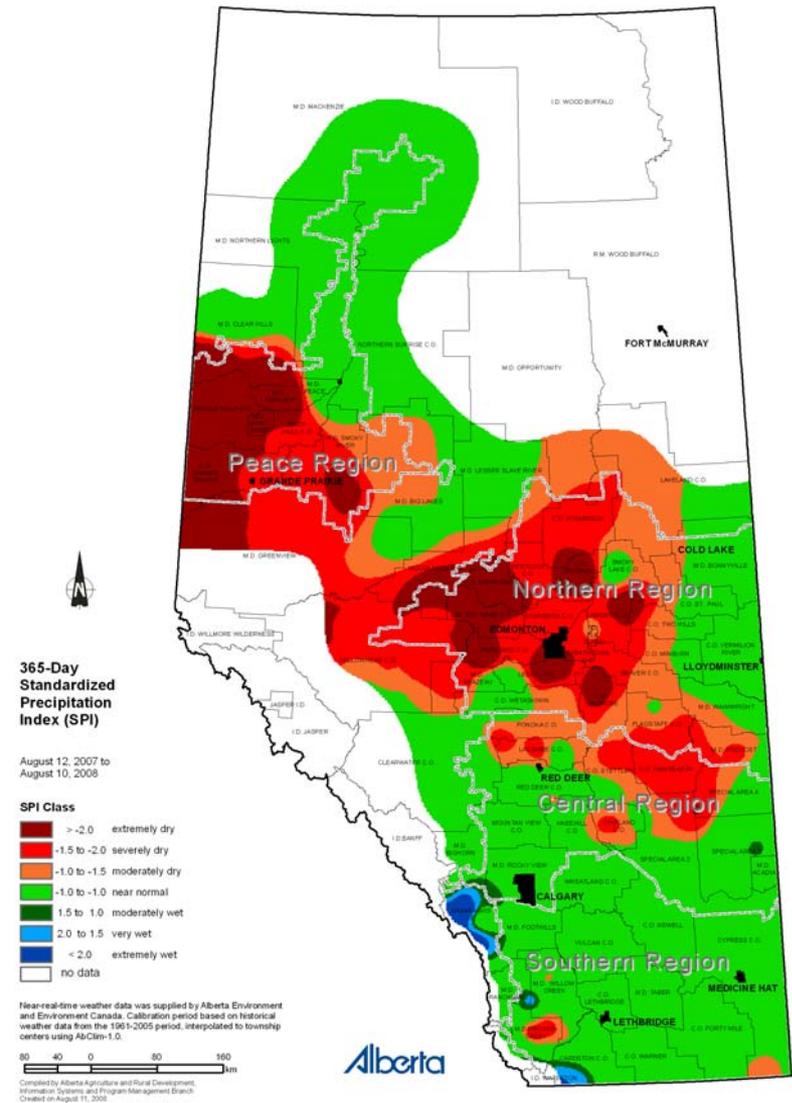
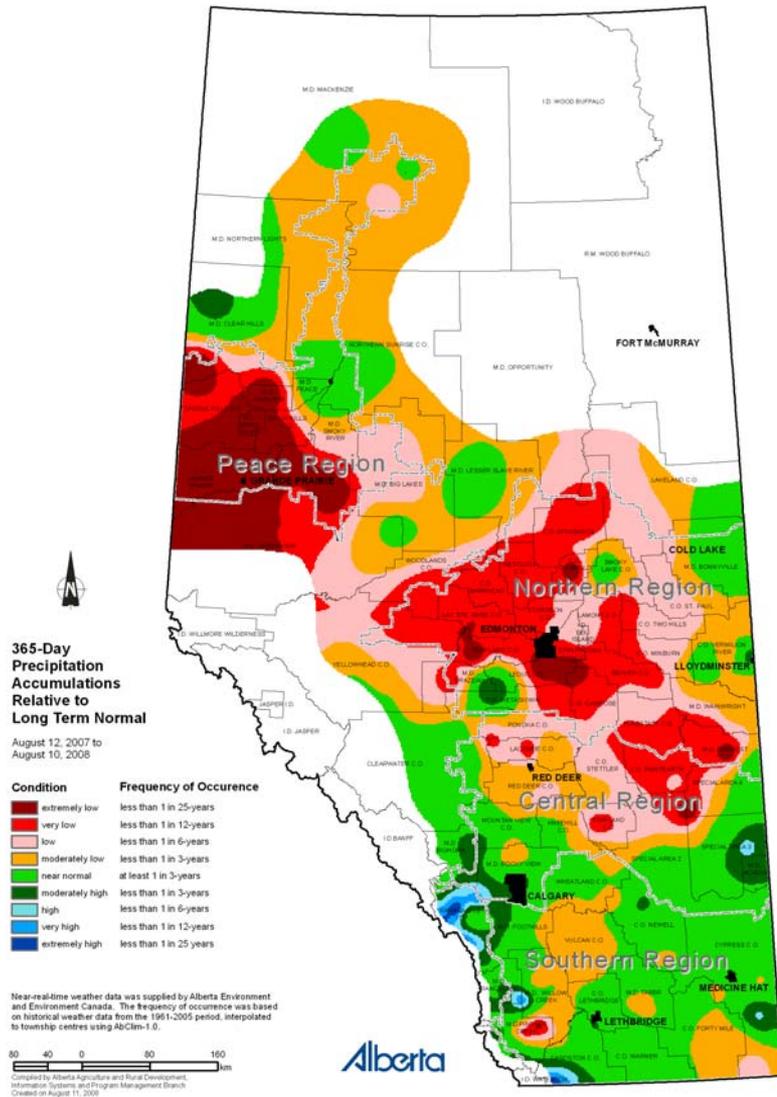




