Drought Report for the Agricultural Region of Alberta:
March 31, *2004*

Summary

Near and *Above Normal* precipitation in northern Alberta during March did little to change long-term *Drought* status, but provided a promising trend toward more *Normal* conditions. In the south, continued dry weather has increased the size and number of *Drought* areas. Soil moisture levels are expected to be *Below Normal* this spring unless significant precipitation occurs during 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 5.4% up from 3.5% as reported for the end of February. They included most of the MD'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 39% up from 34% as reported for the end of January. 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 a line from Drayton Valley - Red Deer - Coronation – Wainwright.
- 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.
- A small area around Lesser Slave Lake is trending toward *Wet* (1 to 2).

Precipitation (Figures 3 – 9):

- Precipitation in the past 90 days (since January 2) was near normal for northern Alberta. An area of much above normal was reported in the Slave Lake – Wabasca area, which is north of most of the agricultural zone (Figure 3) and one in the southern portion of Saddle Hills County.
- Precipitation was below normal in the central and western areas, and much below normal in the south.
- Precipitation during March was near to *Much Above Normal* for most of the northern half of the province, the wettest areas were in the eastern Peace region and north of Slave Lake, with pockets east of Edmonton and at Lloydminster (Figure 4a).
- Precipitation was *Below Normal* in the central and western areas, and much *Below Normal* in the south, with totals ranging from less than 10 mm in the driest areas to above 75 mm in the wettest area north of Slave Lake (Figure 4b).
- Accumulated departures since January 2001 varied greatly in most regions. In the south departures ranged from < 50 mm (near normal) at Medicine Hat to > 650mm 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, and in the Peace, departures ranged from near normal at Ballater to 500mm below normal at Beaverlodge.

- Departures are based on Environment Canada verified data from through September 2003, and unverified data from October through February 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 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 Costal Mountain to the Great Lakes and extends north to the Montana border.
- *Drought* conditions have change little since February in the western US 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 probability of receiving enough precipitation to return to average spring soil moisture levels is 10% or less for most of north western Alberta, southern Alberta and parts of the central Alberta and central peace river region.
- The Lloydminster, and Bow Valley areas 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, PFRA 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 affect 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 SPI is recommended for *Drought* identification by the United States National *Drought* Mitigation Centre. 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 of –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 W*et* 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[1]

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 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.

[1] Precipitation analysis was based on Environment Canada data, with recent data unverified. Amounts may change as data becomes verified.

Report prepared by the Drought Reporting Team
Allan Howard, Ralph Wright, Katherine Altman and Kris Sabourin
Conservation & Development Branch & Program
Alberta Agriculture, Food and Rural Development
Edmonton, AB T6R 5T6
Contact: Ralph Wright; ph (780) 427-3556

This report was created on March 31st, 2004.

Drought analysis is scheduled at monthly intervals between November 1 and April 30. This report updates the previous report of February 29th, 2004.

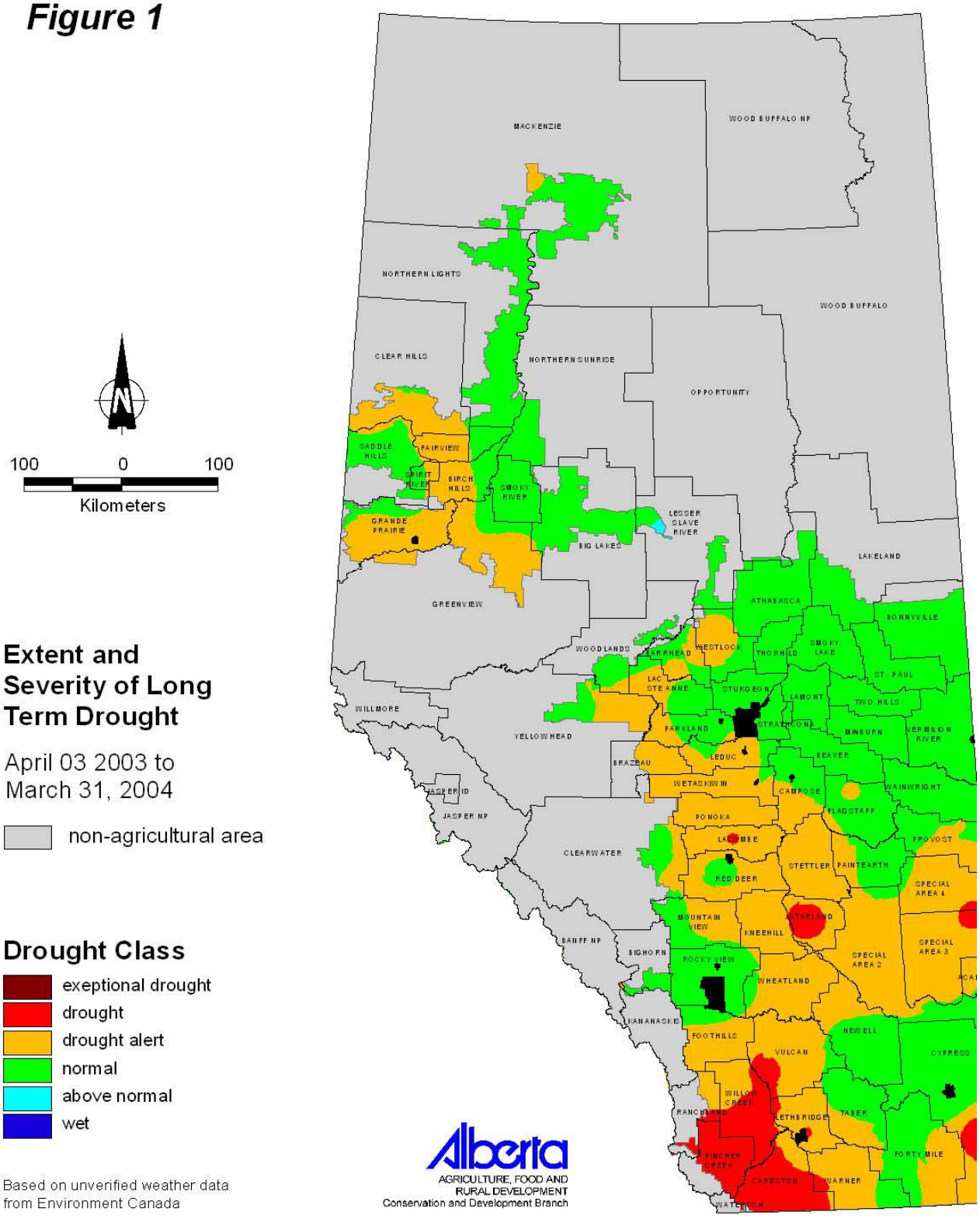

Figure 1. Extent and severity of long-term drought in the agricultural region of Alberta, March 31, 2004.

