Drought Report for the Agricultural Region of Alberta:
February 29, *2004*

Summary

For most of the province, *Normal* precipitation for the month of February ranges between 10 and 20mm. Since February is typically a very dry month, relatively small deficiencies or excesses in total precipitation may yield large differences in the indices presented here.

In February most of the province received *Below* to *Much Below Normal* precipitation, resulting in a slight increase in the areas affected by *Drought* and *Drought Alert*. In order for soil moisture levels to return to *Normal* by May, *Much Above Normal* precipitation is required. Recent trends showed that most of the current *Drought Alert* areas in central Alberta are remaining in this class. In the south, many of the *Drought Alert* areas are tending towards the *Drought* classification with some areas even trending towards *Exceptional Drought*. In the west, central and southeast portions of the province, areas that were previously classified as *Normal* are beginning to trend towards *Drought Alert*. 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.

Current Situation

Long-term drought (Figure 1):

- The areas in the *Drought* class increased to 3.5% up from 2.8% as reported for the end of January. They included most of the MD's of Pincher Creek and Cardston and portions of the M.D. of Willow Creek. Local areas in *Drought* also appeared in the county of Lethbridge and Special Areas 3 and 4.
- The areas in the *Drought Alert* class increased to 34% up from 23% as reported for the end of January. These areas are mostly in the southwestern, southeastern and central portions of the province and include the south and central Peace regions.

Recent trends (Figure 2)

- Recent (90 day) trends toward *Drought Alert* conditions were experienced in the most of the south and east central areas, and in much of the south and central area in the Peace region. These areas are currently trending toward *Drought Alert* status or, if they are already in *Drought Alert,* they are showing no indication of changing. Many areas currently mapped as the *Normal* class are trending towards *Drought Alert*.
- Areas trending toward *Drought* status increased since the last report and include much of Southern Alberta and the county of Starland.
- Trends toward *Exceptional Drought* are beginning to emerge in the northern portion of Forty Mile County and south of Medicine Hat.
- Parts of the province experiencing moderating conditions decreased in size since the last report and are now confined to the northern part of the province and the east and western Peace Regions.

Precipitation (Figures 3 – 9):

- Precipitation in the past 90 days (since December 3rd, 2003) was *Below Normal* for most of the northern half of the province except for some isolated pockets reporting *Much Below Normal* in the counties of Fairview, Birch Hills, Grande Prairie and Greenview. Most of the Southern half of the province had *Much Below Normal* precipitation.

- February is a historically one of the driest months of the year with most of the province typically receiving between 10 and 20 mm of precipitation (Figure 4a). As a result deficiencies of only a few mm of precipitation about the 30-year mean can have a large impact on the indices presented here. For most of the province total precipitation reported for this period ranged between 10 and 20 mm (Figure 4b).
- Precipitation since the last report (Jan 31) was *Much Below Normal* for most of the southern and western half of the province and *Below Normal* for much of the central Alberta except for a few pockets east and west of the city of Edmonton that recorded *Near* to *Above Normal* precipitation (Figure 4c).
- 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 275 – 525 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 500 mm *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, March 9, 2004*):

- Runoff on the plains from March through September 2004 is forecast to be *Below Normal* for the Red Deer basin, *Below Normal* to *Much Below Normal* for the Oldman, Bow and North Saskatchewan basins, and *Much Below Normal* for the Milk River basin.
- Mountain snow packs are *Below Average* to *Average* in the Oldman headwaters.
- Mountain snow packs in the Waterton, St. Mary, Bow, and Red Deer river basins are *Below Average*.
- Mountain snow packs in the North Saskatchewan River and Athabasca basins are *Below Average* to *Much Below Average*.
- The plains snow pack is *Above Average* to *Much Above Average* in west central Alberta, and *Below Average* to *Average* in northern Alberta, and varies from *Average* to *Much Below Average* in east central Alberta.
- A near record snow pack was observed in the top and south slopes of the Cypress Hills.
- Water storage for irrigation in the Oldman river basin is *Below Average* except for the Chain Lakes reservoir, which is *Average*.

United States (Figure 10):

- The U.S. *Drought* Monitor reports a large and persistent *Drought* from the Montana border through most of the west and mid-west.
- 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 areas of Alberta, except along Highway 1, and in the Lloydminster – Cold Lake area. This was a continued deterioration in the south and no change elsewhere from conditions as of January 31.
- The Lloydminster area has 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.
- This information was not updated by Environment Canada since December, 2003

United States *Drought* Forecast (Figure 13)

- The U.S. Seasonal *Drought* Forecast predicts improving *Drought* conditions in the west, including northern Montana, through May 2004.
- Much of the are where improvement is expected, including the area bordering southern Alberta, is not expected to improve 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.

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This report was created on February 29th, 2004.

Drought analysis is scheduled at monthly intervals between November 1 and April 30. This report updates the previous report of January 31st, 2004.

