Drought Report for the Agricultural Region of Alberta:
June 27, 2005

Summary

Since the last Drought Report (June 07, 2005) Southwestern Alberta continued to receive unprecedented amounts of rainfall. Across the reporting area, precipitation totals were highly variable with the least amounts being recorded in the Peace Region, where less than 25 mm was recorded in central locations, 25-50 mm over most other areas of the region with slightly higher amounts in the north west and south east. In the Northern, Central and Southern Regions precipitation totals generally ranged from 50-125 mm, with the exception of western parts of the Southern and Central Regions, where upwards of 200 mm was not uncommon. Parts the Northern Region received between 25-50 mm, which is considered to be *Below* to *Much Below Normal* for this period.

Since the start of the growing season (April 1, 2005), precipitation across most of the Southern Region was *Much Above Normal* with the exception of the extreme southeast corner of the region, reporting *Near Normal* to *Above Normal* precipitation. For central parts of the Central Region, precipitation was *Normal,* grading to *Much Above Normal* in the east, and west. In the Northern Region, central areas received *Below Normal* precipitation with most other areas receiving at least *Normal* precipitation. Much of the south half of the Peace Region has received *Below Normal* precipitation, with all other areas reporting at least *Normal* precipitation.

Currently only one area in the province is classified as *Drought Alert*. This small pocket is centered on the town of Vegreville in the Northern Region.

The 90-day trend in *Drought* conditions across the Southern and Central Regions ranges from *Normal* to *Wet*. In the Central Region most of the area is trending towards *Normal*, with a few exceptions centered on the Town of Vegreville and Whitecourt. In the Peace Region, the 90-day trend is towards *Normal*, despite recent precipitation deficits. In this area, if July remains dry, much of the central Peace Region will trend towards *Drought Alert*.

Currently, the lowest soil moisture levels in the province (25-50 mm) are found in the central Peace Region, where less than 25 mm of precipitation has fallen since the last report. The situation would be worse had it not been for previously adequate soil moisture reserves which had been established last fall and early this spring. In the Peace, Northern, Central and Southern Regions, a few areas with soil moisture reserves ranging between 50-75mm can be found. These areas will need precipitation soon to insure crop growth is not affected by lack of moisture.

Current Situation

Drought Indices

Long-term Drought (Figure 1)
Currently 0.3% of the reporting area is in *Drought Alert*, down significantly from the 1.8% reported in the June 07, 2005 Drought Report. Only one pocket of *Drought Alert* currently exists in the province, this can be found in the Central Region, centered on the town of Vegreville.

Historically in Alberta, about 48% of average annual precipitation is received through the July–August period. Since the long-term *Drought* index (SPI) is a measure of yearly precipitation deviations from *Normal*, precipitation totals through July-August will carry significant weight in the SPI calculations. Thus, over the next few months, the SPI will be quite responsive to precipitation departures from *Normal*. As a result, if precipitation trends remain *Below Average* across the current *Drought Alert* areas, then expect to see *Drought Alert* areas growing rapidly in size.

Currently 74.3% of the area is classified as *Normal*, down from the 89.7% reported during the last report, largely due to an increase from 7.7% to 21.2% in the *Above Normal* category. Recent precipitation in the Southern Region has moved some more land into the *Wet* category, which currently occupies about 4.2% of the reporting area.

Recent (90-day) trend in long-term Drought conditions (Figure 2**)**
Over the past 90-days, precipitation surpluses in the Southern Region have resulted in a trend towards *Above Normal* or *Wet.* Precipitation since the last report has seen improvements in most of the Central and Northern Regions, with most areas trending towards at least *Normal*. One exception exists near the town of Whitecourt where the trend is towards *Drought Alert*. Similarly, the trend in much of the Peace Region is towards *Normal,* with the exception of one small area trending towards *Drought Alert*, near the town of High Prairie.

These trends appear to contradict those shown of the Growing Season Precipitation Departures map (Figure 5) where much of the central Peace Region and parts of the central portions of the Northern region have received *Below Normal* precipitation. In these areas, expect to see recent trends appearing as *Drought Alert* if conditions to not improve in the next few weeks.

Precipitation

The 90-day precipitation departures cover the period from March 31, 2005 to June 27, 2005. This is a very similar period to that covered by the Growing Season Precipitation Departures map. As a result, only the Growing Season Precipitation Departures map is presented here (see section below entitled Growing season precipitation to date (Figure 4 and Figure 5).

Precipitation since the June 07th, 2005 Drought Report (Figure 3**)**
Since the June 07, 2005 Drought Report, two major precipitation events brought in excess of 150 mm to the western parts of the Southern and Central Regions. The bulk of this precipitation fell in the foothills in and around Rocky Mountain House (> 200mm) and lesser amounts (> 150 mm) west of Highway 2 between Calgary and Lethbridge and west of Highway 4 between Lethbridge and the Coutts. Note that AAFRD currently does not have access to all of the mountain stations and as a result, more precipitation fell than is shown on Figure 3**,** particularly south west of Calgary**.**

Elsewhere in the Southern Region, precipitation totals were in excess of 100 mm, with the exception of the southeast, which received between 50 and 75 mm and one station, near Foremost, reported only 45 mm. In the Central Region, precipitation totals since the last report were in excess of 75 mm. In the Northern Region, precipitation totals generally exceeded 50 mm, with the lowest amounts reported at Vegreville (42.5mm) and Twin Lakes (25.1 mm).

The Peace Region was the driest region with less than 25 mm recorded in central locals, 18.9 mm at Fairview, and 25.1 mm at Peace River Airport. Elsewhere in the Peace Region generally less than 50 mm fell with some local areas reporting more than 75 mm.