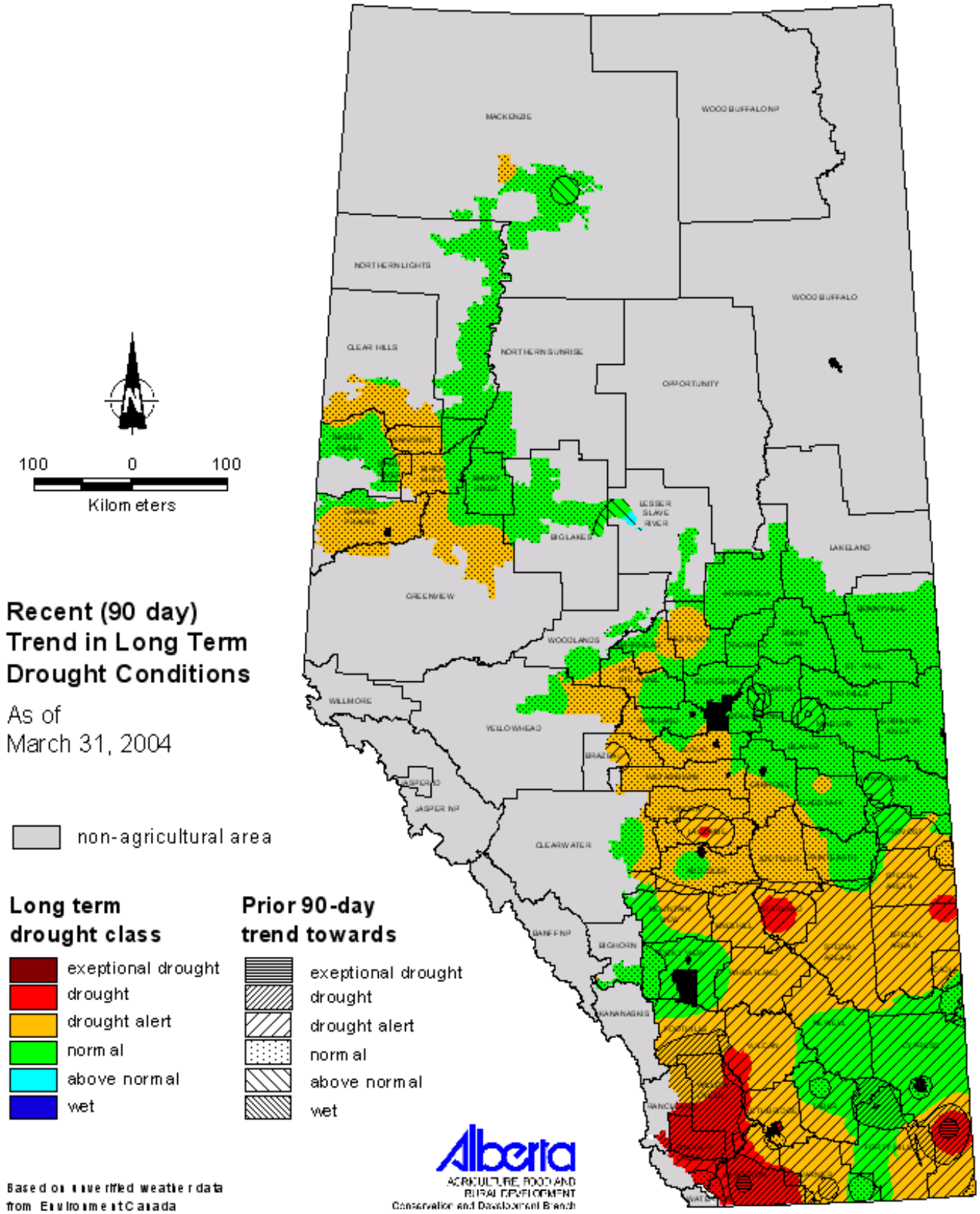

Figure 2. Recent (90 day) trends in drought status in the agricultural region of Alberta, March 31, 2004.

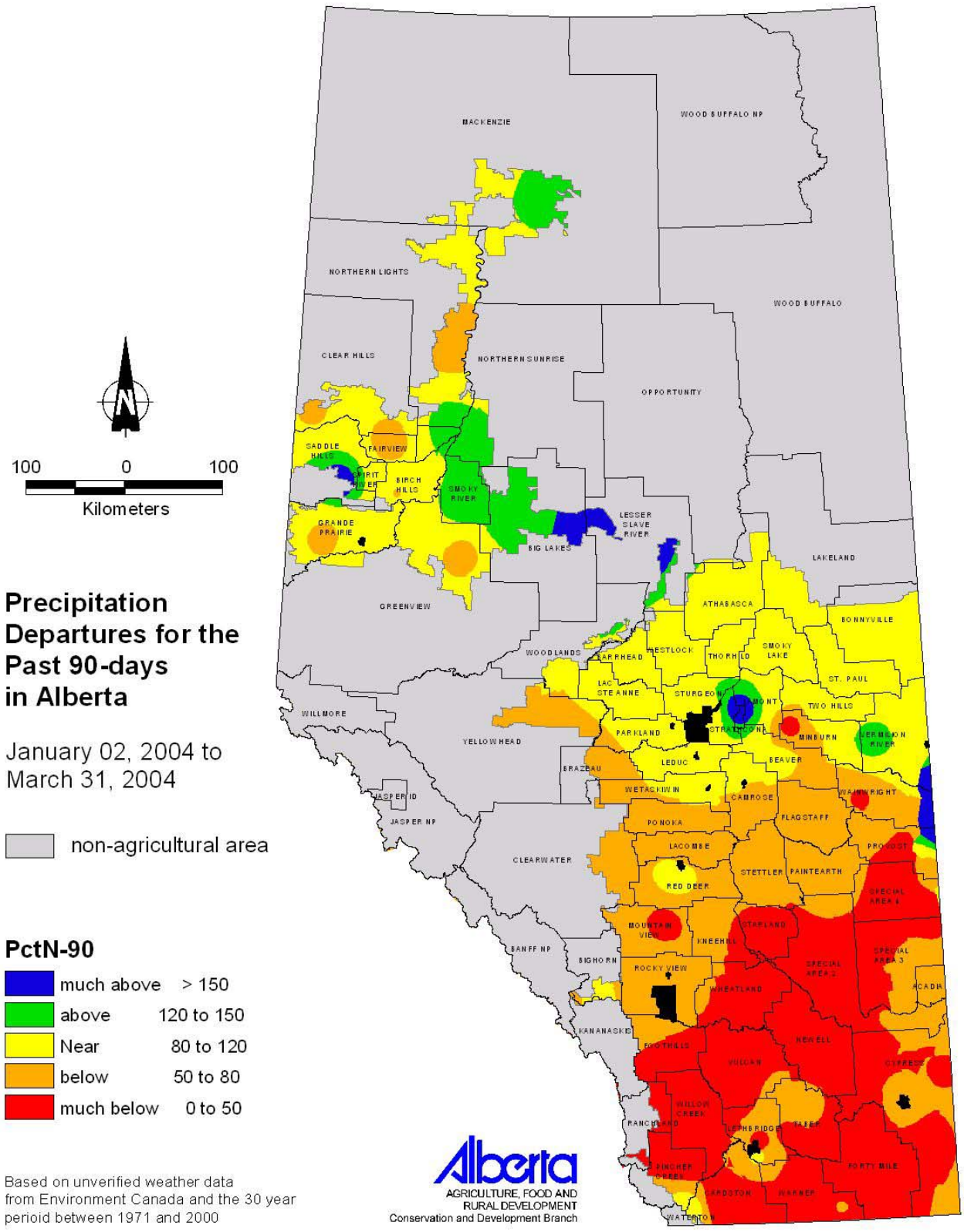

Figure 3. Precipitation departures for the 90 days up to March 31, 2004.