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

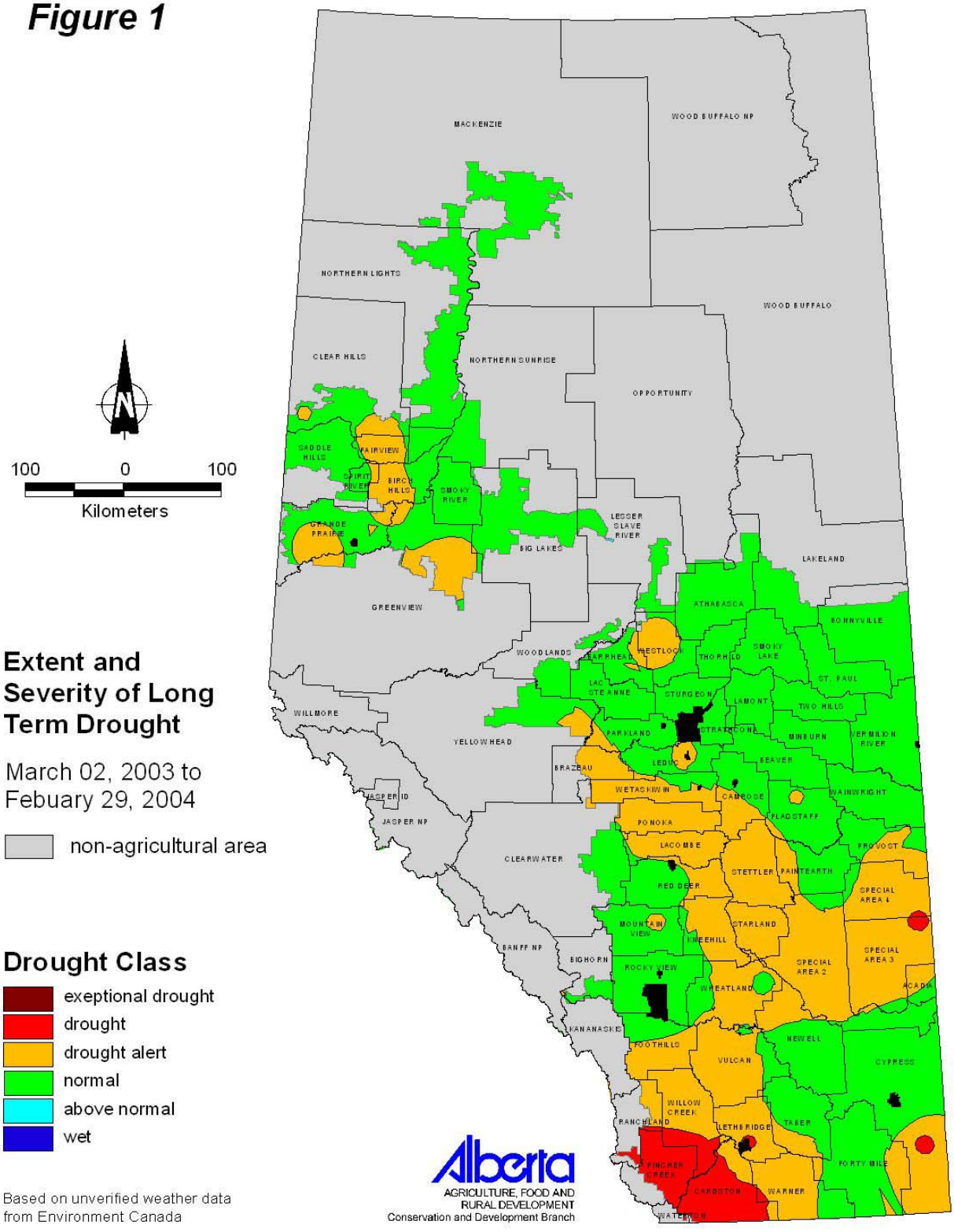

Figure 1. Extent and severity of long-term drought in the agricultural region of Alberta, February 29, 2004.

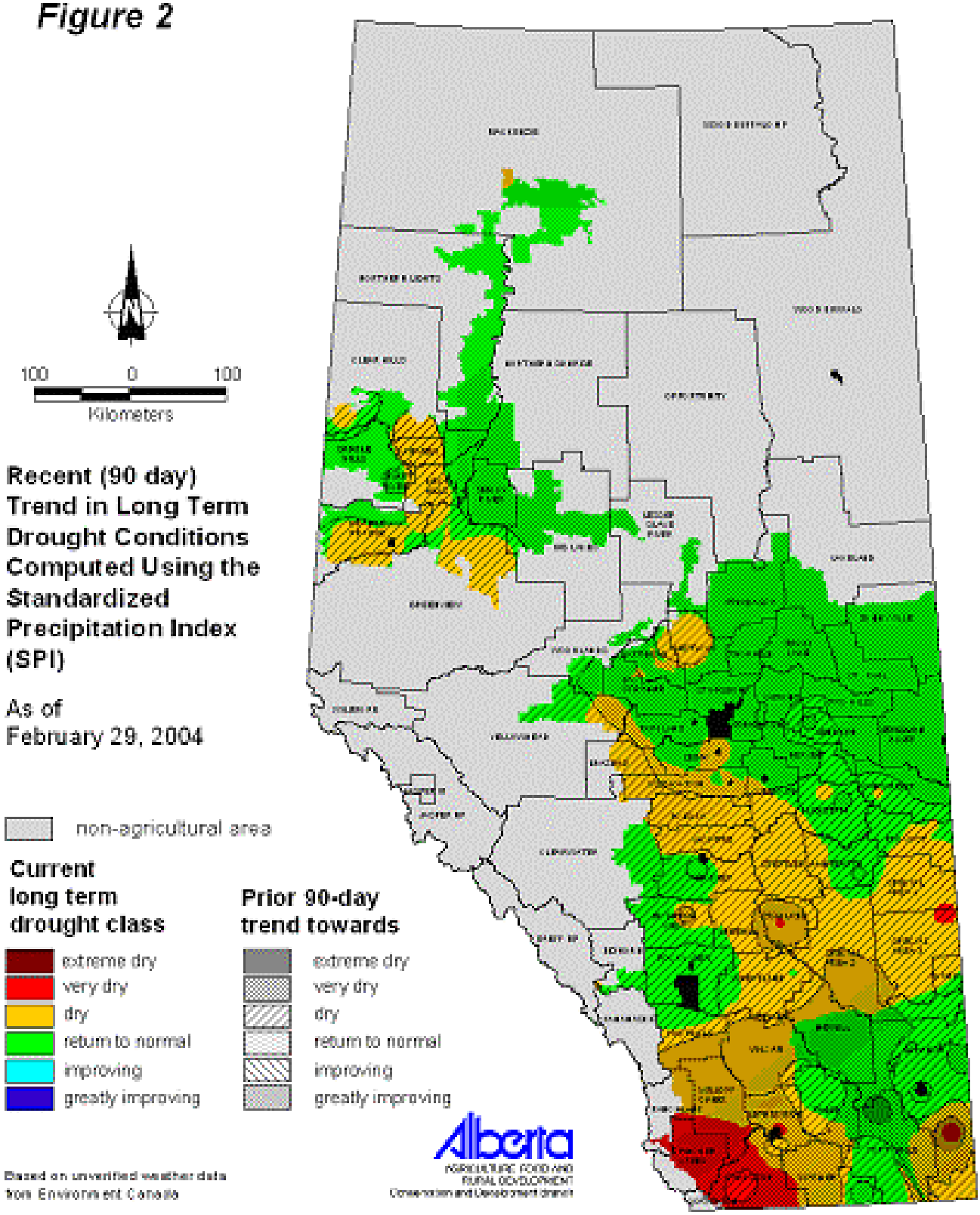

Figure 2. Recent (90 day) trends in drought status in the agricultural region of Alberta, February 29, 2004.