Growing season precipitation to date (Figure 4 and Figure 5)
To date, growing season precipitation has been highly variable across the province, grading from 75-100 mm in the central and south Peace Regions to over 450 mm in the southwest portions of the Southern Region. Elsewhere in the Peace Region, 100-150 mm was recorded in the north, and 100-150 in the western and extreme eastern locations. Across the Northern Region, central parts received the least amount of precipitation (100-150 mm) increasing to greater than 175 mm in northern, eastern and western localities. In the Central Region, the driest locations can be found in the central portions, through the Counties of Starland, Stettler, Lacombe and Paintearth where 100-150.mm was recorded. These amounts quickly increase in the west to over 250 mm and in the east to upwards of 200 mm. The wettest part in the reporting area can be found in the western portions of the Southern Region where over 450 mm has fallen west of Lethbridge and Calgary, grading to a low of 125-150 mm in the southeastern portion of this region (**Figure** 4).

Growing season precipitation, expressed, as a percent of *Normal,* is variable across the reporting area with the wettest locations found in the southwest and the driest areas in the Peace Region. Most of the Southern Region has reported *Near* to *Much Above Normal* precipitation, as a result of three major precipitation events that fell during June. Most of the central region received *Near Normal* precipitation grading to above and *Much Above Normal* in the west and east. The station at the town of Lacombe received less than 80% of *Normal*, the driest part in the Central Region.

In the Northern Region, several areas of *Below Normal* precipitation exist. One large one in and around the City of Edmonton extending as far west as Wabamun Lake, and others around the town of Vegreville, and in the counties of Barrhead and Lac Ste Anne. The Peace Region currently is the driest area in the reporting area with much of the southern, central and eastern areas reporting *Below Normal* precipitation. The driest areas, centered on High Prairie, recorded *Much Below Normal* precipitation. Elsewhere in the Peace Region, northern areas reported *Above Normal* and the extreme western localities reported *Near Normal* precipitation **(Figure 5**).

Normal precipitation for the month June (Figure 6)
July is typically one of the wettest months in Alberta, with the exception of Southern Alberta where June is the wettest month, accounting for about 18% of average annual precipitation. Average July precipitation ranges from 30-40 mm in the east central portions of the Southern Region, up to 120-140mm in the Swan Hills and areas surrounding Rocky Mountain House (**Figure 6**).

Soil Moisture

Soil moisture in the agricultural regions of Alberta as of June 07, 2005 (Figure 7)
Soil moisture reserves along the foothills and the northern parts of the Northern Region are typically well above 125 mm. The lowest soil moisture reserves are found in the central Peace Region, near and including the town of Fairview (25-50 mm). Elsewhere the lowest soil moisture reserves (50-75 mm) can be found in the central parts of the Northern and Central Regions and again in Special Areas 3 and 4 centered on the town of Esther. For those areas with 25–50 mm of moisture reserves, precipitation will be needed in the next few days. Areas with 50-75 mm will need precipitation within the next 10 days or so, provided that crops have well established root systems, capable of extracting soil water a depth.

All other areas of the province have at least 75-100 mm of soil moisture reserves, adequate protection against short-term dry spells. Regardless, in those areas with less than 100 mm of reserves, *Near Normal* well-timed precipitation is needed to provide adequate moisture for crop growth. Those areas with greater than 125 mm of reserves will need warm dry weather over the next few weeks to prevent localized yield reductions due to ponding in low lying field areas. This is particularly true, in along the Foothills, between Rocky Mountain House and the US border.

Current soil moisture deficit (Figure 8)

Soil moisture deficits are computed relative to *Normal* (which is the 30 year statistical average taken from the years 1971-2000).

For the Southern Region, no areas are reporting *Below Normal* soil moisture reserves at this time. In fact, soil moisture reserves across most of the Southern Region range from *Well Above Normal* to *Extreme Surplus*, mostly due the heavy rains that occurred during the month of June. In the Central Region, soil moisture reserves are *Near Normal* with several areas, particularly in the east, reporting *Well Above Normal* to *Extreme Surplus*. In the Northern Region most of the area is *Near Normal* grading to *Well Above Normal* in the northern and eastern locations, with some areas in the *Extreme Surplus* category. Notable exceptions can be found in several small pockets widely scattered through the region where soil moisture reserves are *Below Normal*. In the Peace Region, much of the east and central locations have *Well Below Normal* soil moisture reserves, with one area in the M.D of Big Lakes reporting *Extreme Deficit*. However, in this region soil moisture reserves are typically high (Figure 9) so there remains no immediate need for precipitation with respect to crop growth.

It is important to point out that given extreme rainfall along the foothills, one would assume that *Extreme Surplus*es should show up on Figure 8, in these areas, and indeed *Extreme Surplus*es likely exist as most of the soils in these regions are at or near saturation. The modeling process currently being used assumes that field capacity is attained in one day and any excess soil moisture above field capacity is rapidly lost to deep drainage. In reality when extreme quantities of rainfall occur, which have over much of the foothills, it is difficult to account for subsurface lateral flow across saturated landscapes as surface seeps, relatively shallow impermeable layers and a host of other factors come into play as soil water is redistributed. In addition, the foothills areas in this region are typically near field capacity at this time of year (Figure 9), thus when soil moisture deficits are computed by subtracting current soil moisture levels that are estimated to be field capacity, from a 30-year normal that is near field, only marginal surpluses will appear to emerge.

Explanation of Terms

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 supplies 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. 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.

