

# Drought Report for the Agricultural Region of Alberta: April 18, 2004

## Summary

The recent precipitation event in Alberta (April 12 to April 15, 2004) delivered moisture to the north, west and central portions of the province while largely missing the south and east half of the province. In itself this event alone was not enough to yield significantly *Above Average* precipitation for the month of April. In the south and the east half of the province, continued dry weather has increased the size of *Drought* areas. Soil moisture levels are expected to be *Below Normal* this spring unless significant precipitation occurs during the latter half of April. Long-range forecasts were for *Above Normal* temperatures and *Below Normal* precipitation for the next six months, however the *Drought* situation in the northwestern U.S. is expected to improve through May, which could benefit southern Alberta slightly.

## Current Situation

### Long-term *Drought* (Figure 1):

- The areas in the *Drought* class increased to 7.6% up from 5.4% as reported for the end of March. They included most of the M.D.'s of Pincher Creek and Cardston and portions of the M.D. of Willow Creek, Warner and Vulcan. Local areas in *Drought* also appeared in the County of Lethbridge, Cypress, Starland, Lacombe, and Special Areas 3 and 4.
- The areas in the *Drought Alert* class increased to 50% up from 39% as reported for the end of March. Much of this expansion has occurred in the south and east half of the province and in the western half of the Peace River region. Most areas of the province have some *Drought Alert* areas except the northeast, and the eastern and northern Peace regions.

### Recent trends (Figure 2):

- Recent (90 day) trends toward *Normal* conditions (-0.5 to 0.5) were experienced in most areas north of line extending just south of Calgary up to and including the Counties of Kneehill Starland Paintearth and the M.D. Provost.
- Areas trending toward *Drought* status (-2 to -3) include portions of the Counties of Pincher Creek, Ranchland, Willow Creek, Foothills, Cardston, Warner, Forty-Mile and Cypress. Of these areas, those in *Drought* status are expected to stay in *Drought* status and those not in *Drought* are expected to move into *Drought* status if current conditions persist.
- Most of the south is currently trending toward *Drought Alert* status (-1 to -2) or, those areas already in *Drought Alert*, are showing no indication of changing.

### Precipitation (Figures 3 – 9):

- Precipitation in the past 90 days (since January 21) was *Near Normal* for northern Alberta. A few areas reported *Above Normal* including the eastern Peace region, a large area centered just east of City of Edmonton, and two small areas near Red Deer and Lloydminster. *Below Normal* precipitation was recorded in the central and western areas, and *Much Below Normal* in the south (Figure 3)
- Most of the precipitation recorded since the last report (March 31, 2004) fell between April 12 and April 16 with much of it occurring as a spring snowstorm (Figure 4). Localized areas east of Edmonton and west of Calgary recorded between 30 and 40 mm. Most of the areas hit by the storm received between 10 and 20mm of precipitation. This included the Peace River region and

included the west central and western half of the province. Less than 10 mm was recorded in the south and eastern half of the province.

- Accumulated departures since January 2001 until the end of March varied greatly in most regions.
  - In the south departures ranged from < 50 mm (near normal) at Medicine Hat to > 650 mm *Below Normal* at Cardston.
  - In the central region departures ranged from 150 - 450 mm *Below Normal* at Calgary and Lacombe respectively.
  - In the northeast region departures ranged from 290 – 550 mm *Below Normal* at Vegreville and Wainwright respectively.
  - In the northwest departures ranged from 350 – 450 mm *Below Normal* at Barrhead and Edson respectively.
  - In the Peace, departures ranged from near normal at Ballater to 500 mm *Below Normal* at Beaverlodge.
- Departures are based on Environment Canada verified data through September 2003, and unverified data from October 2003 through March 2004.

### **Surface Water Conditions**

**(From Alberta Environment *Water Supply Outlook Overview, April 8, 2004*):**

- Spring snowmelt runoff on the plains is forecast to be *Below Normal* to *Normal* for Alberta's plains, with the exception of Edmonton to Slave Lake, and Cold Lake, where runoff is expected to be *Average* to *Above Average*. Little snow remains south of Edmonton and Lloydminster.
- *Below Normal* runoff is expected in the Red Deer basin and *Below Normal* to *Much Below Normal* runoff is expected in the Oldman, Milk, Bow and North Saskatchewan basins. Runoff volumes are expected to be greater than the near-record low volumes of 2001.
- The reservoirs in the Oldman River basin, the Bow River basin, and the North Saskatchewan River basin are generally *Below Average*.

### **United States (Figure 10):**

- The U.S. *Drought Monitor* reports a large and persistent *Drought* from the Coastal Mountain to the Great Lakes and extends north to the Montana border.
- *Drought* conditions have changed little since February in the western U.S. but *Drought/abnormally-dry* conditions have appeared in a large part of the southeast in the past month.
- The *Drought* condition has persisted for 4 to 5 years in some areas of the west and is raising concerns about the supply of the Colorado River
- AAFRD has concerns that a *Drought* of this size, duration, severity and proximity could be influencing conditions in the Canadian Prairies.

## **Outlook**

### **Probability of receiving adequate precipitation (Figure 11):**

- The recent precipitation did little to change the probability of receiving enough precipitation to return to average spring soil moisture levels. For most of north western Alberta, southern Alberta and parts of the central Alberta and central Peace River region, the probability of returning to normal spring soil moisture conditions remains at 10% or less.
- The Lloydminster, Bow Valley Edmonton and Medicine Hat areas and have the highest probability of having average spring soil moisture levels in 2004.

### **Precipitation forecasts (Figure 12):**

- Environment Canada predicts below normal precipitation from March through May 2004.
- Temperatures from March through May 2004 are predicted to be *Below Normal* north of Edmonton and *Near Normal* in the south.

### **United States Drought Forecast (Figure 13):**

- The U.S. Seasonal *Drought* Forecast predicts improving *Drought* conditions through June 2004 in the north, but improvements in areas bordering southern Alberta are not expected to be enough to significantly ease impacts.
- AAFRD expects the persistent *Drought* in the U.S. will influence conditions in southern Alberta.

### **Dugout water levels (Figure 14); report from November 2003:**

- Agriculture and AgriFood Canada expects no dugout water shortages through most of western Alberta and the central and north Peace region.
- Water shortages are occurring from Edmonton to Edson, including the Barrhead area, and in the Lloydminster - Cold Lake area.
- Most areas east of Highway 2, and the southern Peace region, are rated as having some water shortages anticipated.

## **Explanation of Terms**

### **Seasonal Drought (reported during the growing season months only)**

Seasonal *Drought* is only reported for two periods, the growing season (May 1 – August 31) and the fall (Sept 1 – October 31). Seasonal *Drought* during the growing season impacts annual crops, hay and pastures but does not necessarily affect livestock water supply. Seasonal *Drought* during the fall can affect hay and pastures. It also affects livestock water supply in the following year by reducing the potential for spring runoff. The ratings are based on the current soil moisture conditions and precipitation departures. Seasonal *Drought* is rated as *Normal*, *Drought Alert* or *Drought*.

### **Long term (hydrologic) Drought**

Long term, or hydrologic, *Drought* is a result of the cumulative effect of several dry months. It primarily impacts livestock feed and water supply and may affect annual crops. Hydrologic *Drought* is determined from precipitation totals over a 365-day period using the Standardized Precipitation Index (SPI). Long-term *Drought* is rated as either *Wet*, *Above Normal*, *Normal*, *Drought Alert*, *Drought* or *Exceptional Drought*. The United States National *Drought* Mitigation Centre recommends the SPI for *Drought* identification. The long-term *Drought* conditions are reported year-round.