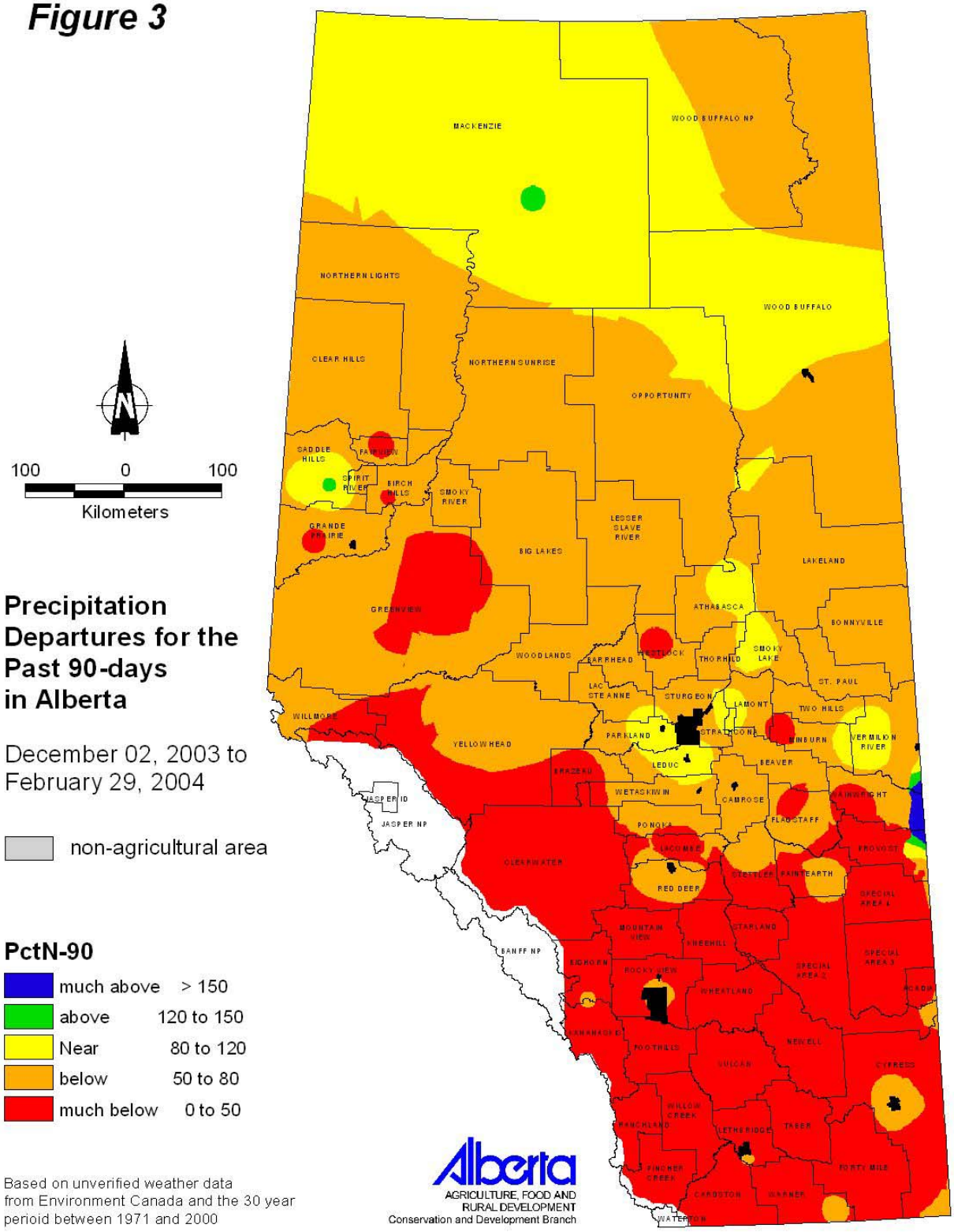

Figure 3. Precipitation departure for the 90 days up to February 29, 2004.

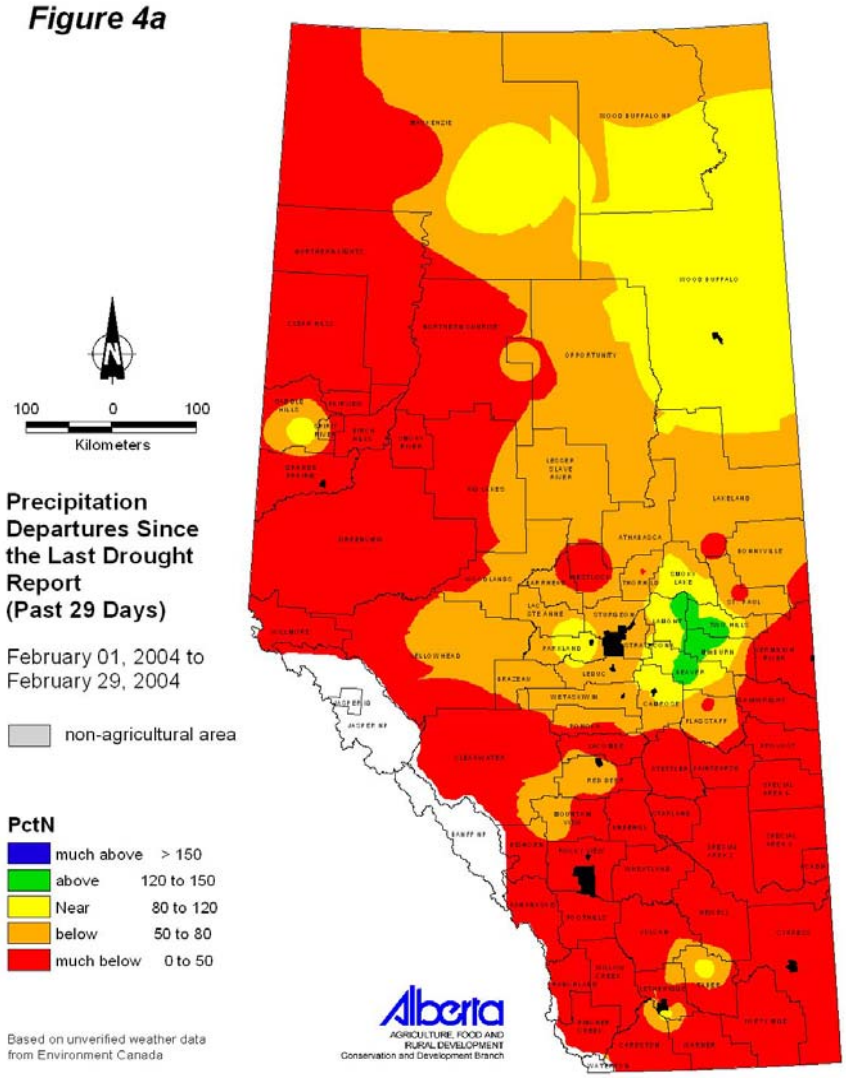

Figure 4a. Precipitation departures since the last drought report for the period Feb. 01, 2004 to Feb. 29,2004

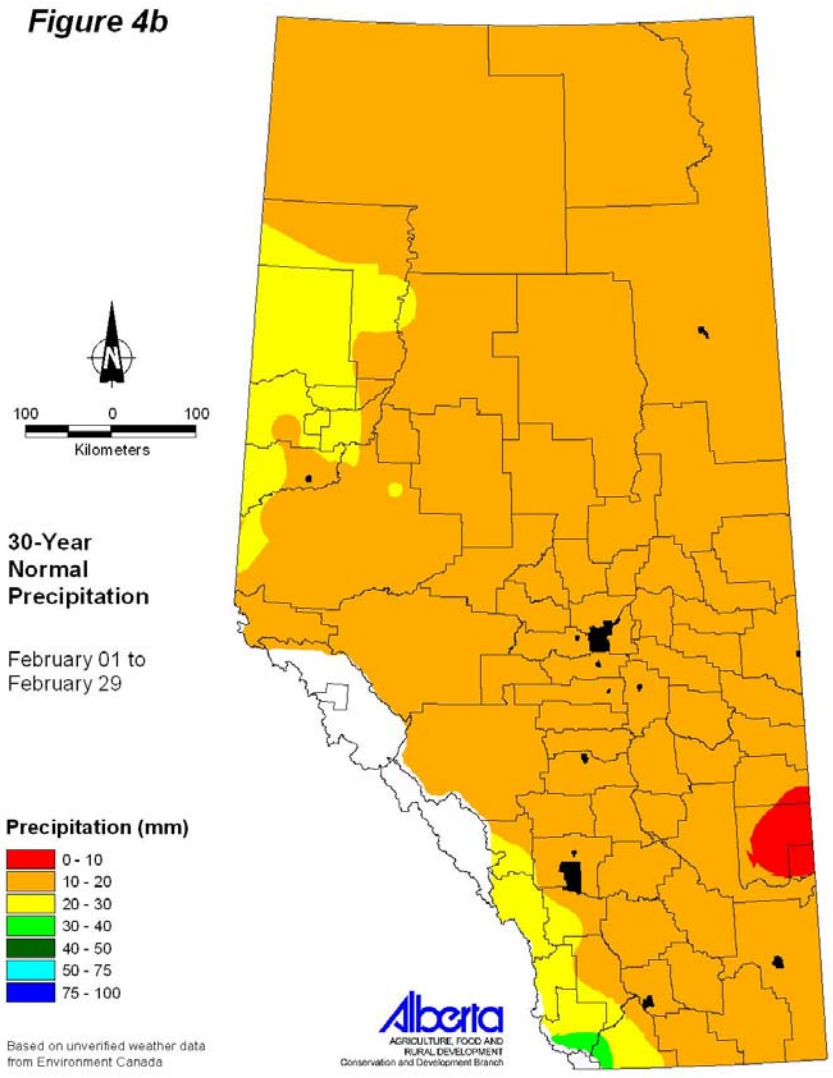

Figure 4b. Total amount of precipitation (mm) normally received between Feb. 01 and Feb. 29