Snow pack (reported during the winter season only)

Snow pack snow water equivalents (SPWE) are modeled for stubble fields. SPWE is defined as the equivalent depth of water (mm) that the snow pack contains if it were to be melted. SPWE is computed from precipitation and subsequent losses due to blowing, sublimation and snow melt processes.

In the model, if precipitation falls when the mean daily temperature is below 2°C that precipitation is estimated to be in the form of snow. If precipitation if estimated to fall as snow then to simulate drifting, only 70% of the total precipitation is allowed to accumulate resulting in a 30% loss due to snow "blow off". If precipitation occurs as rain on an existing snow pack, it is added directly to the snow pack as SPWE.

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 precipitation. Soil moisture is a valuable indicator of drought potential because it indicates 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 peak water use 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 during the frost-free season. Below average soil moisture levels, at any time, indicate a need for more precipitation 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.

Soil moisture needed to return to average spring or fall conditions

Soil moisture needed to return to normal spring or fall conditions is computed by subtracting normal soil moisture (spring or fall), computed using the 1971-2000 period, from current soil moisture conditions. This yields the amount of recharge needed to bring current soil moisture levels to average. Historic model runs are then analyzed to determine how many years during the 1971-2000 period that soil moisture recharge was similar to or greater than that currently needed. The number of years that this occurred is then used to compute the probability of returning to normal. However, the process is currently unable to account for snow currently existing on the ground and as such is not accurate where snow packs exist.

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This report was created on June 27, 2005.
Drought analysis is currently scheduled at monthly intervals between October 30 and May 1. This report updates the previous report of June 07, 2005.

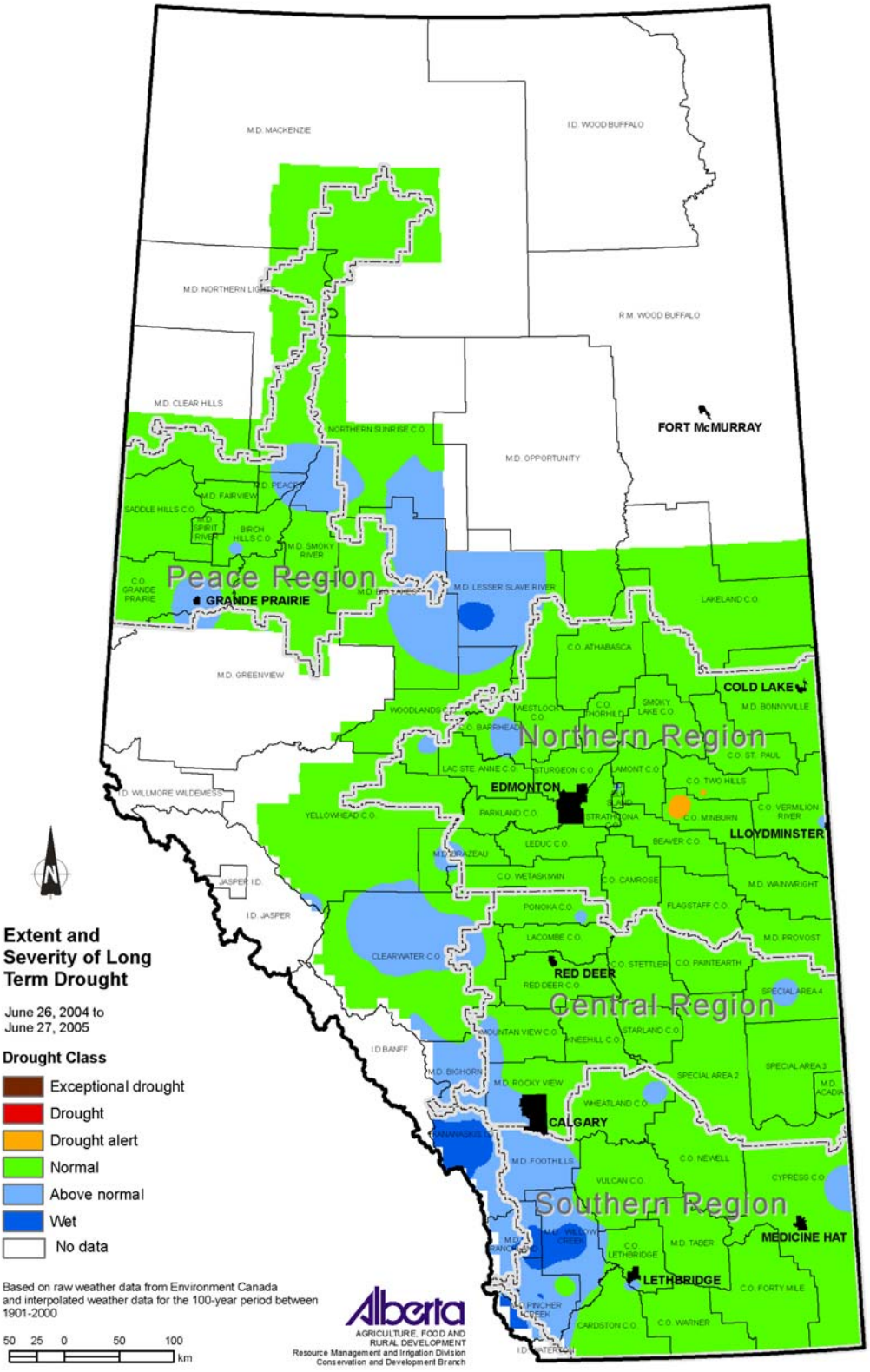

Figure 1. Extent and severity of long-term drought in the agricultural region of Alberta, as of June 27, 2005.