The trend in long term *Drought* is determined by comparing the 365-day SPI with the 90-day SPI. Where the 90-day SPI value is  $-1$  to  $+1$ , then a trend toward moderating conditions is occurring, potentially resulting in *Normal* status. If the 365-day SPI values for that area are already *Normal*, then the trend is toward no change. If the 90-day SPI value is  $-1$  to  $-2$ , then the area is trending toward *Drought Alert* status. This could be a deteriorating condition if the current 365-day value is *Normal*, however it could represent a continuing condition if the area is already in *Drought Alert*, or an improving condition if the area is already in *Drought*. Values of the 90-day SPI that are between  $-2$  to  $-3$  and lower than  $-3$  indicate a trend toward *Drought* and *Extreme Drought* respectively. Values of the 90-day SPI that are between  $+1$  and  $+2$ , and greater than  $+2$  represent a trend toward *Above Average* and *Wet* respectively.

## **Soil Moisture (reported during the growing season months only)**

The crop gets the moisture it requires from the reserve of soil moisture, which in turn is replenished by rainfall. Soil moisture is a valuable indicator of *Drought* potential because it shows the reserve of water available to the crop at a given point in time. During peak growing periods, soil moisture reserves are consumed quickly and must be replenished frequently by rainfall. Low soil moisture reserves during these times indicate a high risk of immediate crop stress. Prolonged stress becomes *Drought*, and results in significant unrecoverable yield loss.

Because the climate varies across Alberta, comparing current moisture levels to *Normal* levels provides a valuable indicator of *Drought* risk that can be applied to all localities and to all times of the season. *Below Average* soil moisture levels, at any time, indicate a need for more rain or snow to restore reserves.

Soil moisture is measured as millimeters (mm) of plant available water. Plant available water is approximately half of the total water that can be measured in the soil. Soil moisture is monitored from May through October.

## **Precipitation Trends<sup>1</sup>**

Long-term cumulative precipitation departures are generated monthly to assess the long-term water status at representative stations in all five regions of the agricultural area of Alberta. Cumulative monthly total precipitation was compared to normal, starting from an arbitrary reference point of January 2001. These departures provide information on how effective recent precipitation trends are in restoring conditions to normal, given that we have had several months of below normal precipitation.

This helps understand what amount of rainfall is required to offset the *Drought* and dry weather since 2001. When the line slopes down, the precipitation is *Below Normal*. When the line slopes up, precipitation is *Above Normal* and when the line is flat, precipitation is *Near Normal*. From this information, short-term periods of *Normal* or *Above Normal* precipitation can be put into perspective with the cumulative effect of conditions since January 2001. For example, in southern Alberta, since the heavy rains in June 2002, precipitation dropped sharply from *Normal* at Cardston, but remained *Near Normal* at Medicine Hat until the summer of 2003. The effect of the dry summer of 2003 can be seen in the steeply sloping lines at most stations in all regions. In the southern Peace region, the flat lines indicate a return to *Near Normal* precipitation during August 2003, however the cumulative total since 2001 is still *Below Normal* for all stations except Ballater.

## **Probability of Returning To Average Spring Soil Moisture Conditions**

The map showing the Probability of Returning to Normal Spring Soil Moisture (PRNSC) conditions is computed by determining the total amount of precipitation required to bring current soil moisture levels up to the modeled 30-year average soil moisture conditions. However, a significant portion of precipitation is lost to other hydrologic factors such as blowing snow, sublimation, runoff, evaporation or, in some cases, leaching. Therefore, more total precipitation is required to bring soil moisture levels back to average spring conditions than simply the difference between the current soil moisture and the average spring soil moisture. This is referred to as total required precipitation.

The PRNSC is determined by computing how much total required precipitation is needed to satisfy the existing moisture deficits. This value is then compared to precipitation data for each year between 1971-2000 for the same time interval. The number of years where precipitation during that time period meets or exceeds the total required precipitation value are counted and expressed as a percent of the

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<sup>1</sup> Precipitation analysis was based on Environment Canada data, with recent data unverified. Amounts may change as data becomes verified.

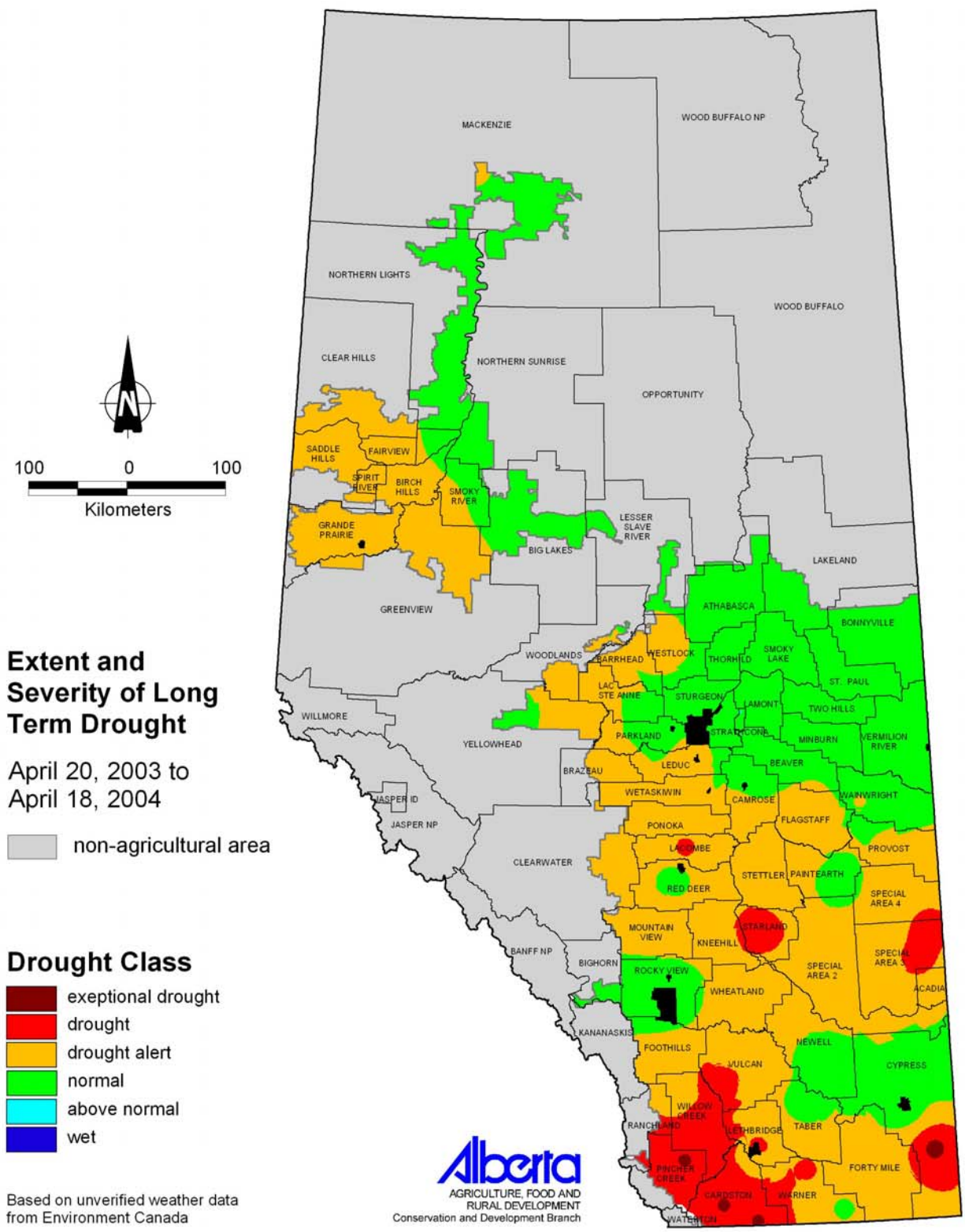
1971-2000 (30-year) period. For example, a probability of 10% means that between 1971 and 2000, the amount of precipitation calculated to return soil moisture to at least normal spring levels occurred three times or less.