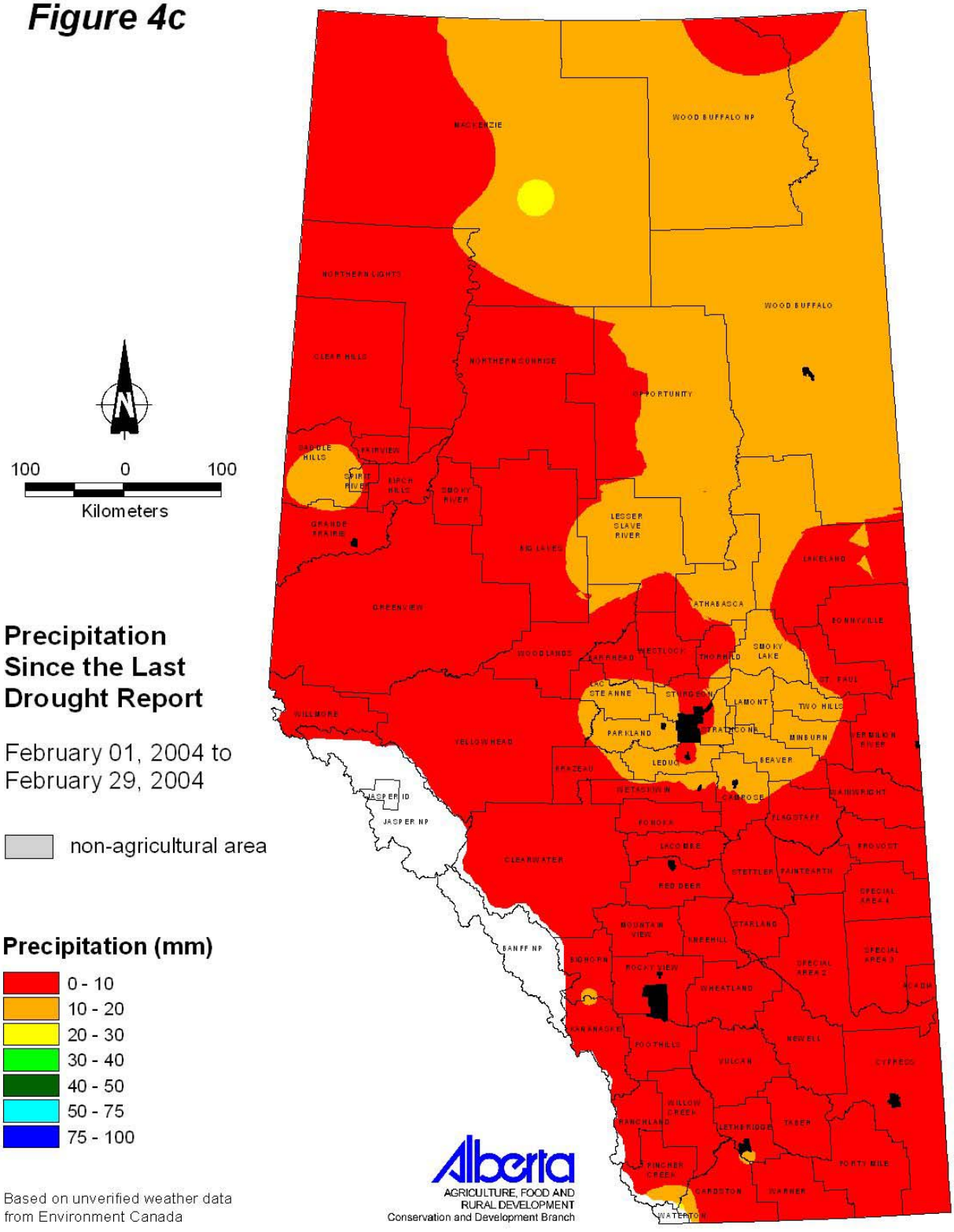

Figure 4. Precipitation (mm) since the last drought report, Feb. 01, 2004 to Feb. 29, 2004.

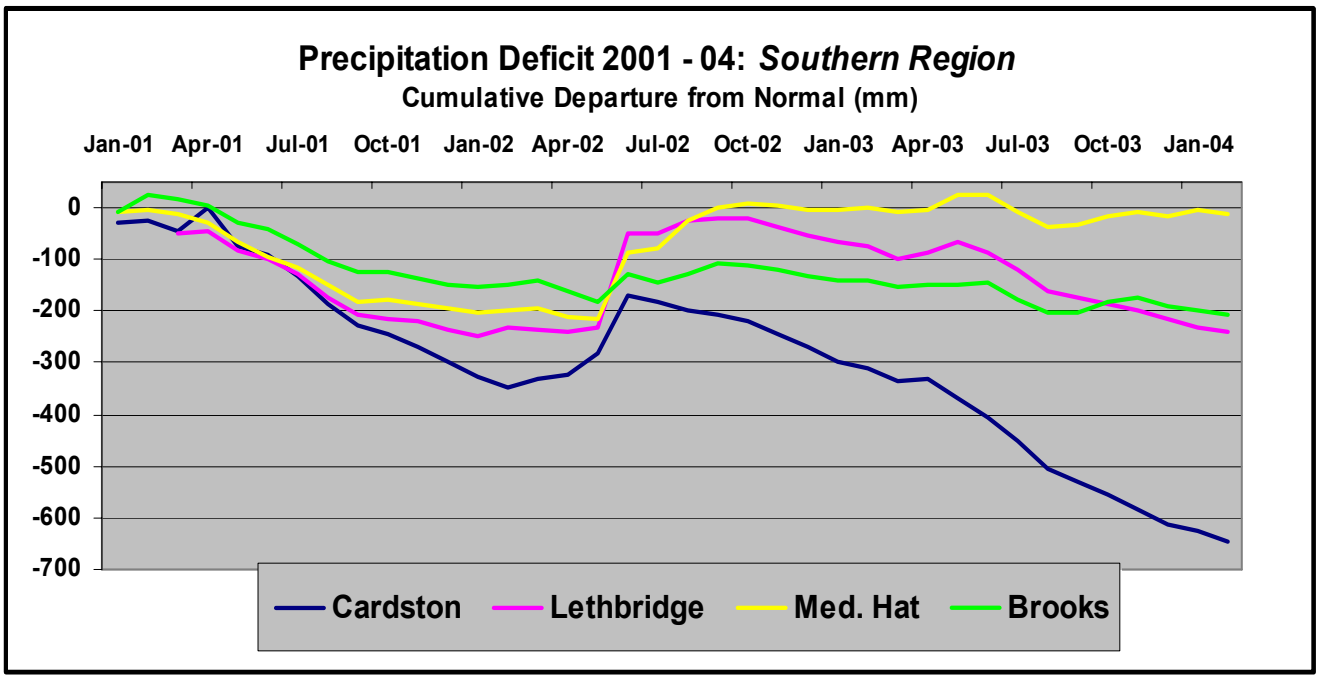

Figure 5. Cumulative precipitation departures from January 2001 through February 2004 for southern Alberta.