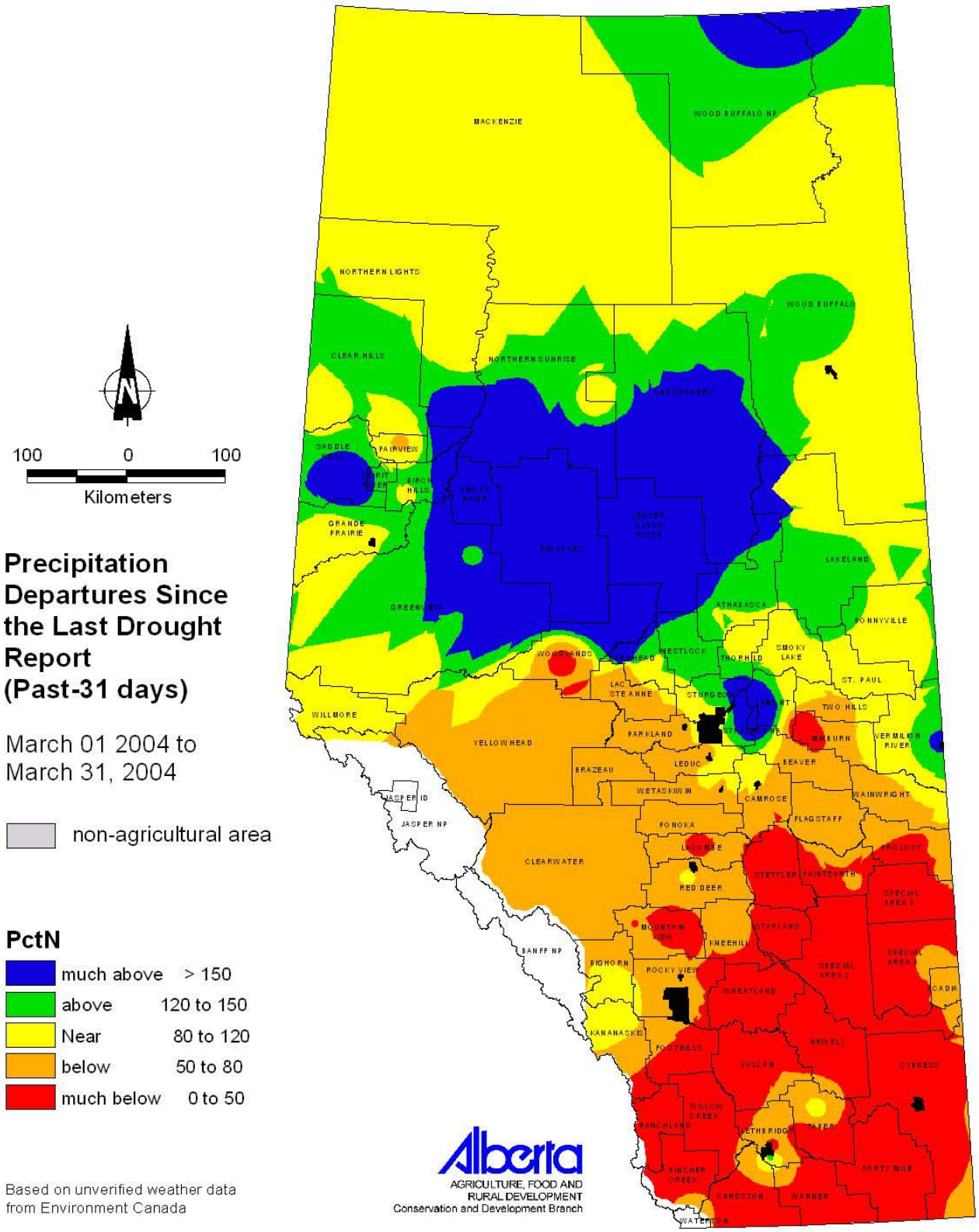

Figure 4a. Precipitation departures since the last drought report, March 01 to March 31, 2004.