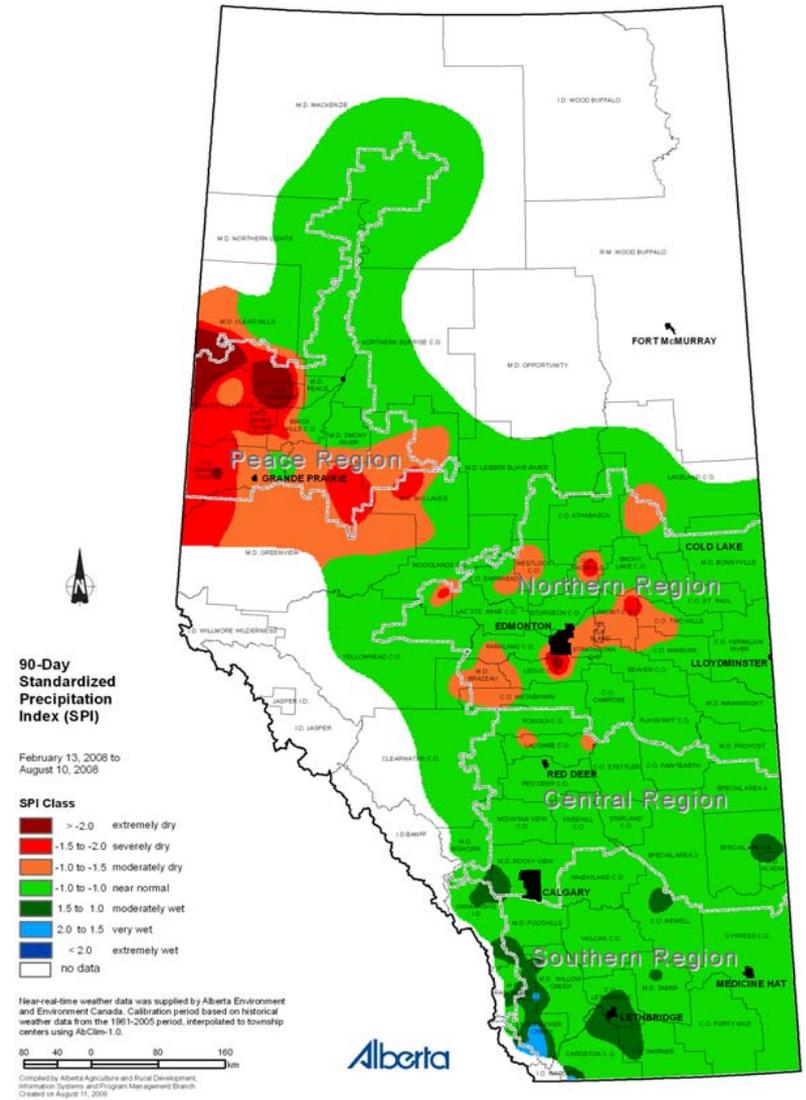
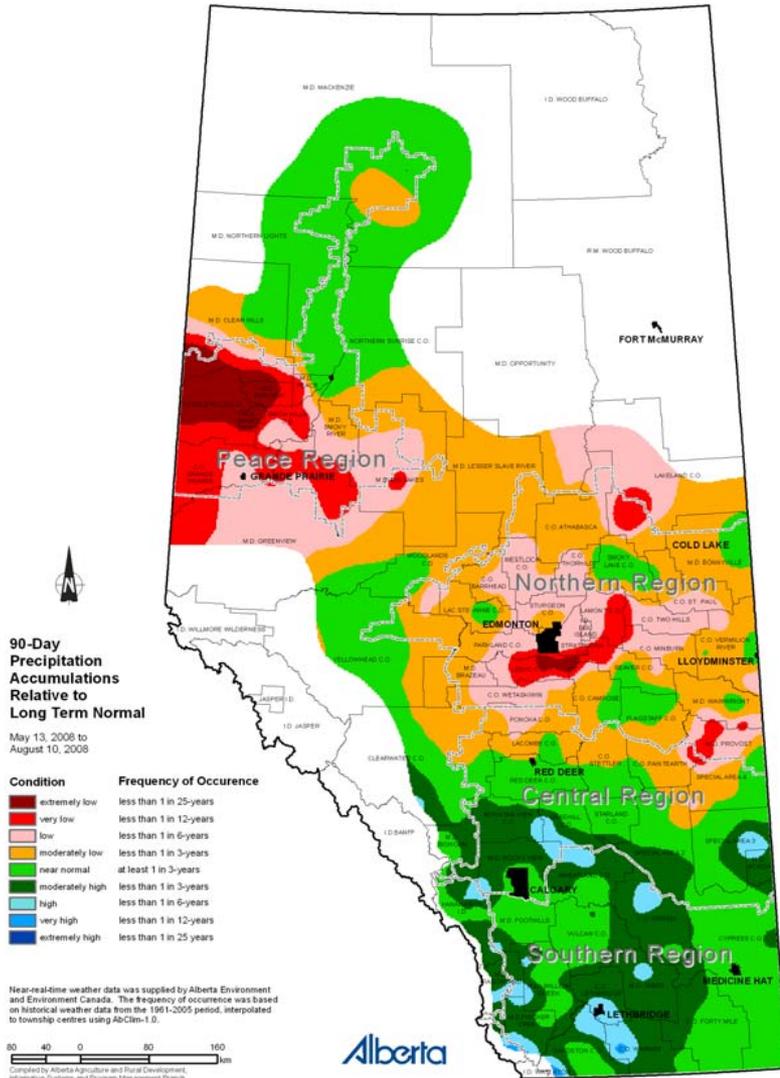
Drought Indicators used