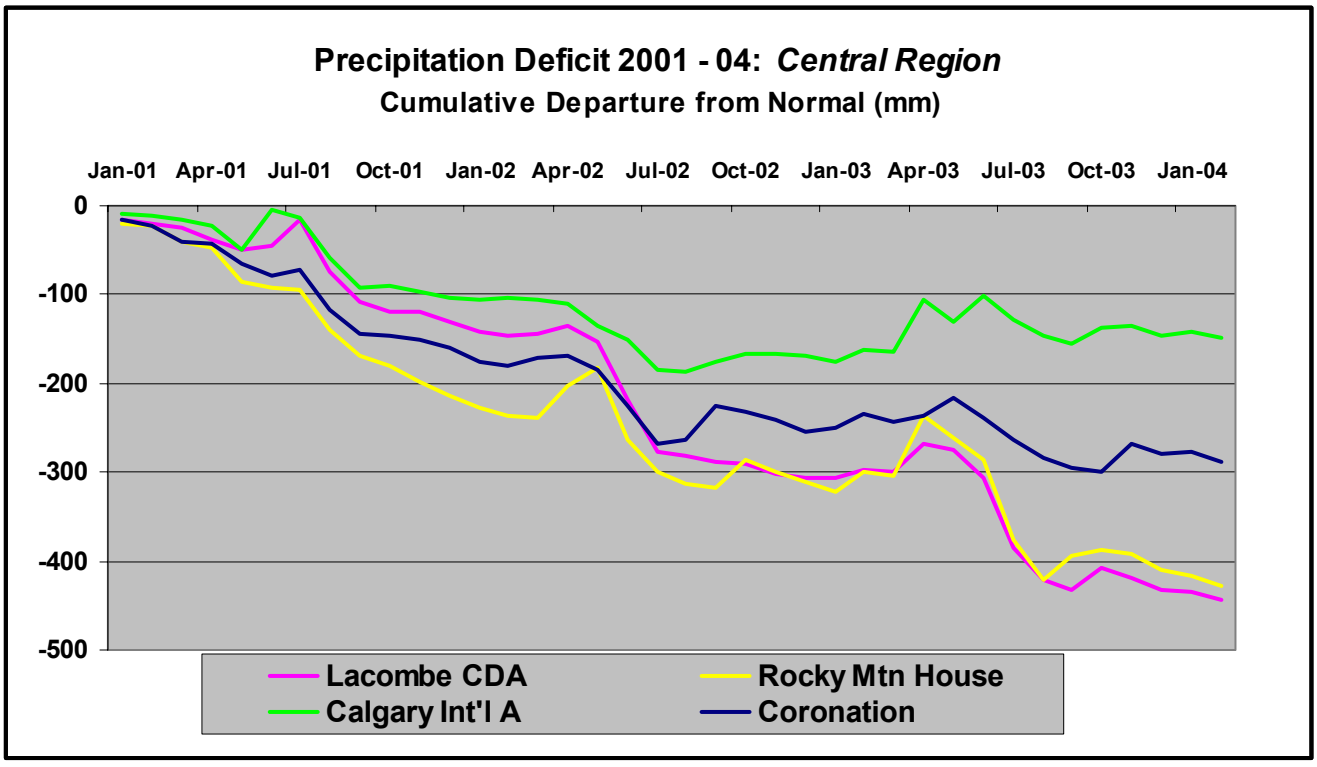

Figure 6. Cumulative precipitation departures from January 2001 through February 2004 for central Alberta.

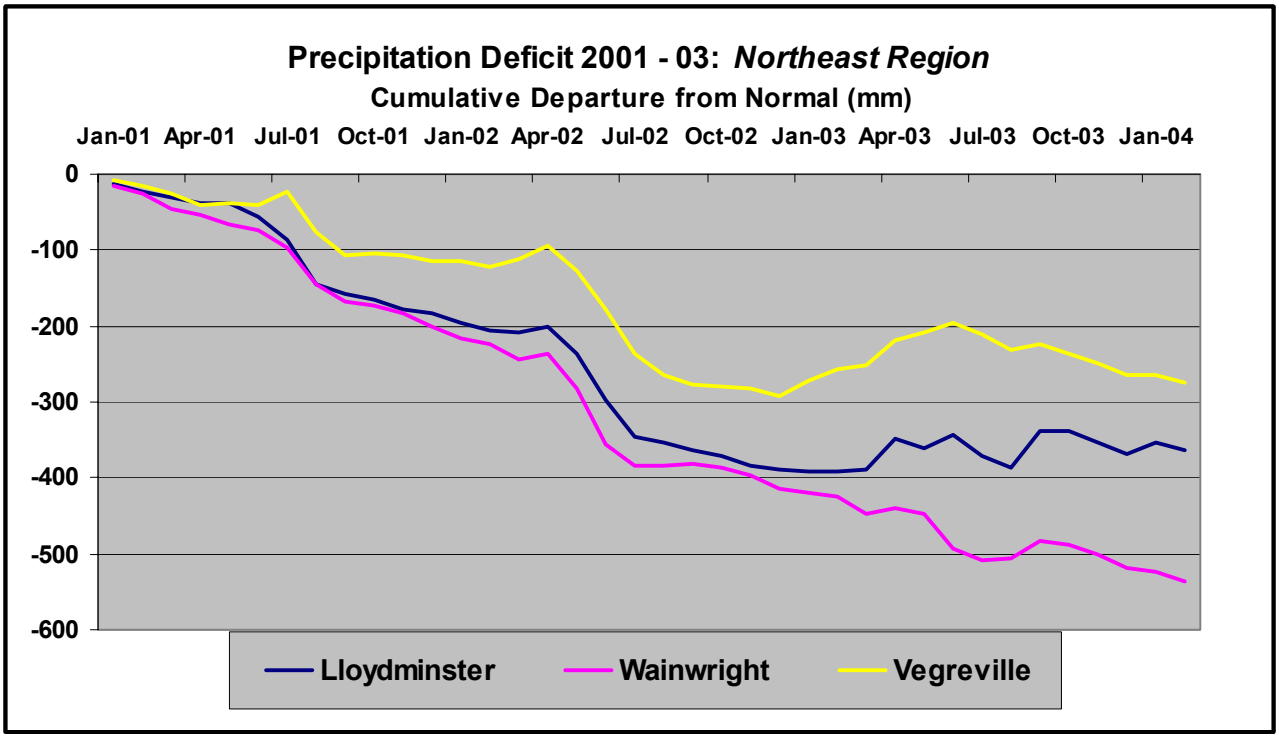

Figure 7. Cumulative precipitation departures from January 2001 through February 2004 for northeastern Alberta.