**Report prepared by the Drought Reporting Team**

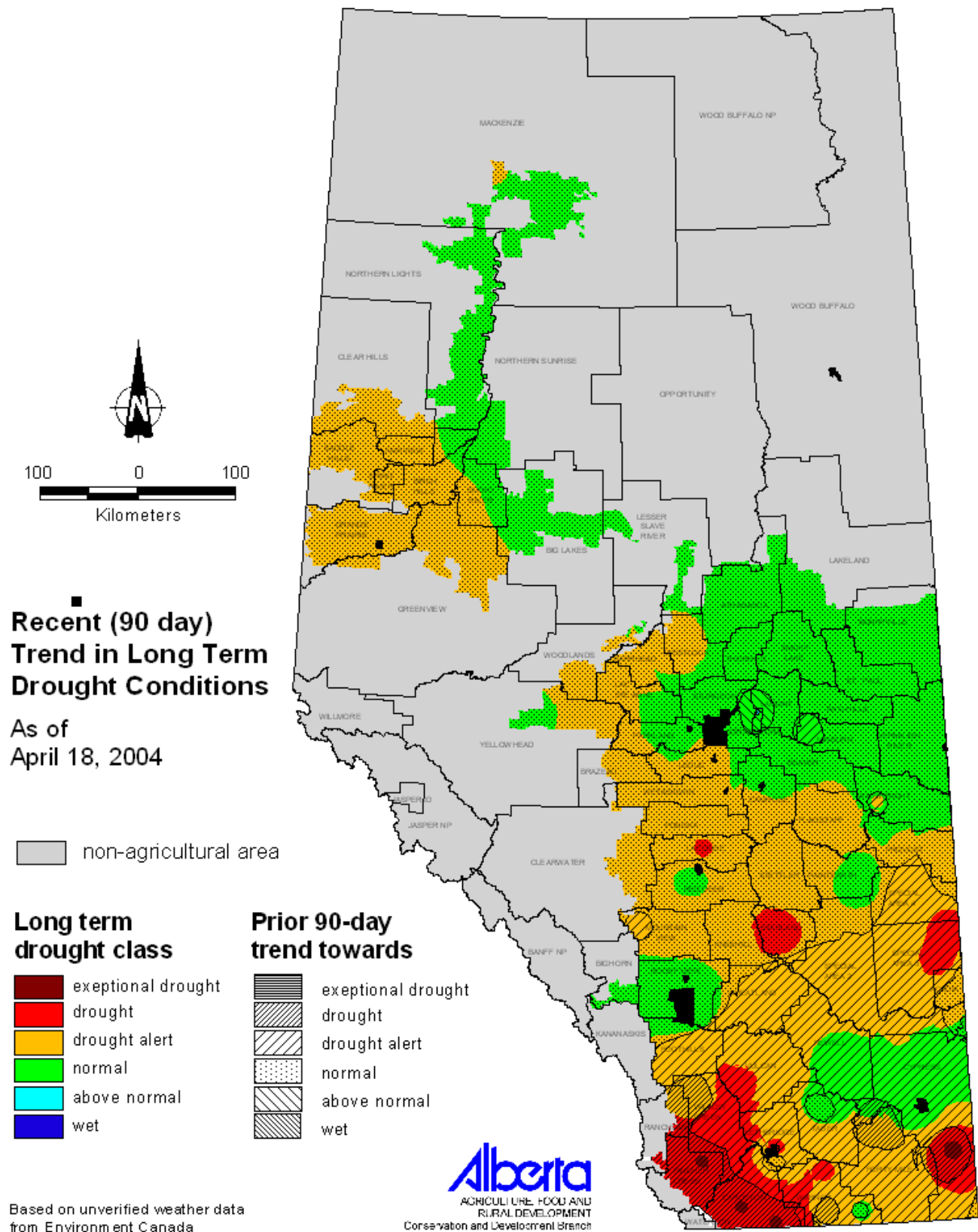
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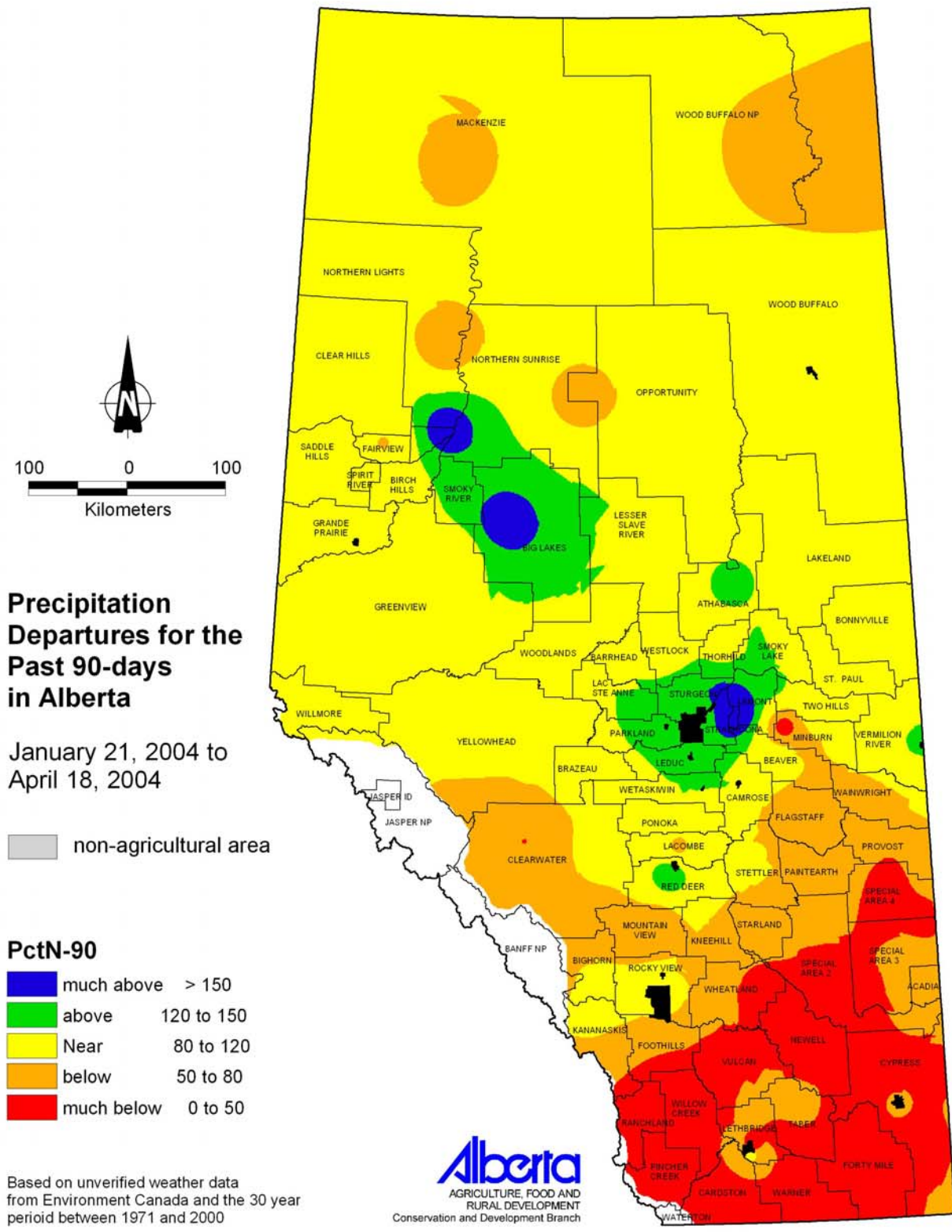
*Drought* analysis is scheduled at monthly intervals between November 1 and April 30. This report updates the previous report of March 31<sup>st</sup>, 2004.