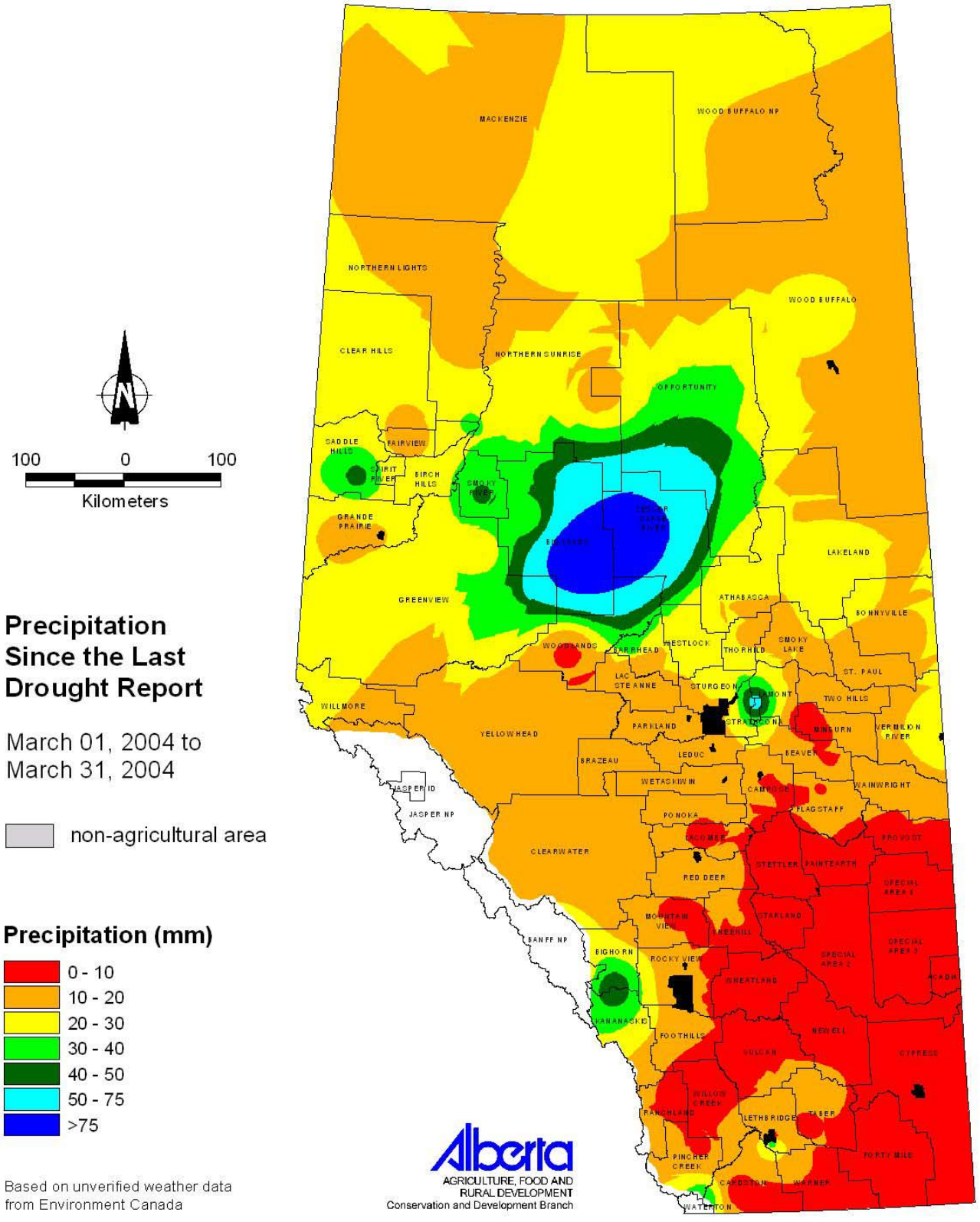

Figure 4. Precipitation (mm) since the last drought report, March 01 to March 31, 2004.

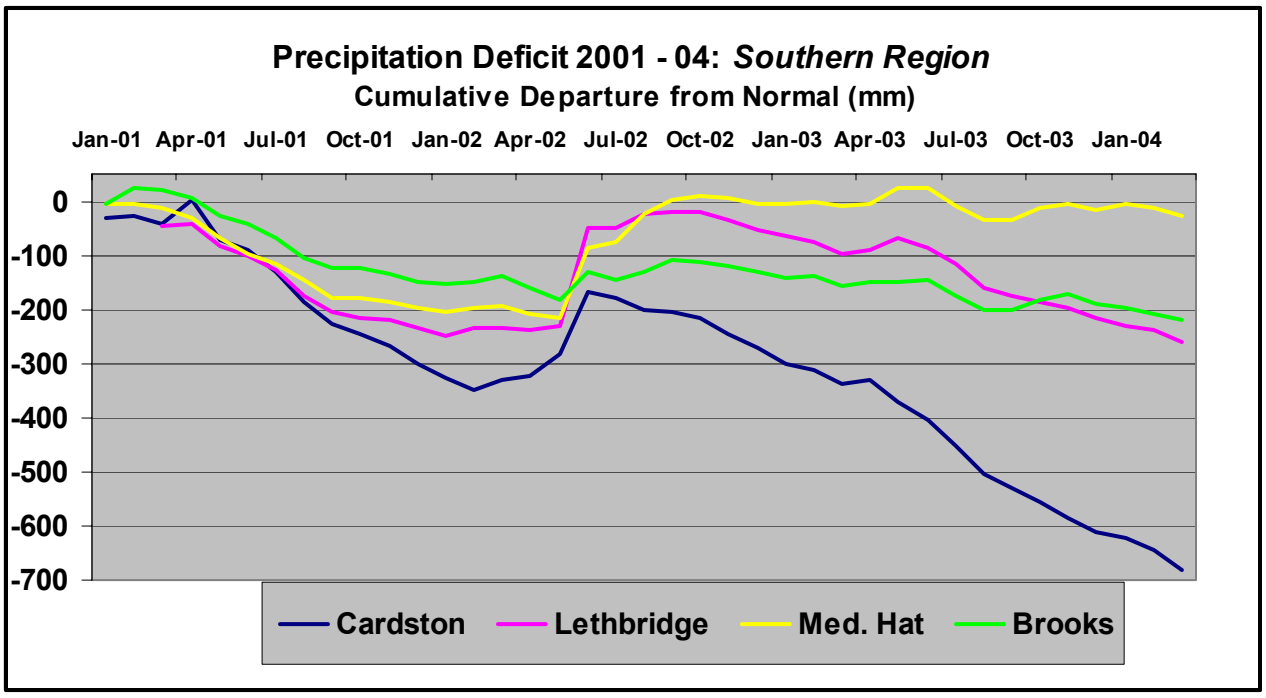

Figure 5. Cumulative precipitation departures from January 2001 through February 2004 for southern Alberta.