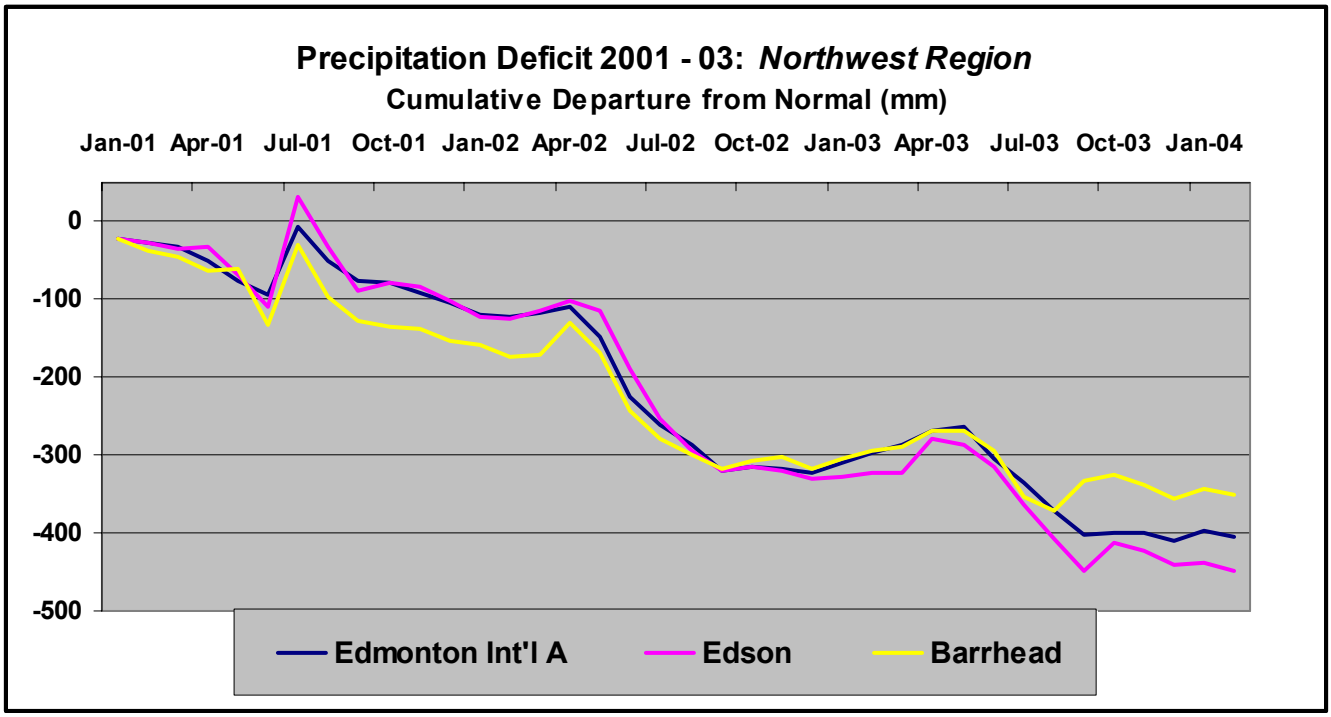

Figure 8. Cumulative precipitation departures from January 2001 through February 2004 for northwestern Alberta.

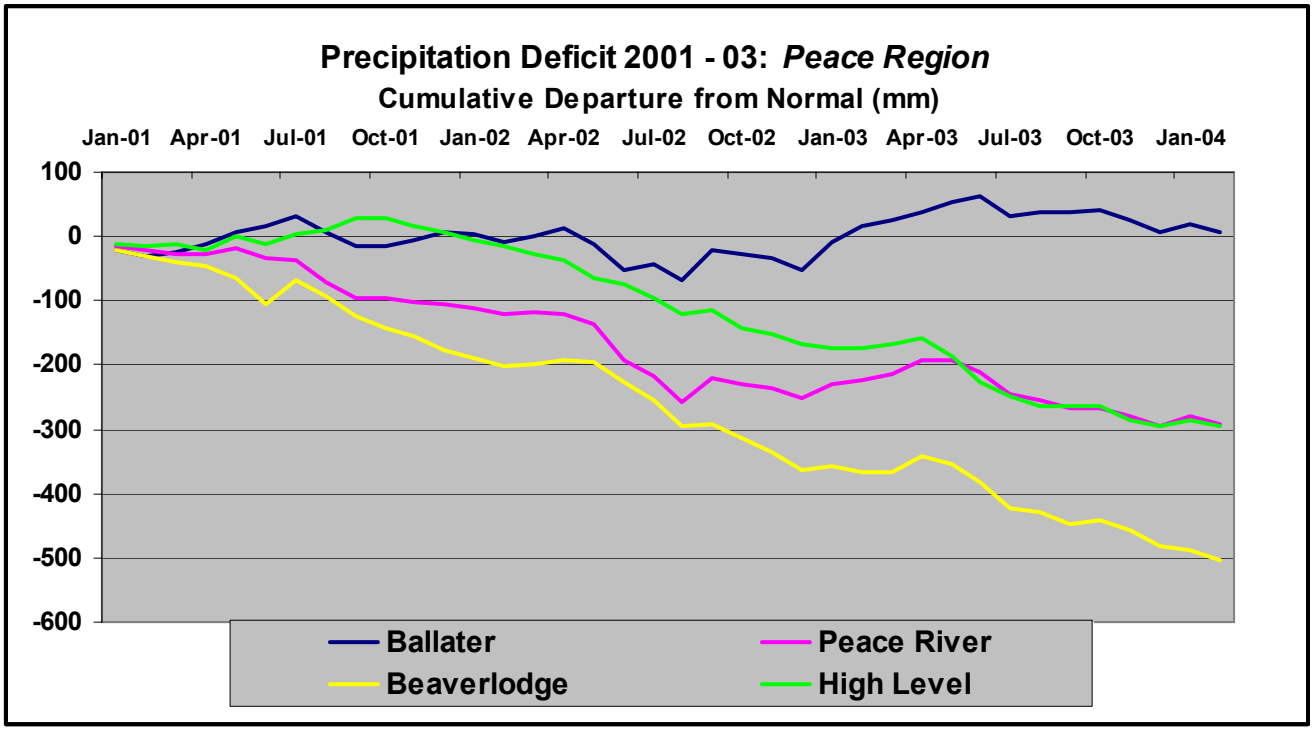

Figure 9. Cumulative precipitation departures from January 2001 through February 2004 for the Peace region.