**Figure 1. Extent and severity of long-term drought in the agricultural region of Alberta, April 18, 2004.**



**Figure 2. Recent (90 day) trends in drought status in the agricultural region of Alberta, April 18, 2004.**



**Figure 3. Precipitation departures for the 90 days up to April 18, 2004.**



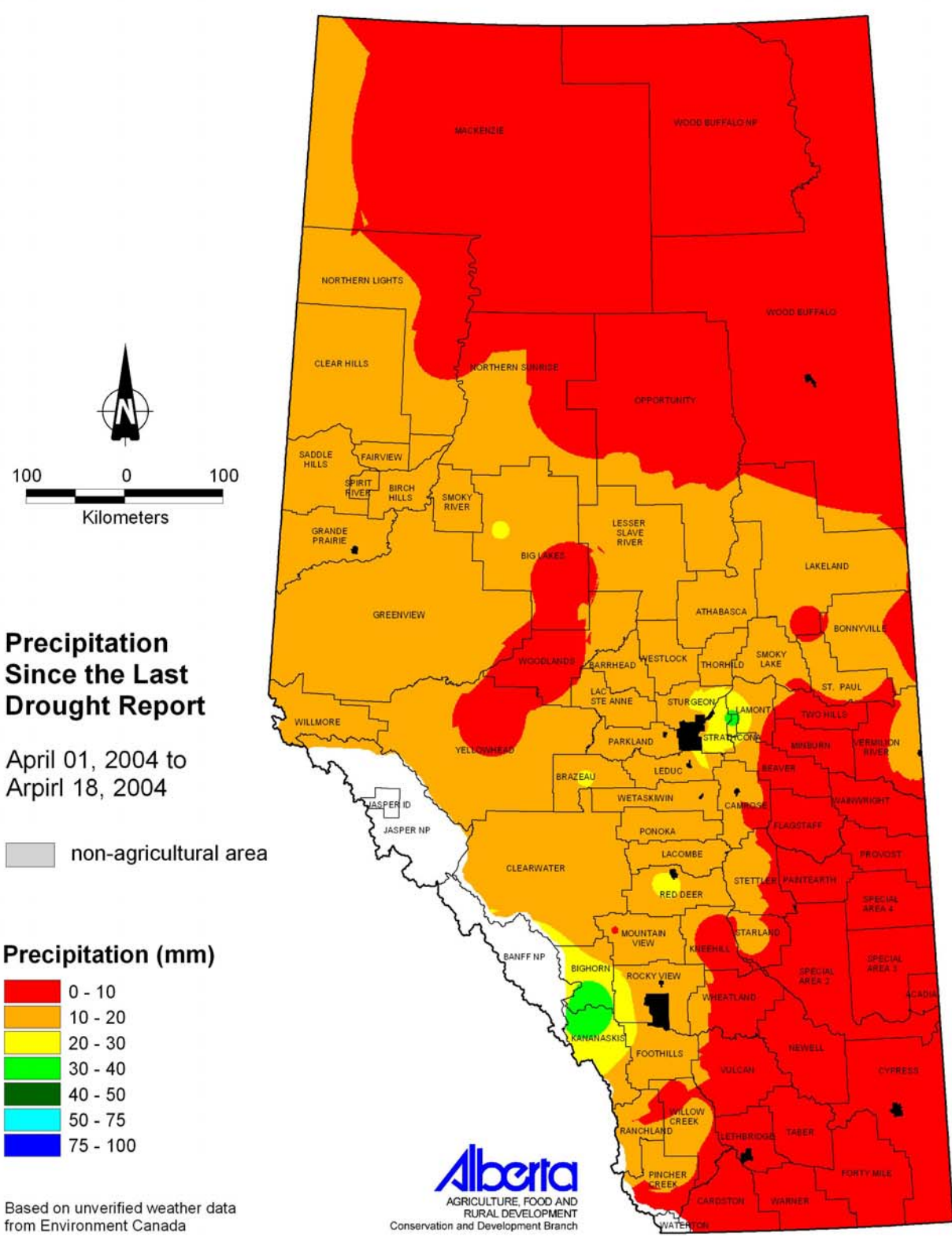


Figure 4. Precipitation (mm) since the last drought report, as of April 18, 2004.

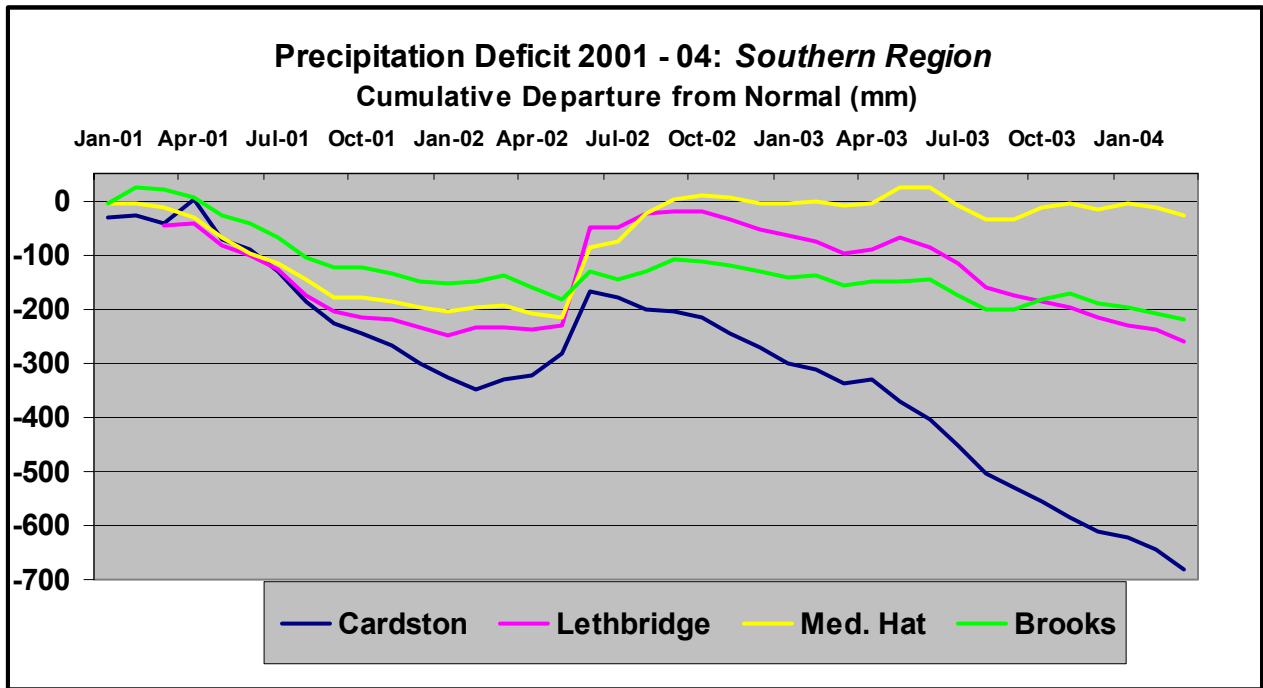


Figure 5. Cumulative precipitation departures from January 2001 through March 2004 for southern Alberta.