- 1. Precipitation summaries relative to long term normal,**
- 2. Soil water balance models for wheat and Pasture,**
- 3. Standardized Precipitation Index (SPI)**

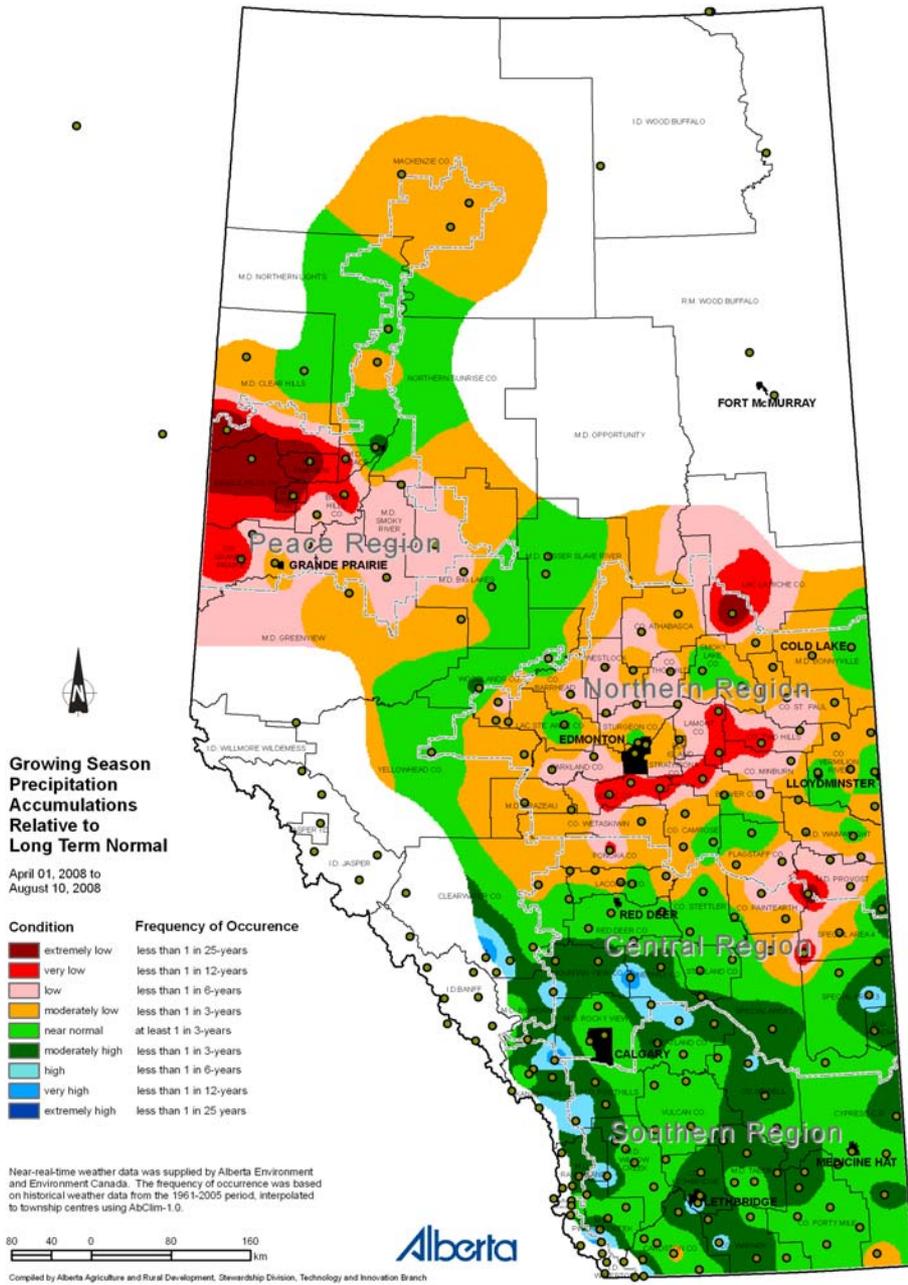
Drought Indices



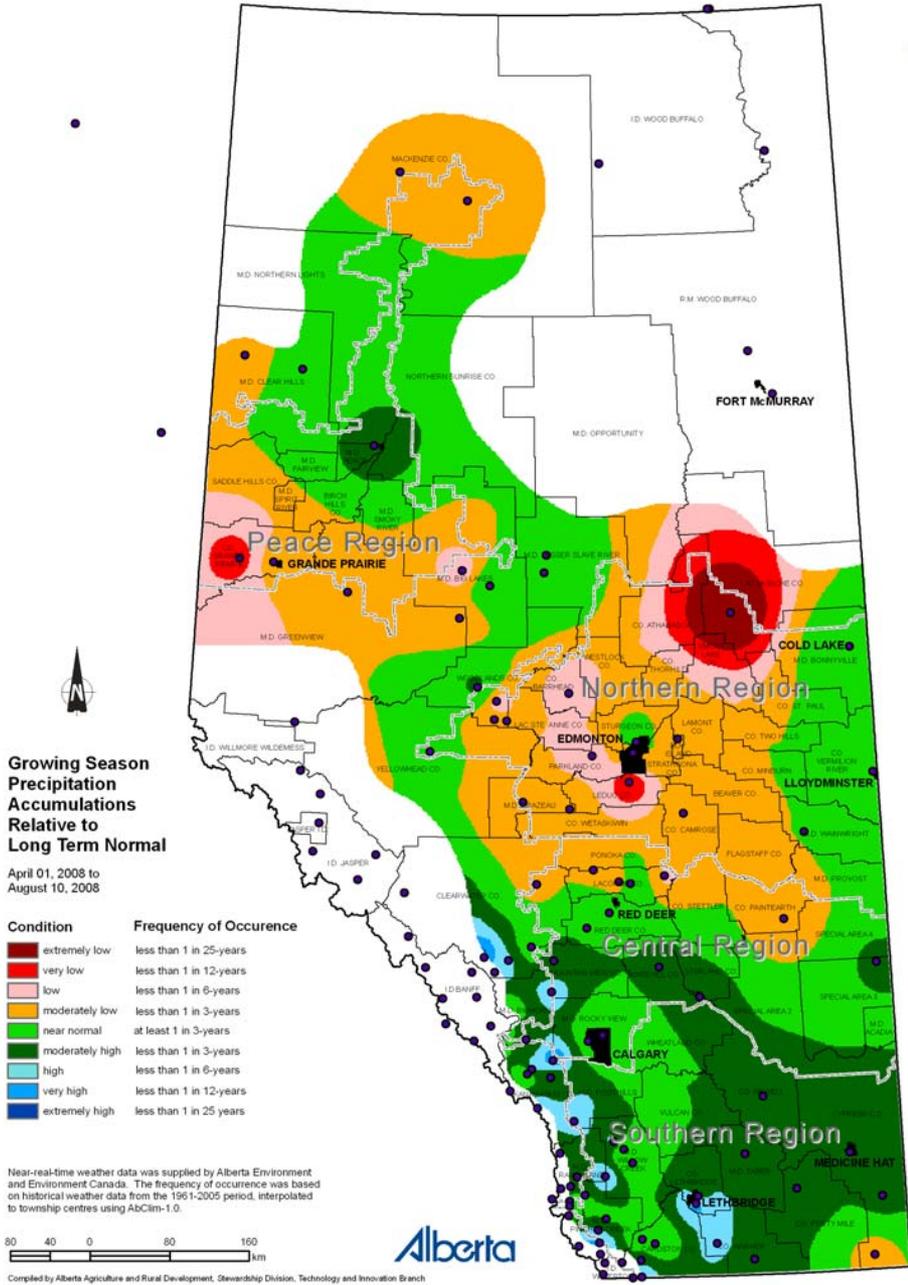
Drought Indices



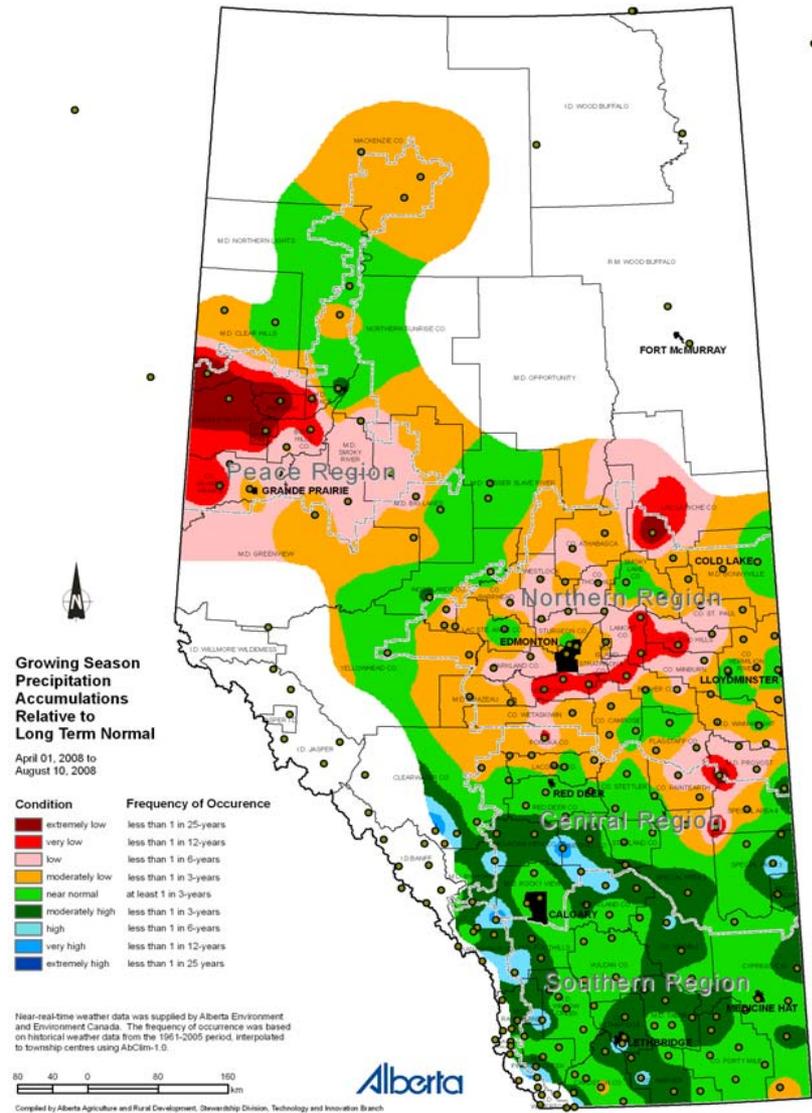
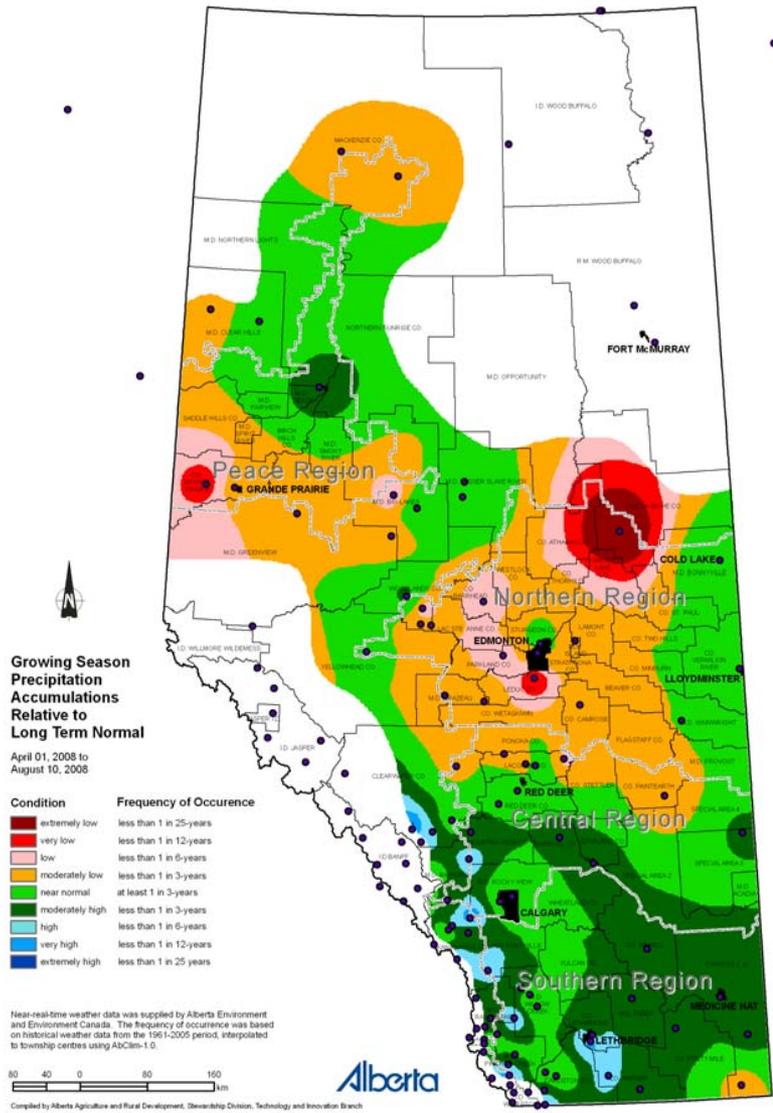
Stations Density



Stations Density ??



Stations Density and Drought Indicators



Data ! Data!

Precipitation Monitoring is at the heart of every drought indices. All indices rely on accurate and spatially representative precipitation observations!

Future....

- Strengthen our network
- Incorporate radar precipitation data and Remote sensing drought related data
- Improve existing Soil water balance and drought indices models
- Understand physical process influencing drought and better characterize AB Agricultural drought
- Make use of hydrometric data/Hydrological drought

Summary

The Alberta Drought Monitoring Program have:

- ✓ established Ag Meteorological Network with **Standard Weather stations (118)**

- ✓ Developed and implemented state of the Art QA/QC and data filling programs

- ✓ Implemented and improved:-

 - soil water balance and drought risk management models,

 - Drought and weather analysis and reporting

 - Web based access to weather data and derivatives

 - forming the basis for the drought preparedness and drought response actions in the province.

Thank You!!

Questions ?