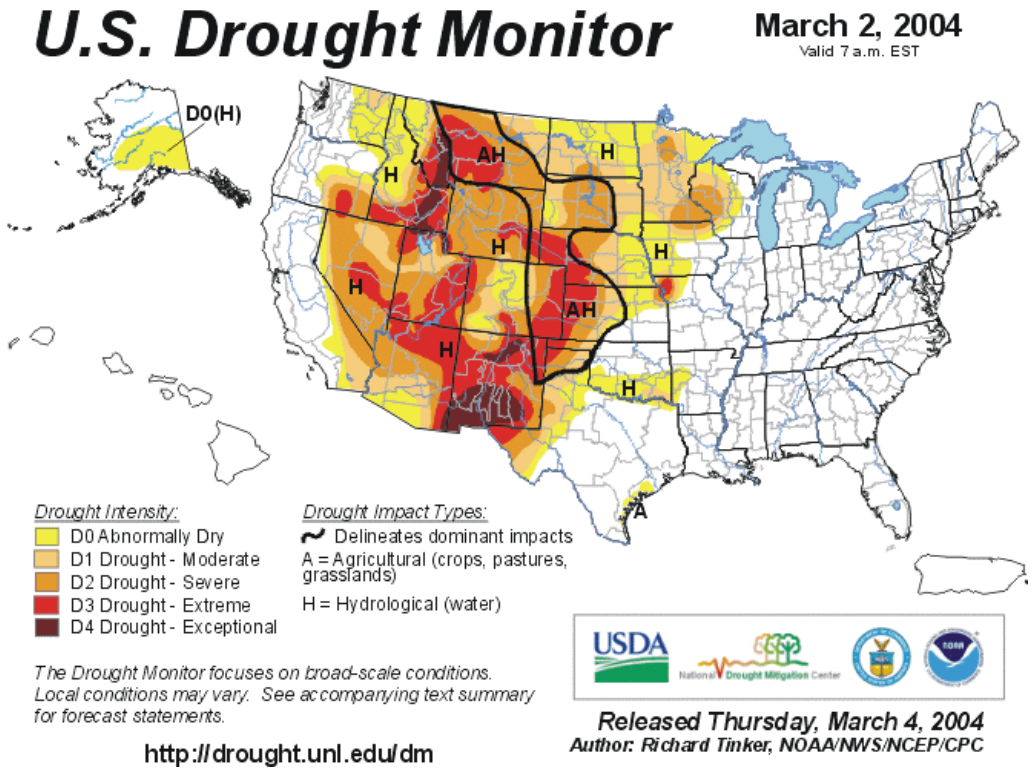

Figure 10. United States Drought Monitor for March 2, 2004

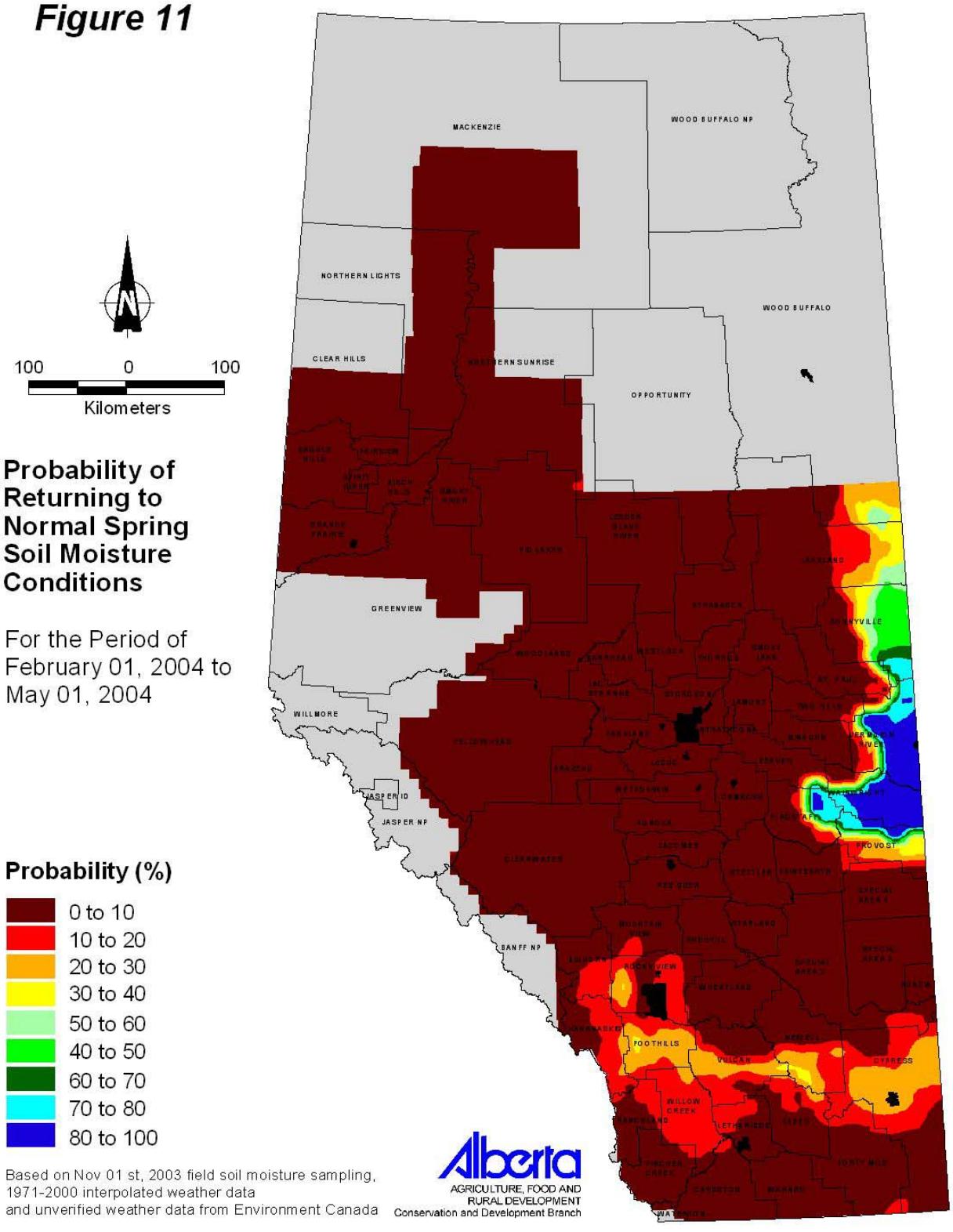

Figure 11. Probability of returning to average spring soil moisture levels in 2004, as of February 29, 2004.