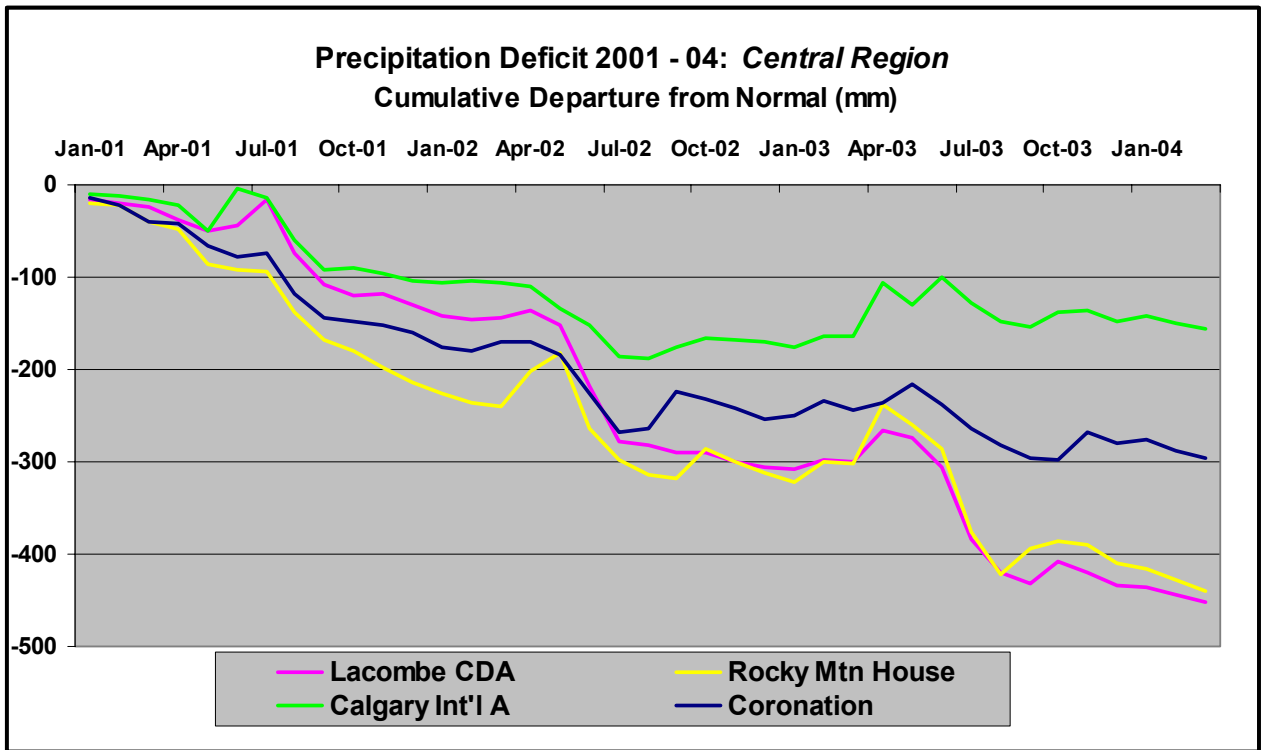


Figure 6. Cumulative precipitation departures from January 2001 through March 2004 for central Alberta.

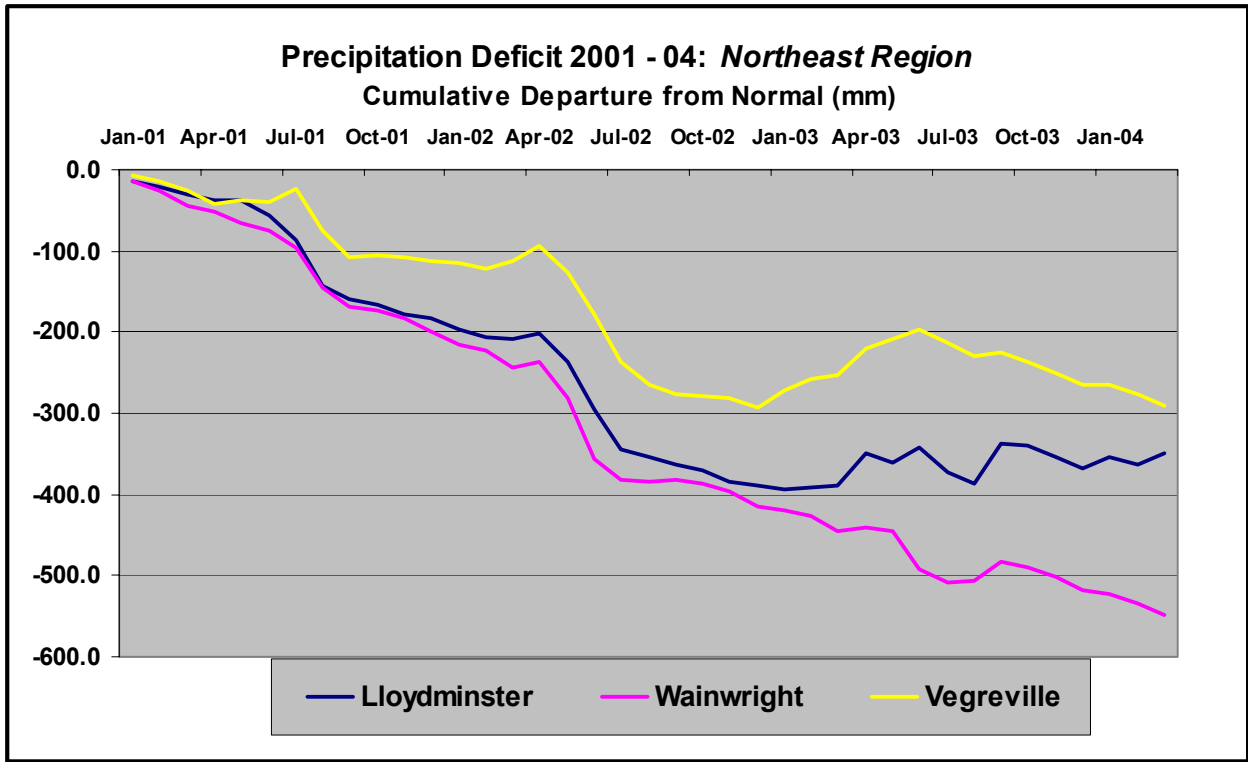


Figure 7. Cumulative precipitation departures from January 2001 through March 2004 for northeastern Alberta.