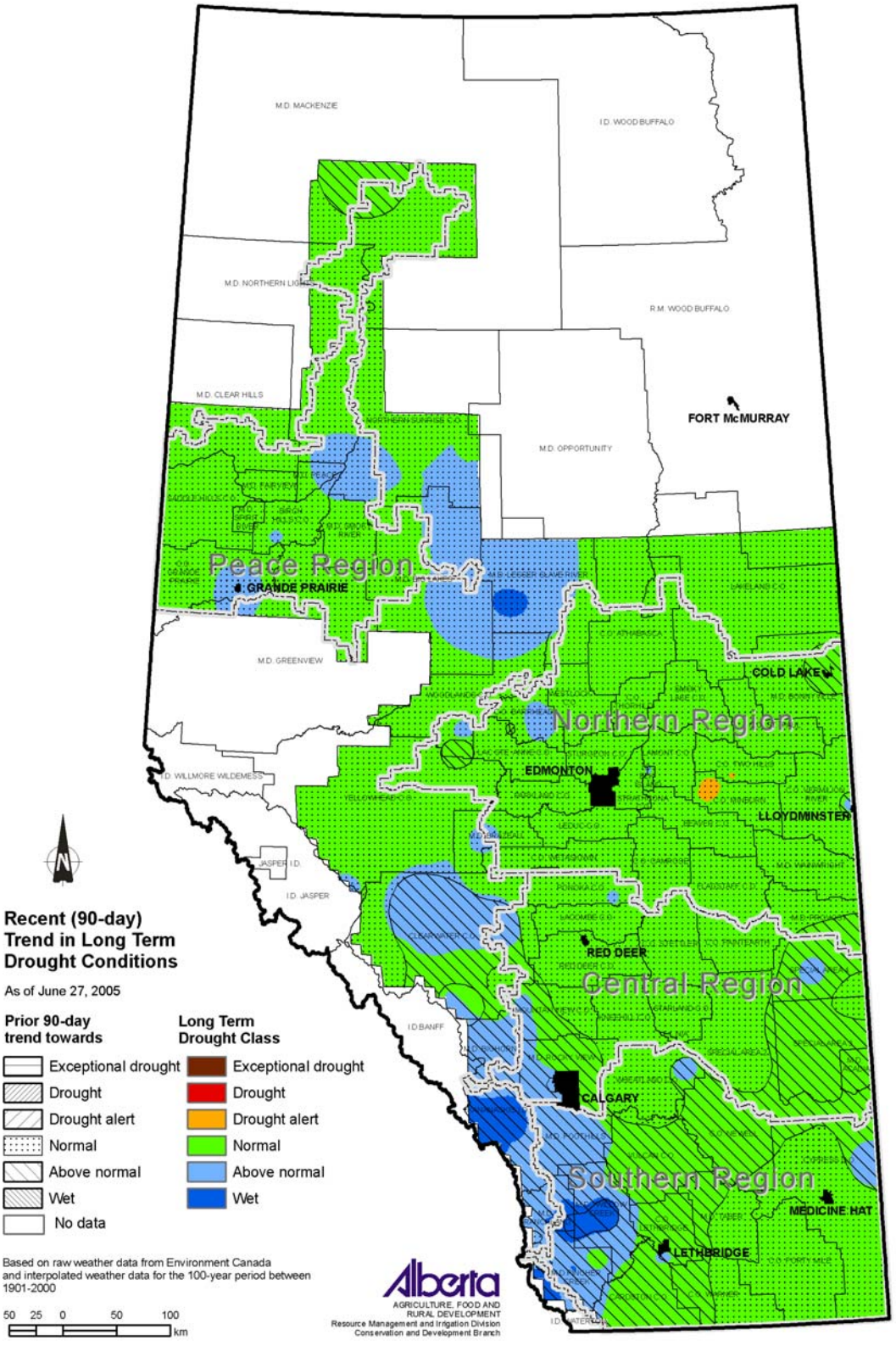

Figure 2. Recent (90-day) trend in drought conditions for the agricultural region of Alberta, as of June 27, 2005.