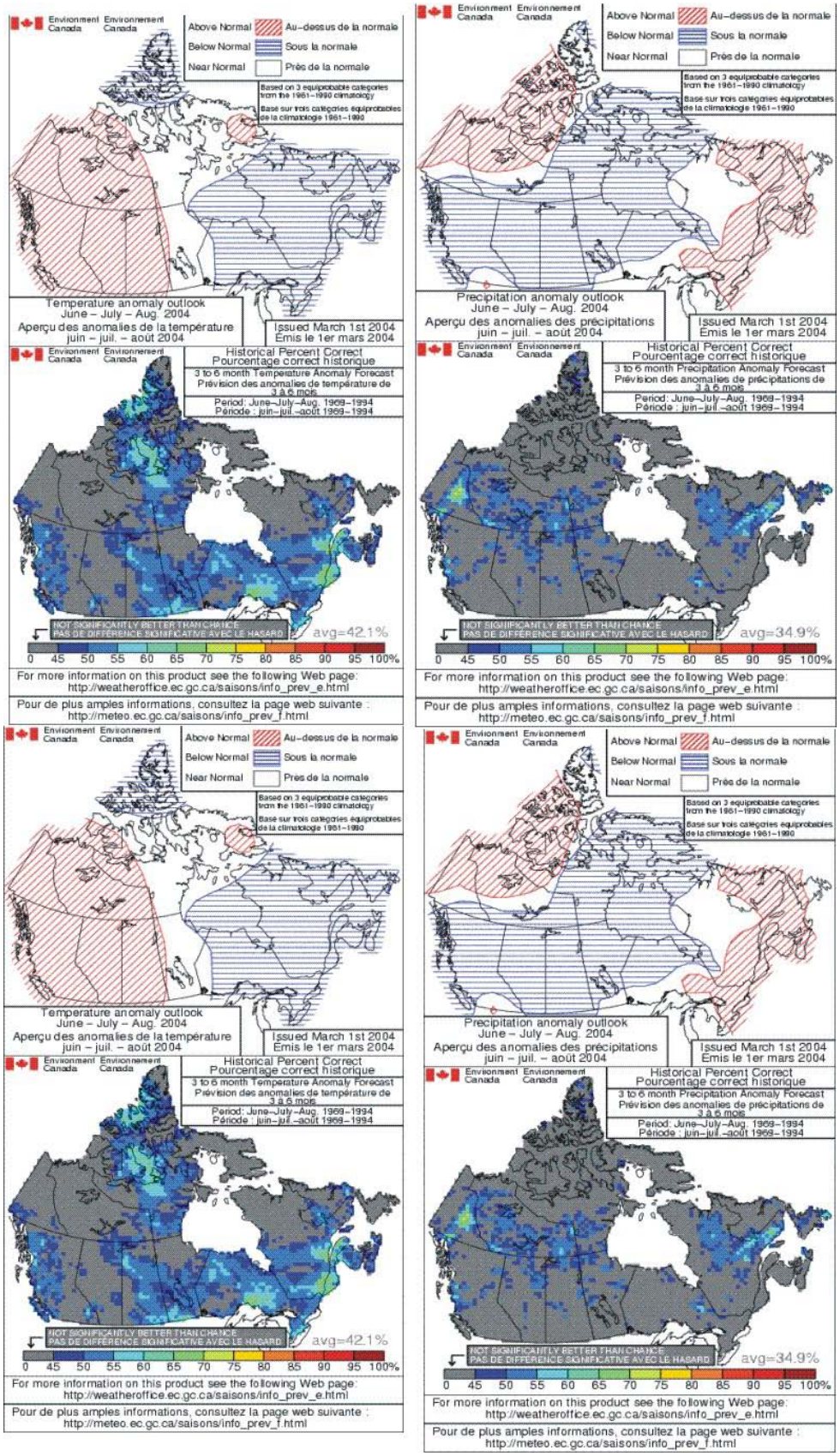

Figure 12. Environment Canada forecasts for June – August (top) and March – May 2004 (bottom) for temperature (left) and precipitation (right).

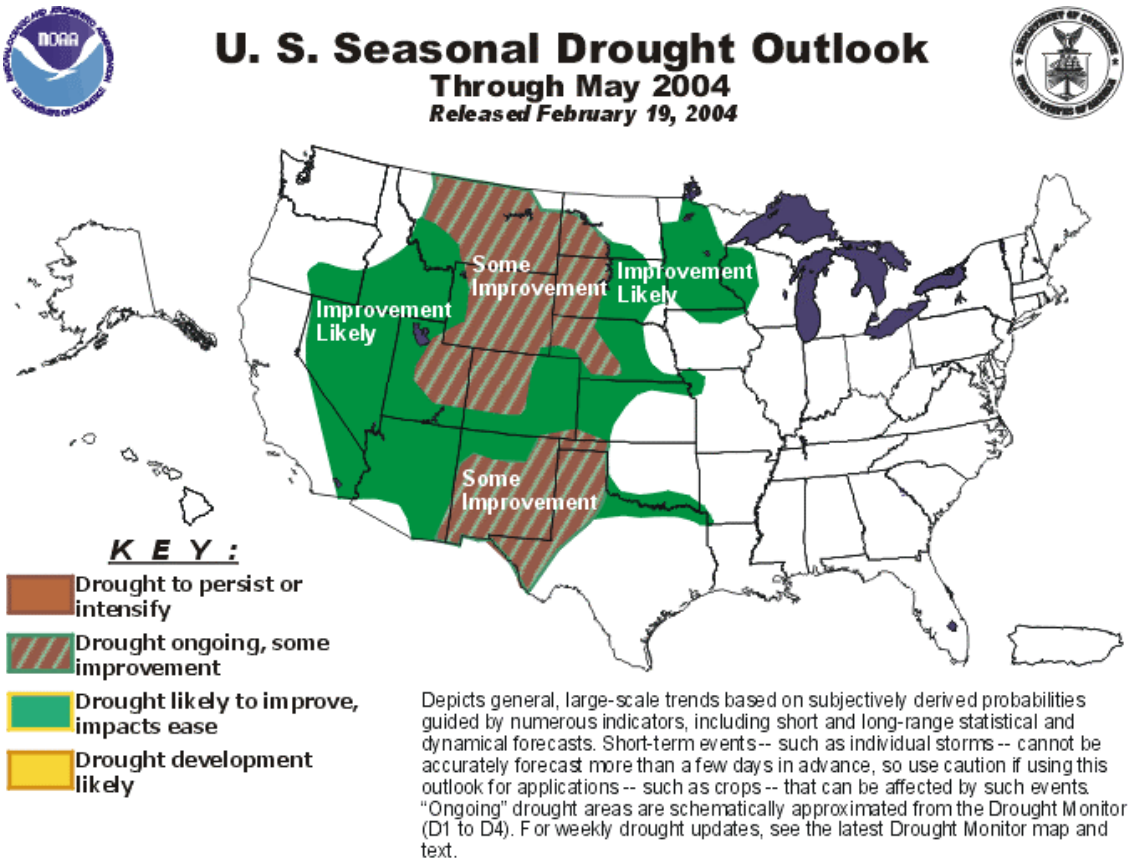

Figure 13. U.S. Seasonal Drought Outlook through May, 2004

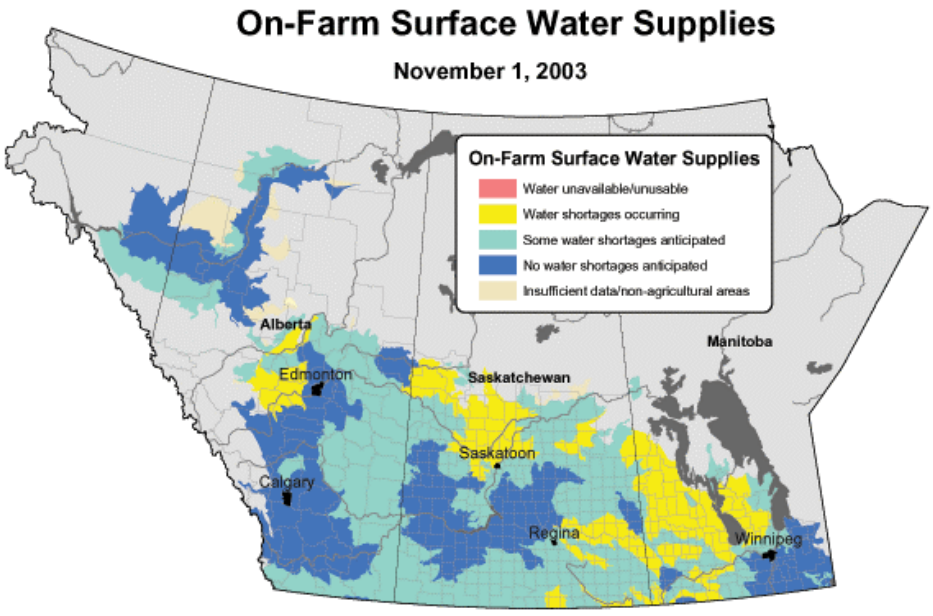

Figure 14. PFRA on-farm water supply outlook for November 2003.