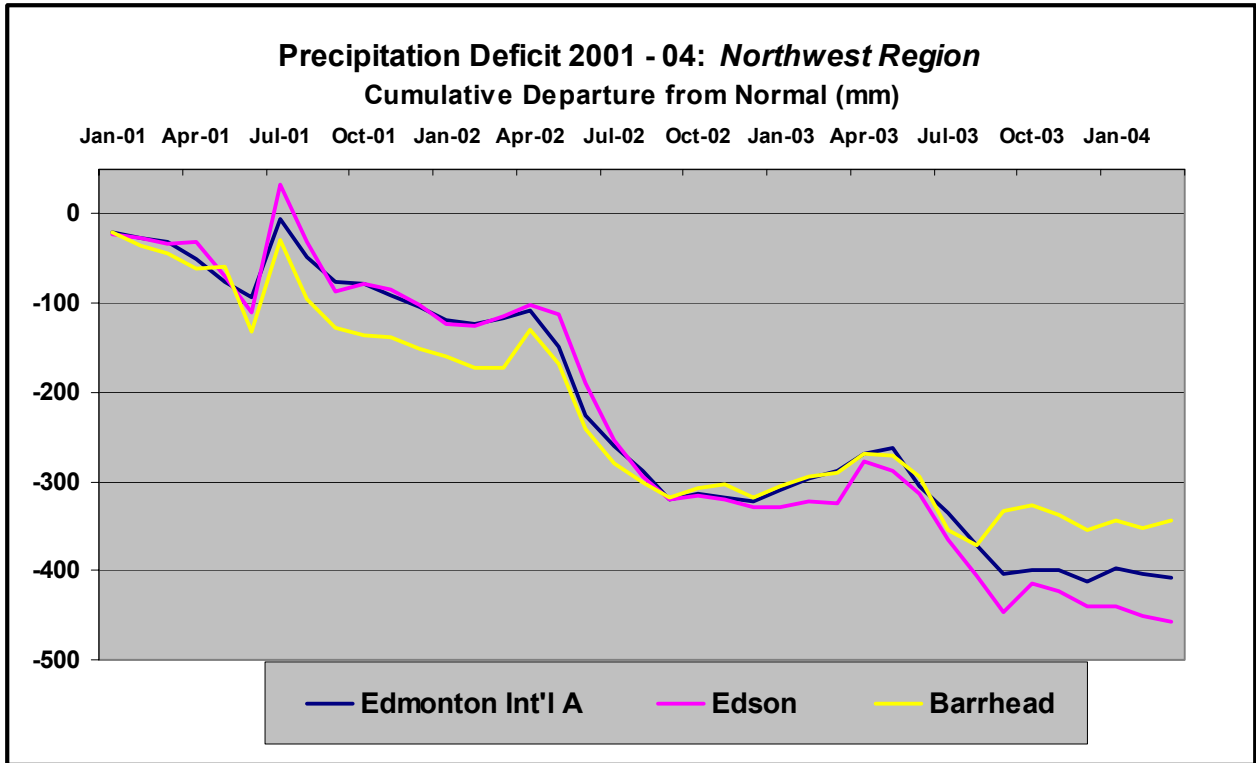


Figure 8. Cumulative precipitation departures from January 2001 through March 2004 for northwestern Alberta.

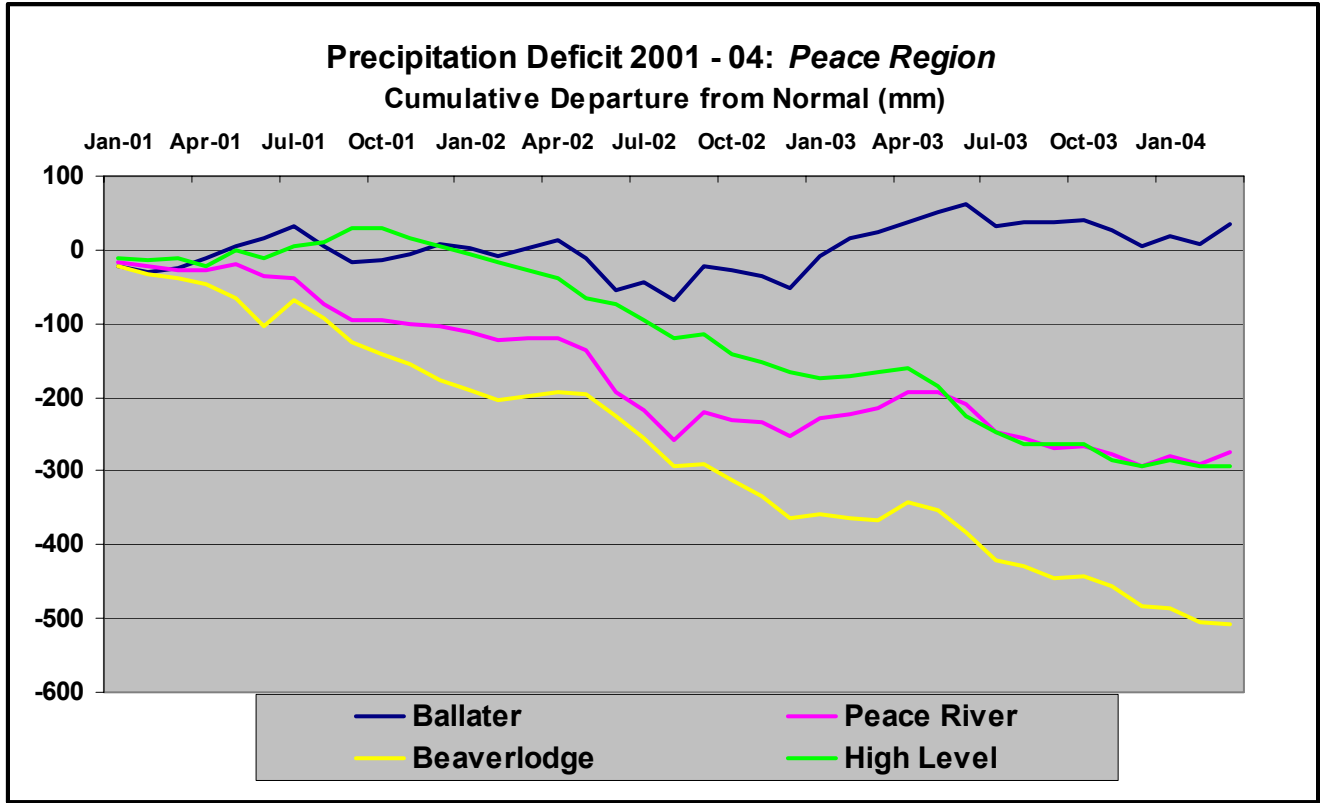


Figure 9. Cumulative precipitation departures from January 2001 through March 2004 for the Peace region.