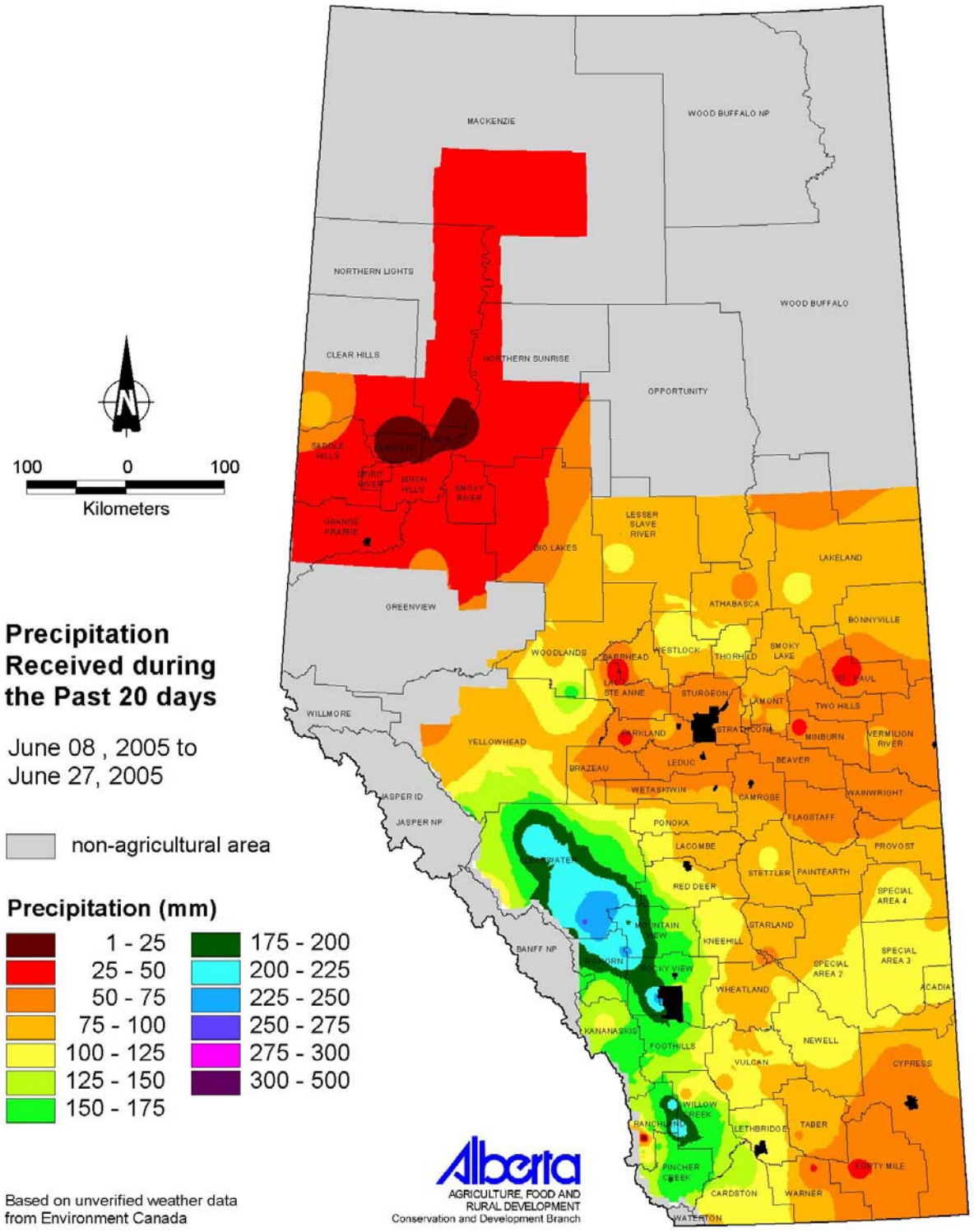

Figure 3. Precipitation (mm), since the June 07, 2005 Drought Report, in the agricultural region of Alberta as of June 27, 2005

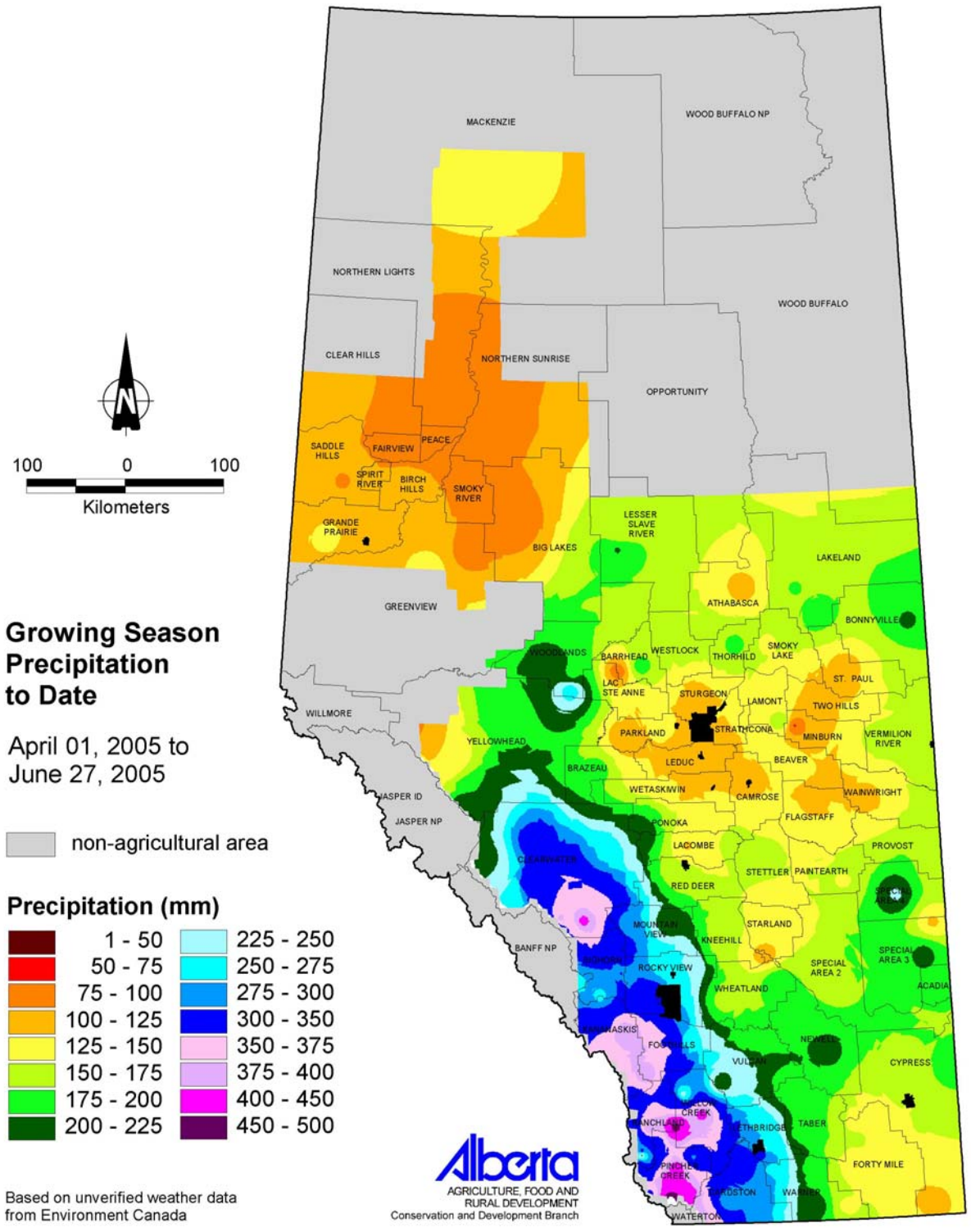

Figure 4. Precipitation (mm), received as of June 27, 2005, since the start of the growing season in the agricultural region of Alberta.