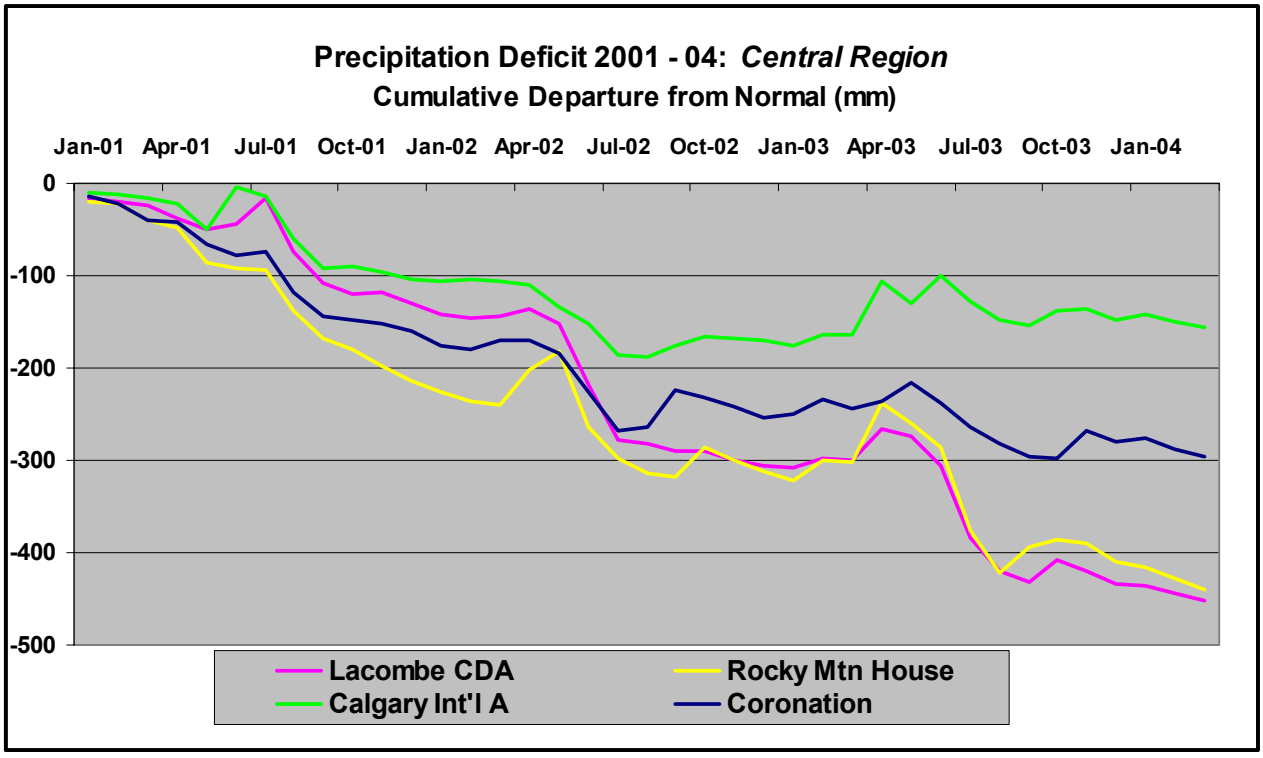

Figure 6. Cumulative precipitation departures from January 2001 through February 2004 for central Alberta.

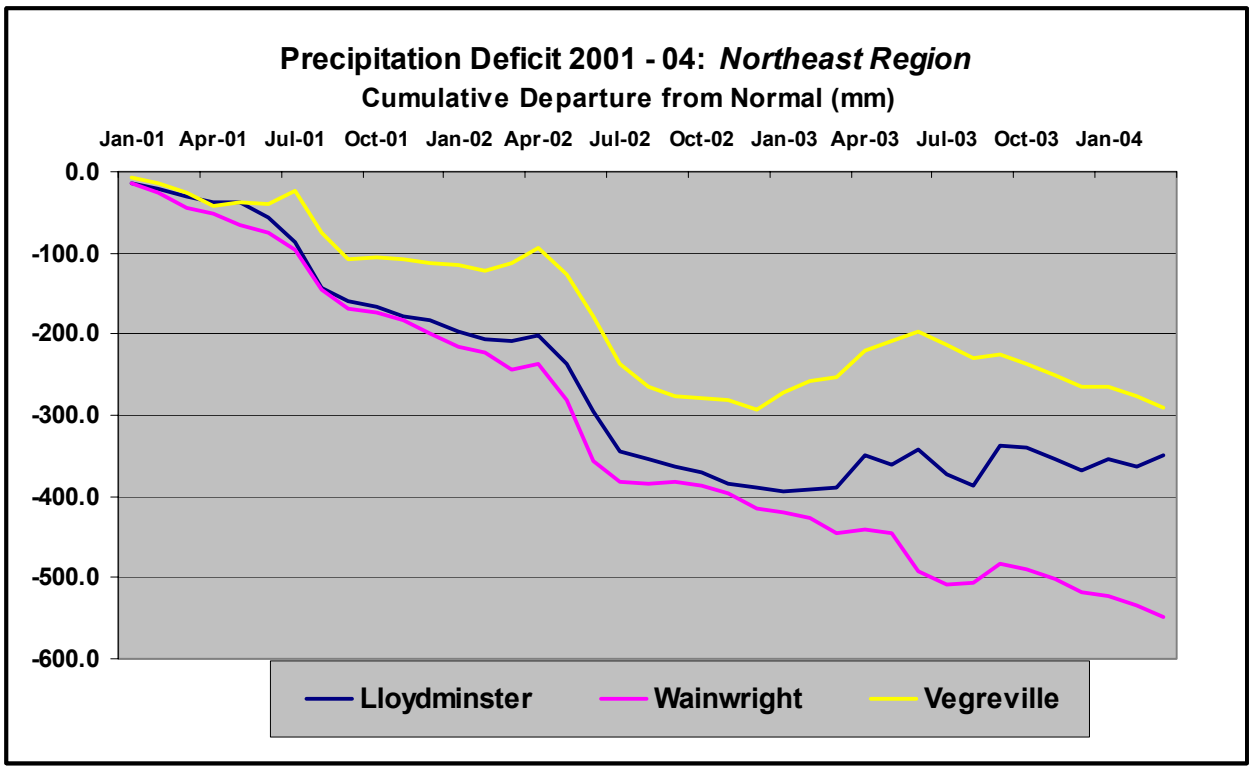

Figure 7. Cumulative precipitation departures from January 2001 through February 2004 for northeastern Alberta.

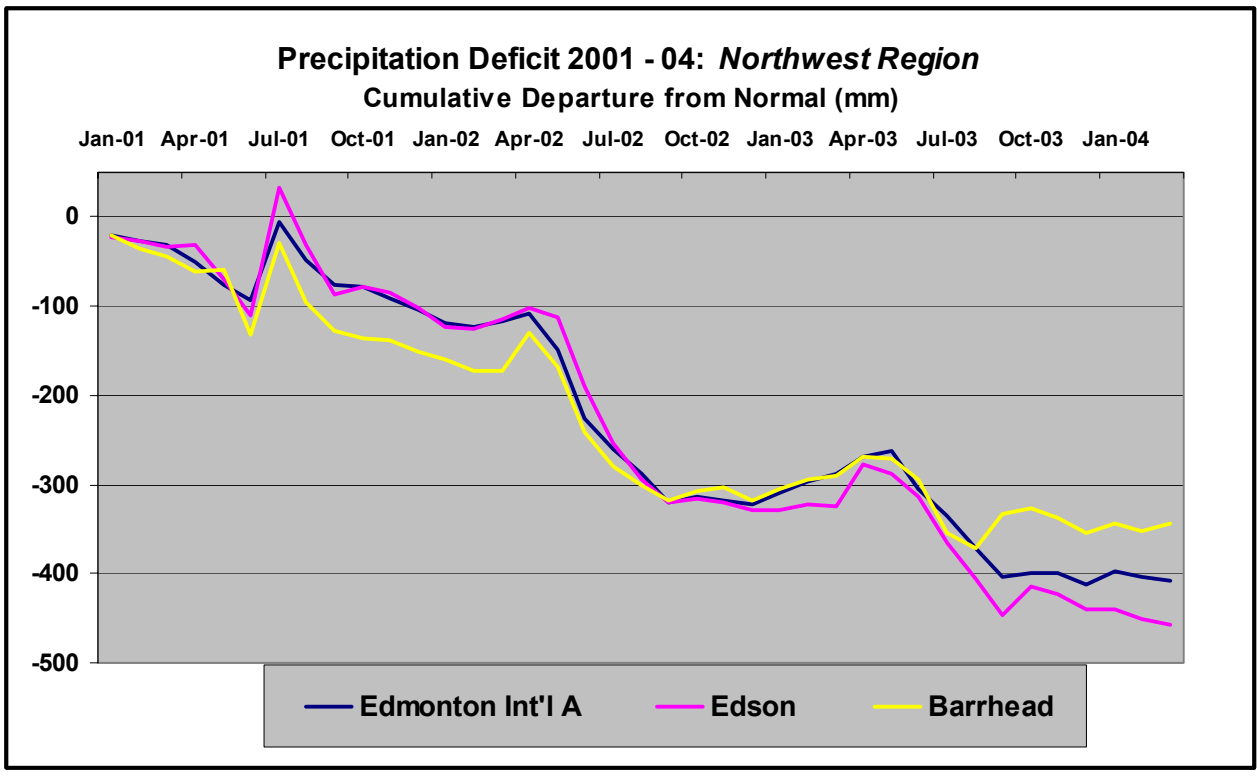

Figure 8. Cumulative precipitation departures from January 2001 through February 2004 for northwestern Alberta.