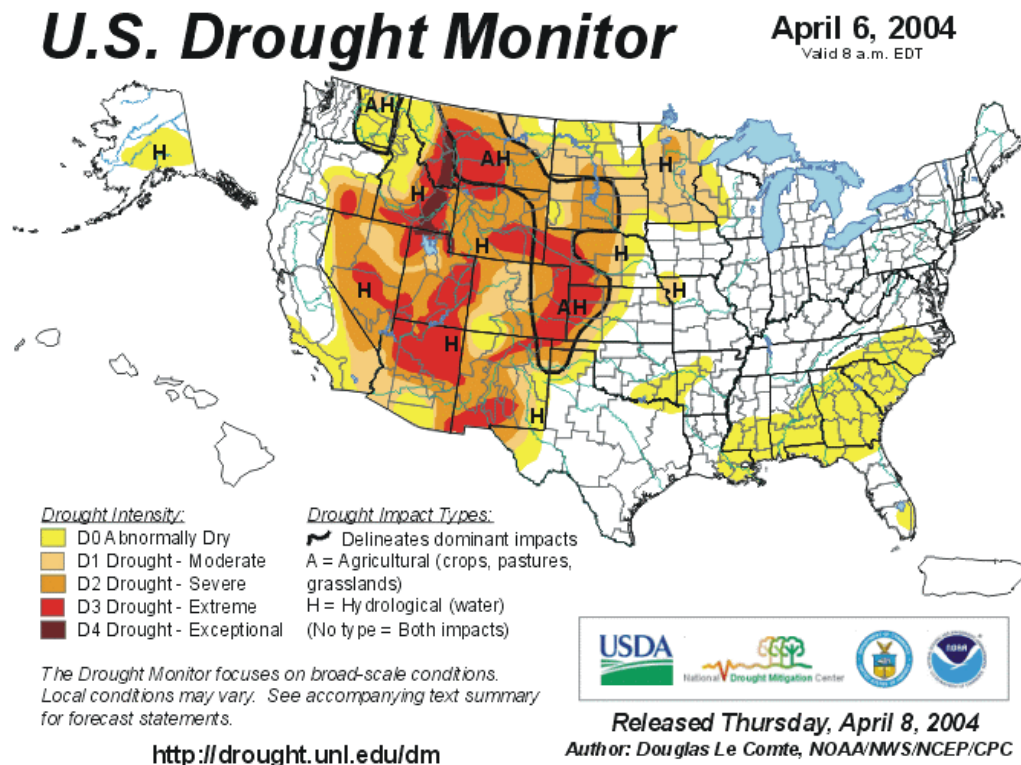
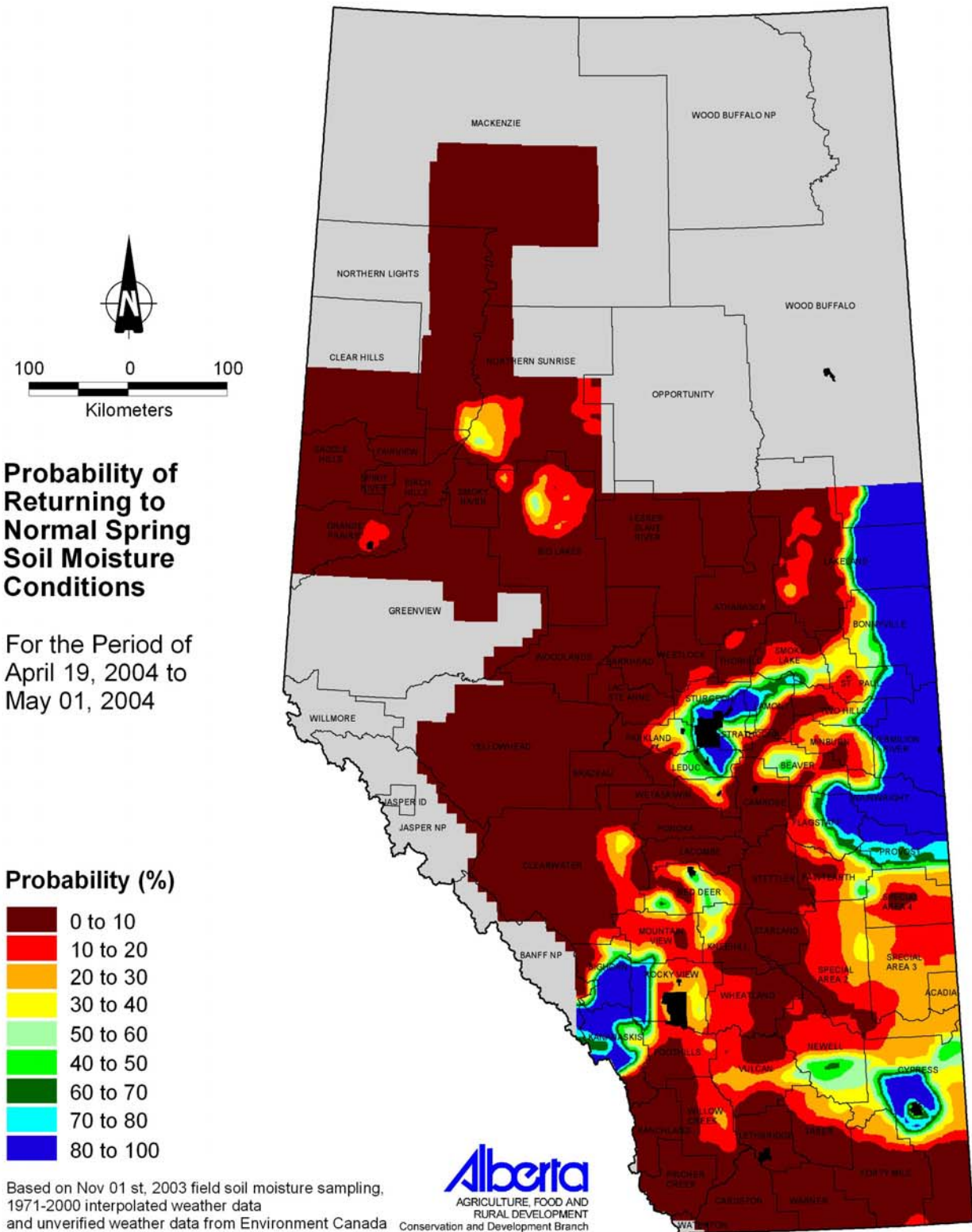