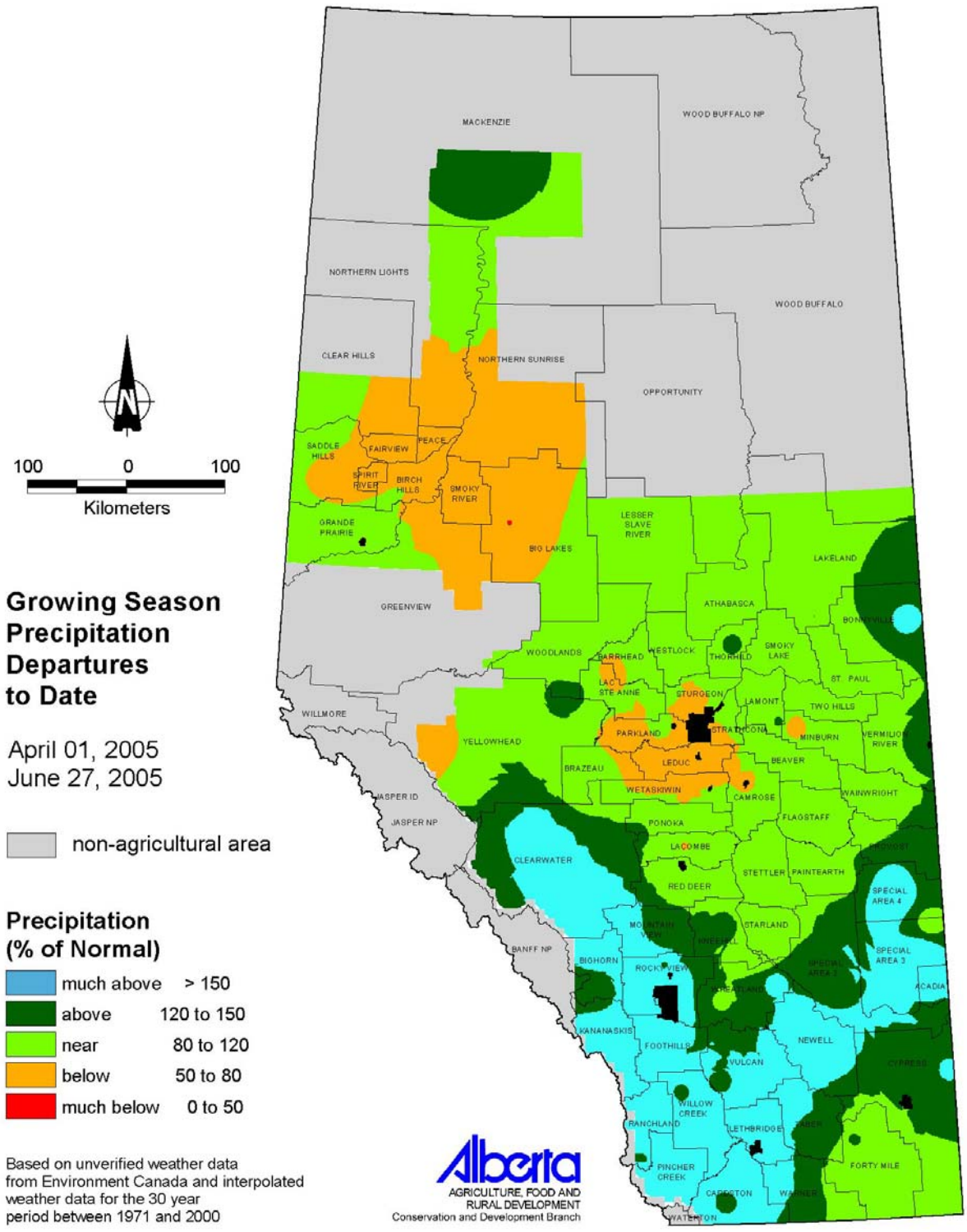

Figure 5. Percent of Normal Precipitation (mm), received as of June 27, 2005, since the start of the growing season in the agricultural region of Alberta.