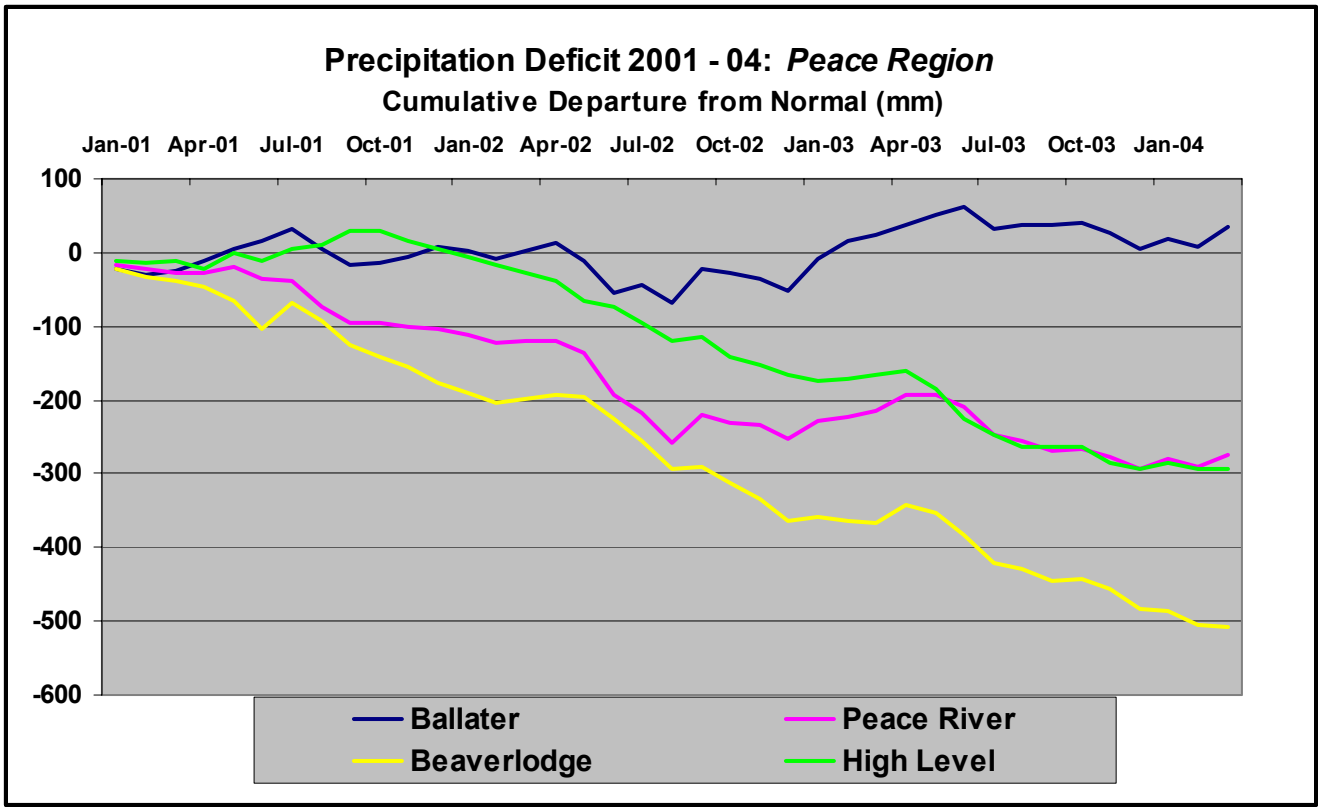

Figure 9. Cumulative precipitation departures from January 2001 through February 2004 for the Peace region.