Figure 10. United States Drought Monitor for April 6, 2004



**Figure 11. Probability of returning to average spring soil moisture levels in 2004, as of April 18, 2004.**

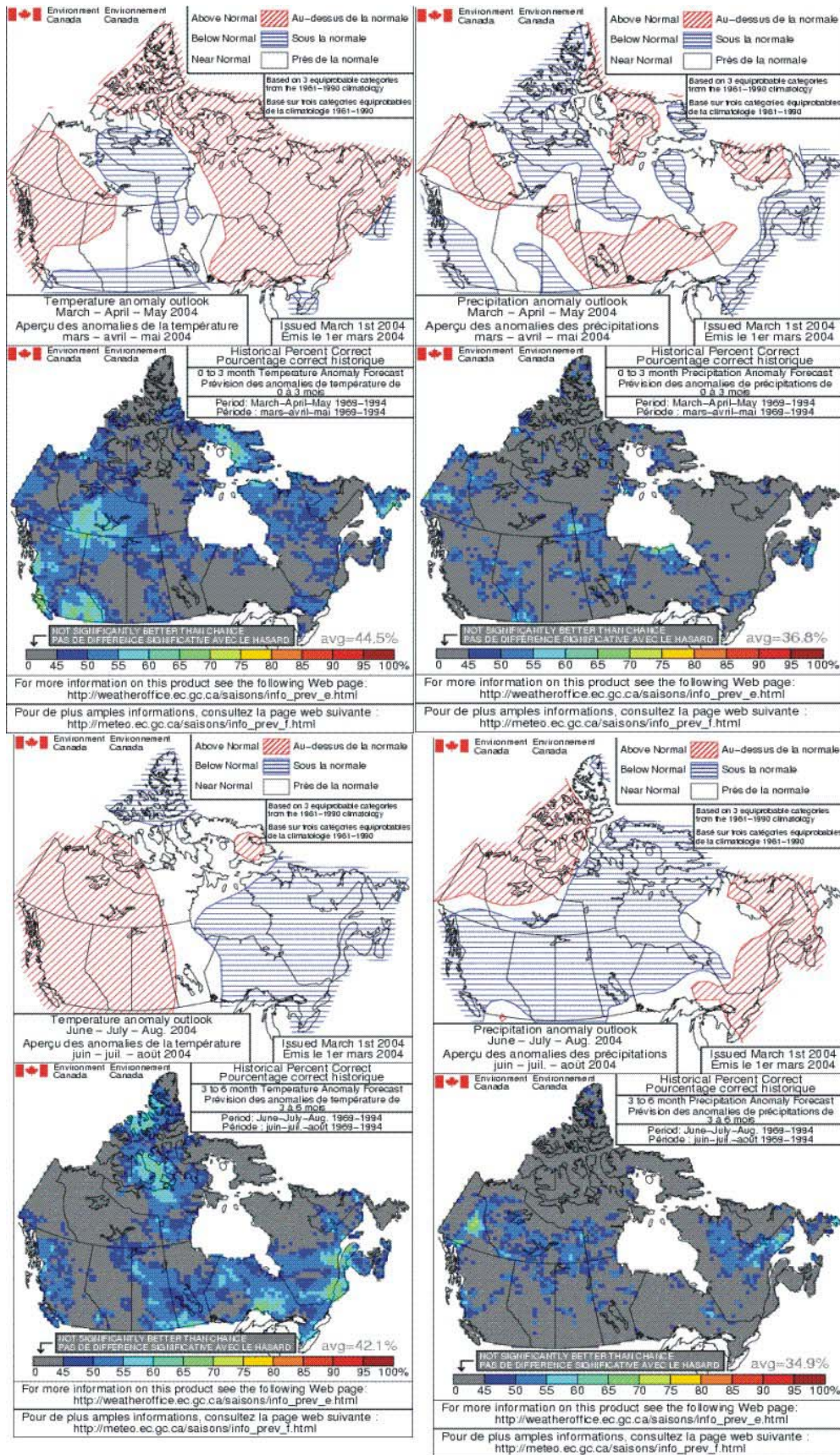


Figure 12. Environment Canada forecasts for March – May 2004 (top) and June – August (bottom) for temperature (left) and precipitation (right).



## U. S. Seasonal Drought Outlook Through June 2004 *Released March 18, 2004*

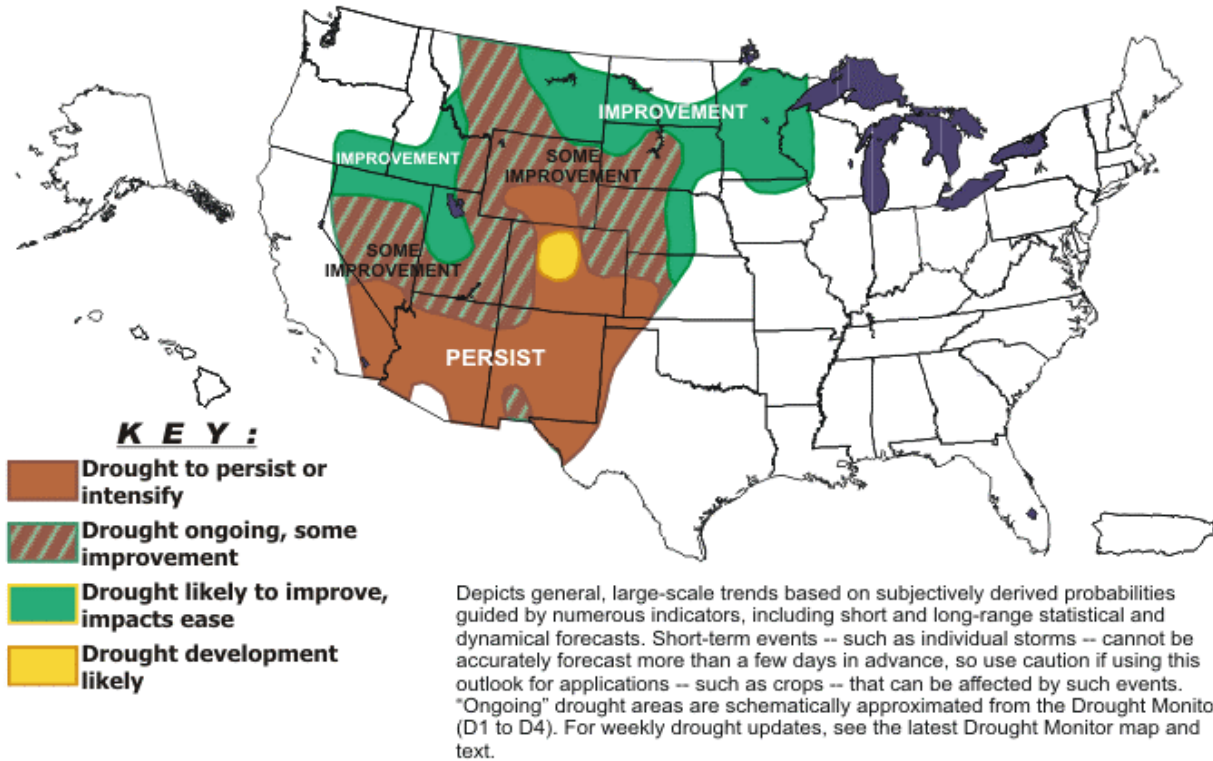


Figure 13. U.S. Seasonal Drought Outlook through May, 2004

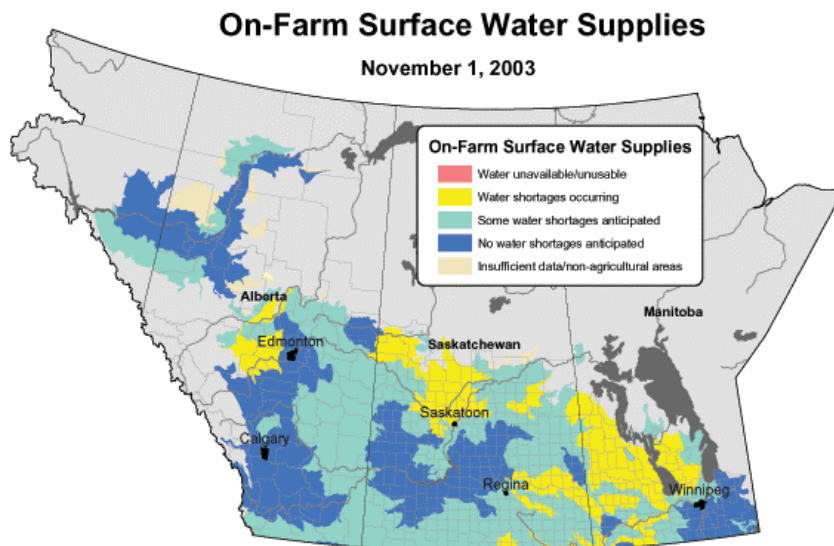


Figure 14. PFRA on-farm water supply outlook for November 2003.