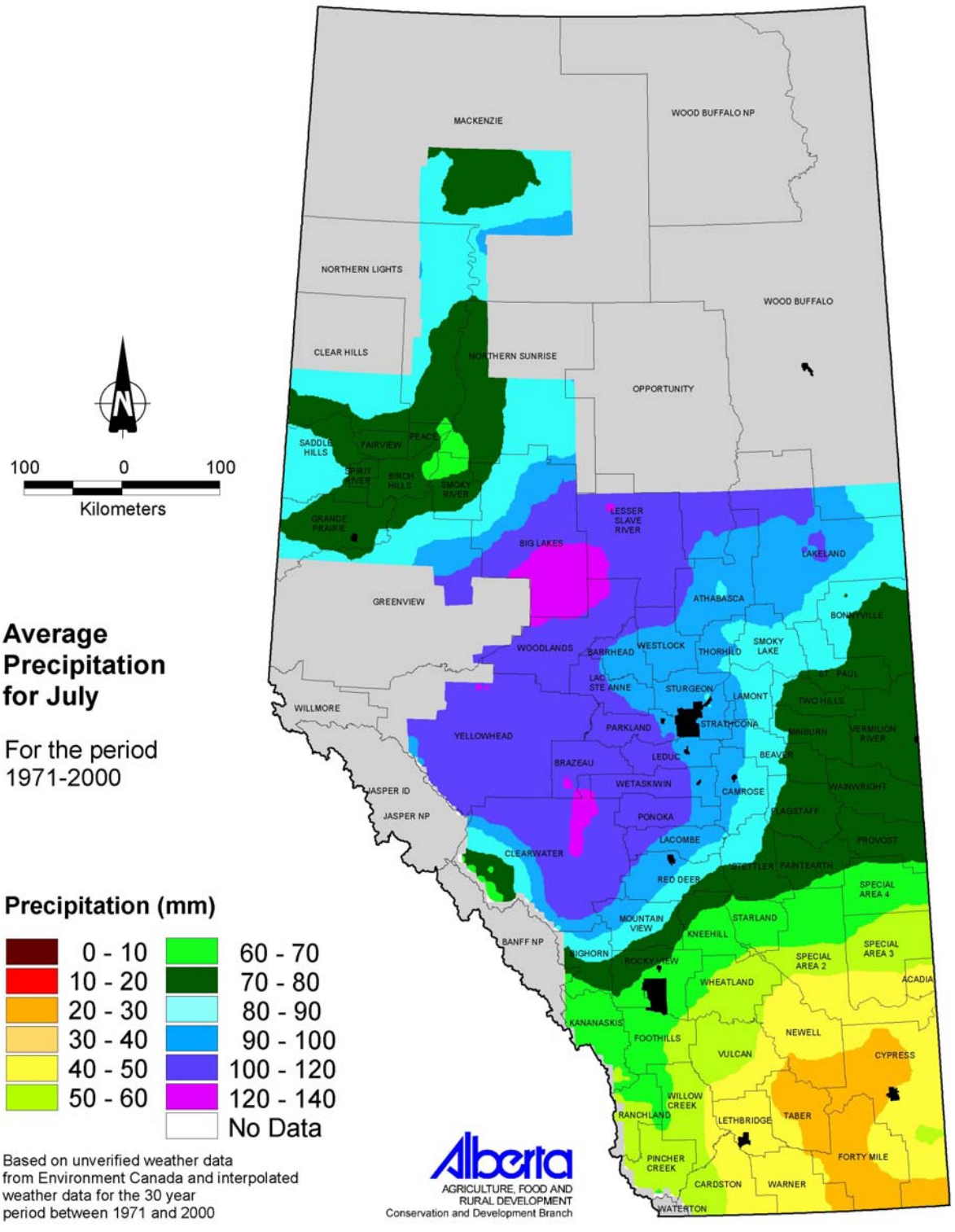

Figure 6. Average (1971-2000) precipitation for July in the agricultural region of Alberta.