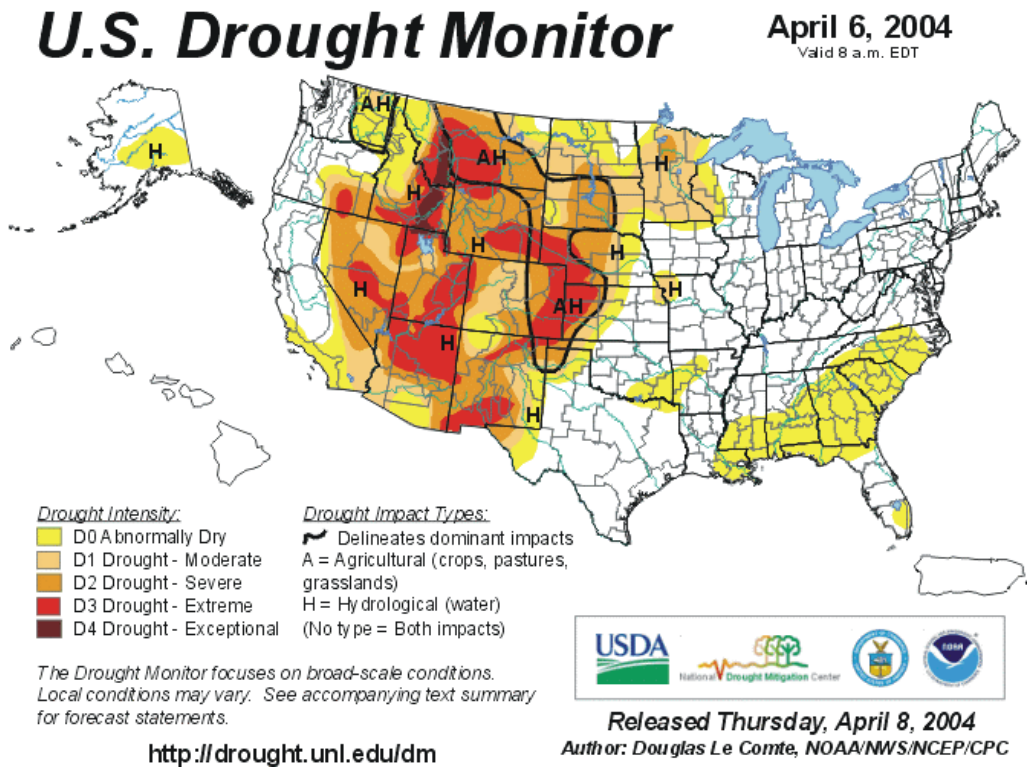

Figure 10. United States Drought Monitor for April 6, 2004

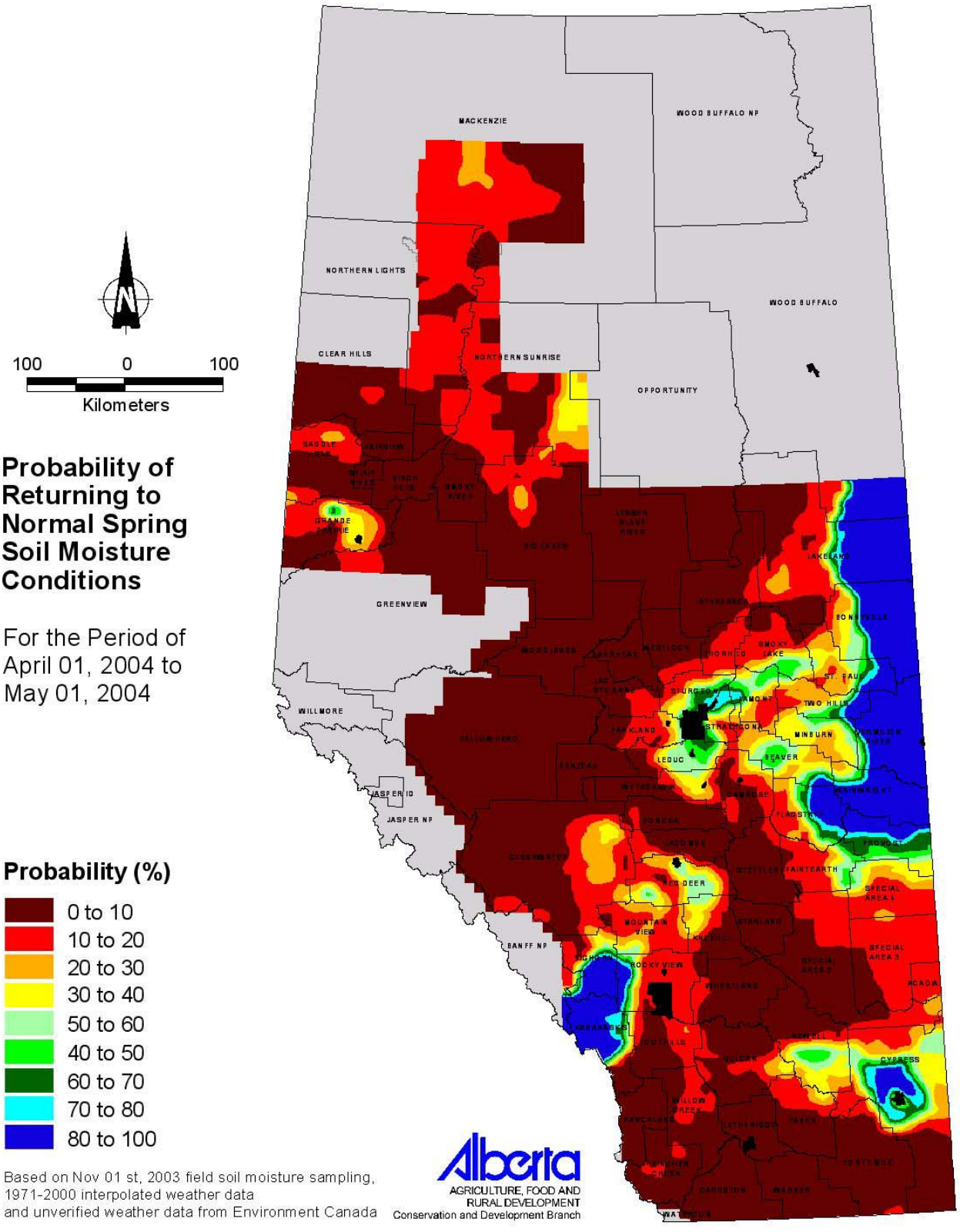

Figure 11. Probability of returning to average spring soil moisture levels in 2004, as of March 31, 2004.

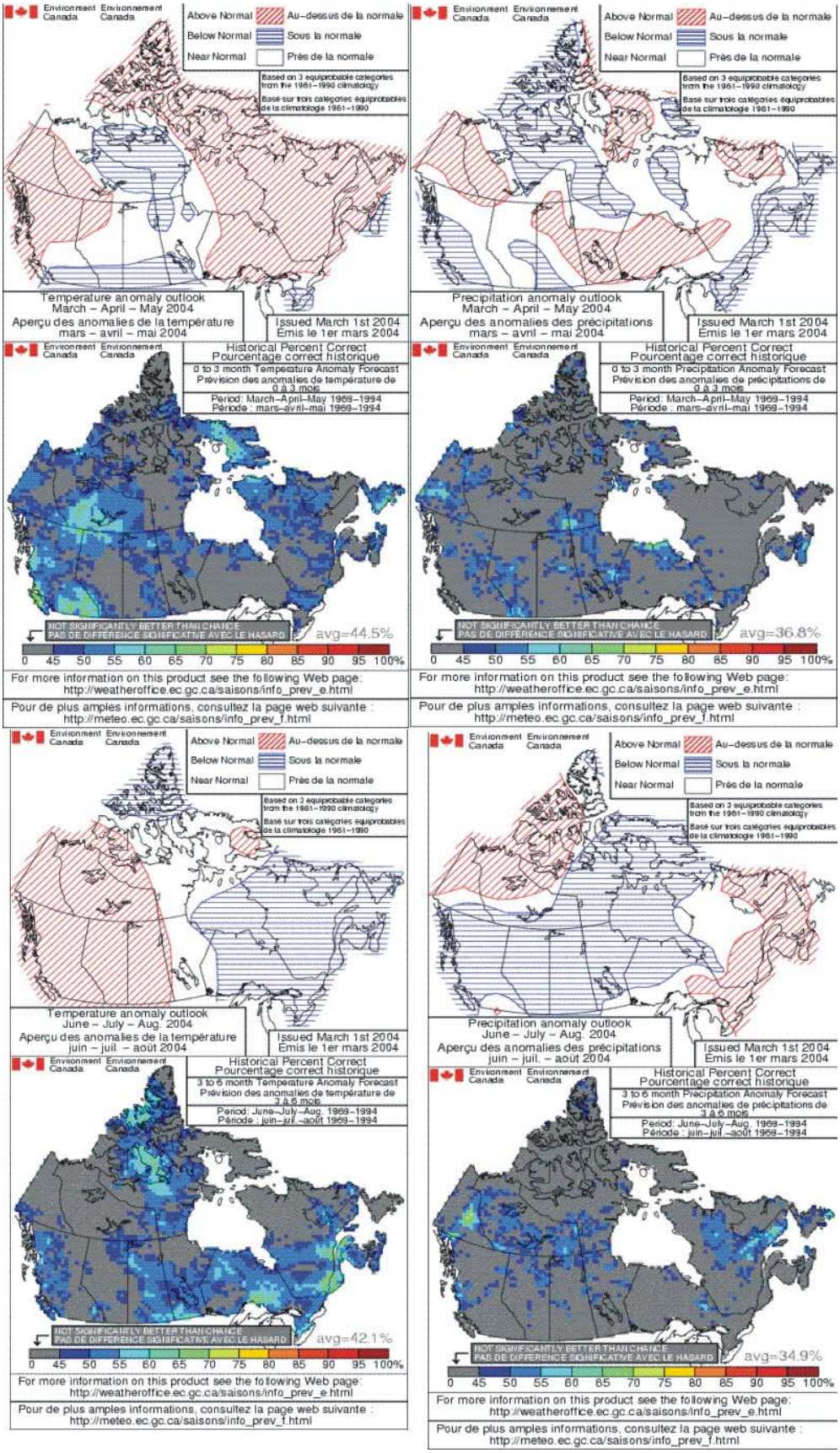

Figure 12. Environment Canada forecasts for March – May 2004 (top) and June – August (bottom) for temperature (left) and precipitation (right).

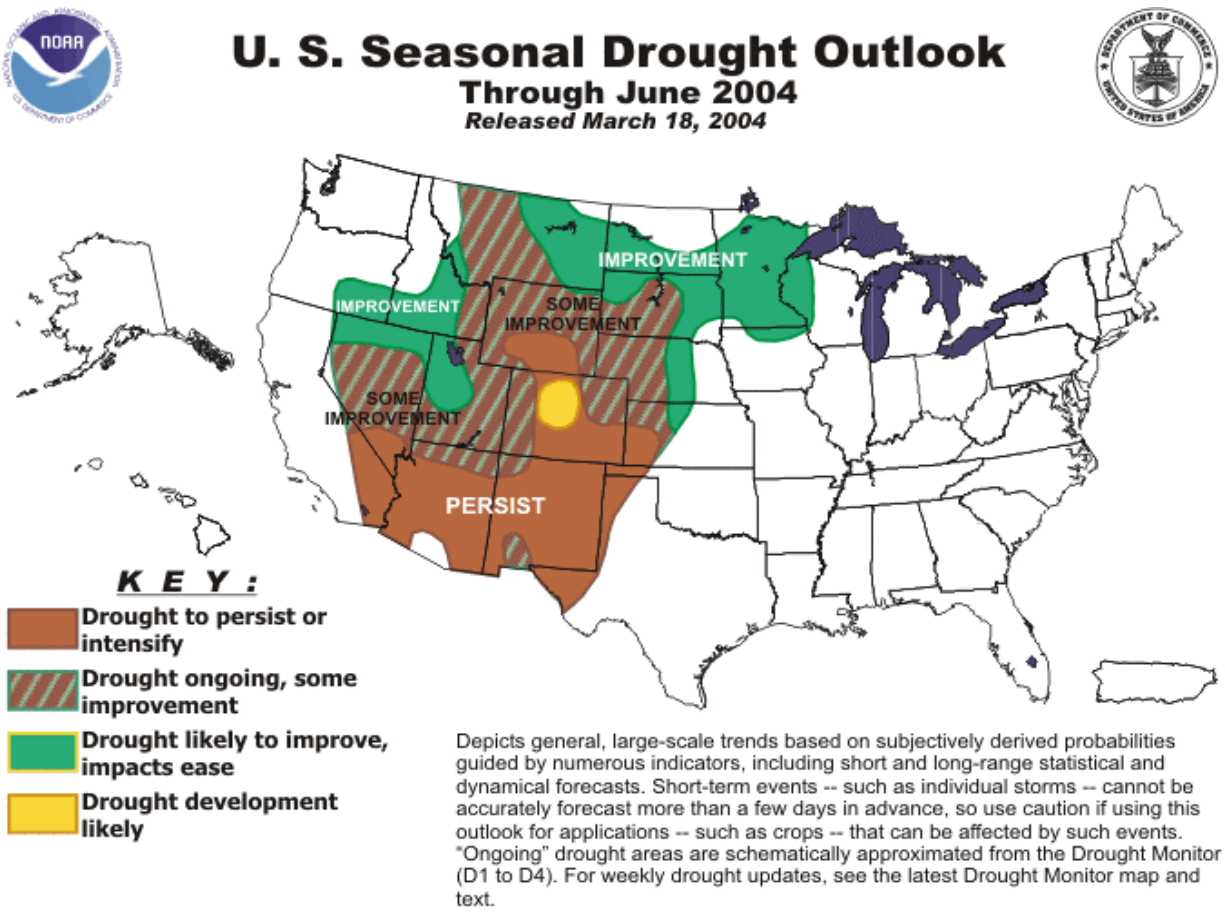

Figure 13. U.S. Seasonal Drought Outlook through May, 2004

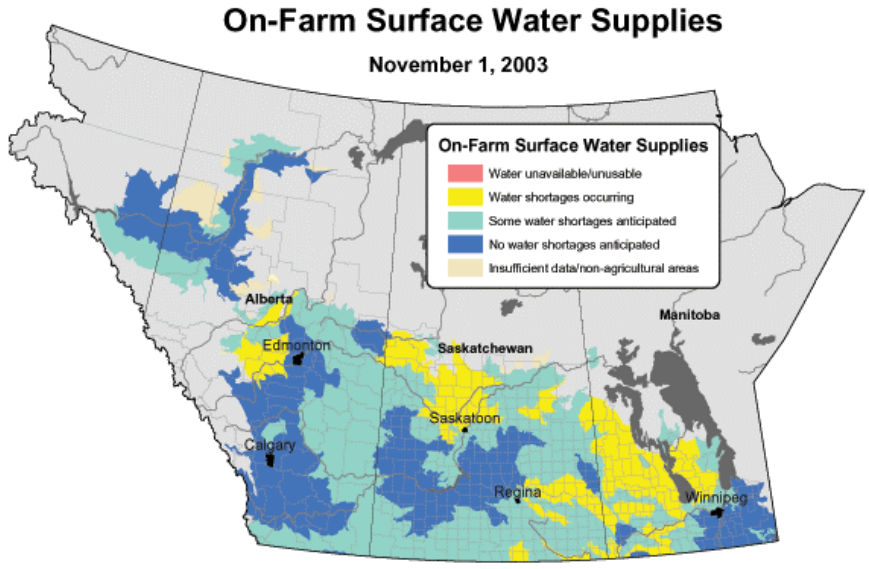

Figure 14. PFRA on-farm water supply outlook for November 2003.