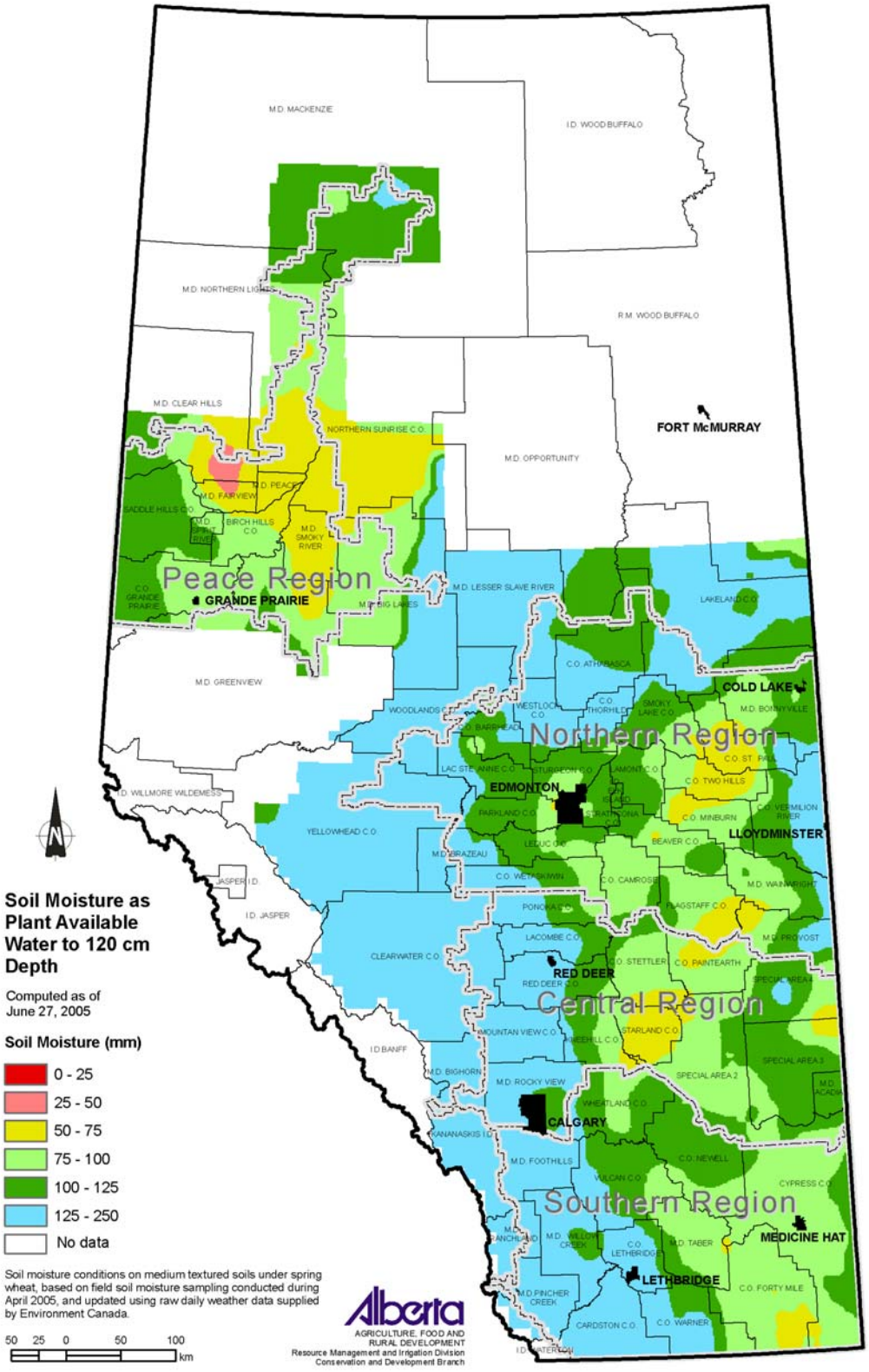

Figure 7. Soil moisture in the agricultural region of Alberta as of June 27, 2005.

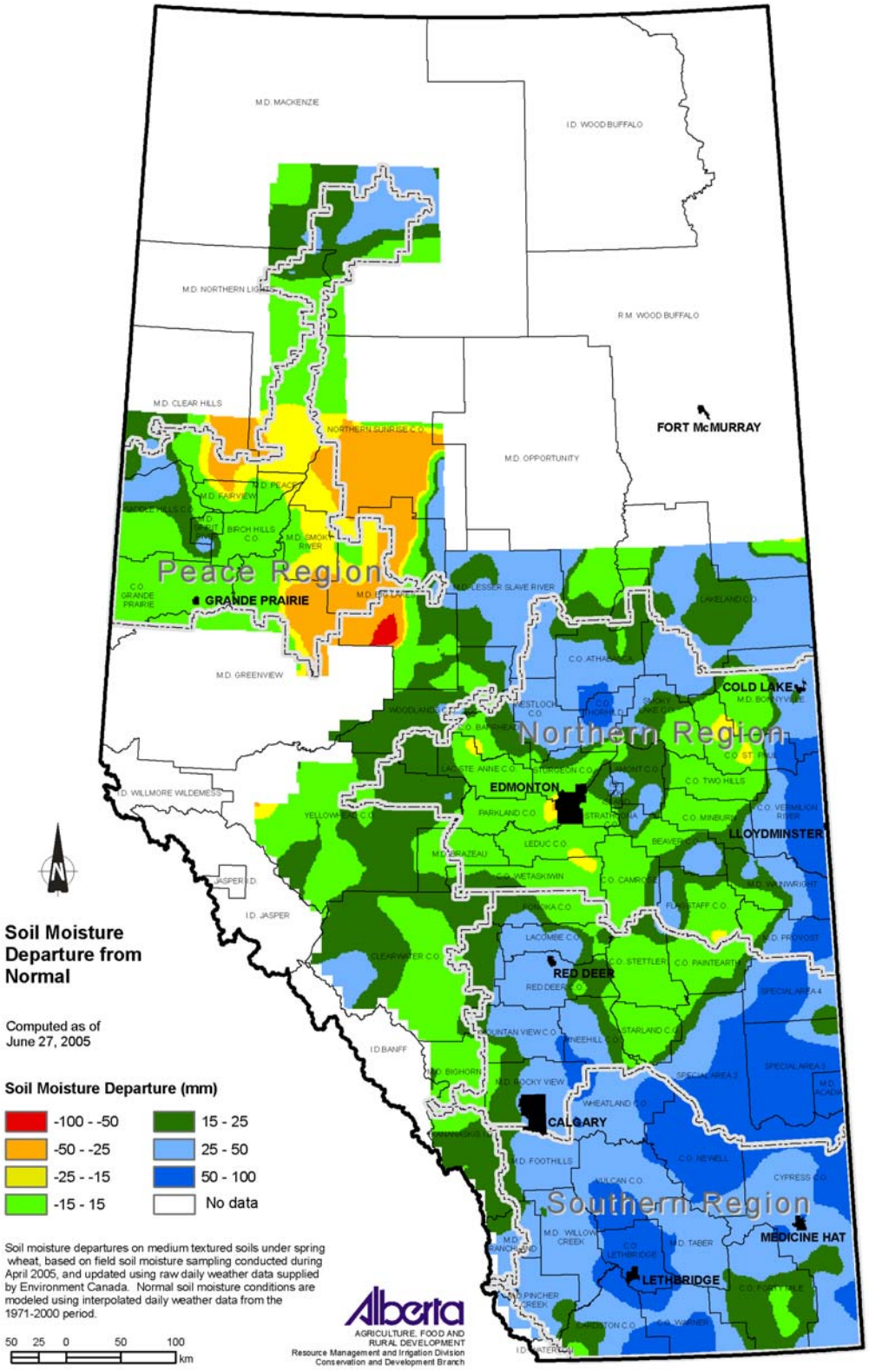

Figure 8. Soil moisture departure from the 30-year average (1971-2000) modeled soil moisture in the agricultural region of Alberta for June 27, 2005.

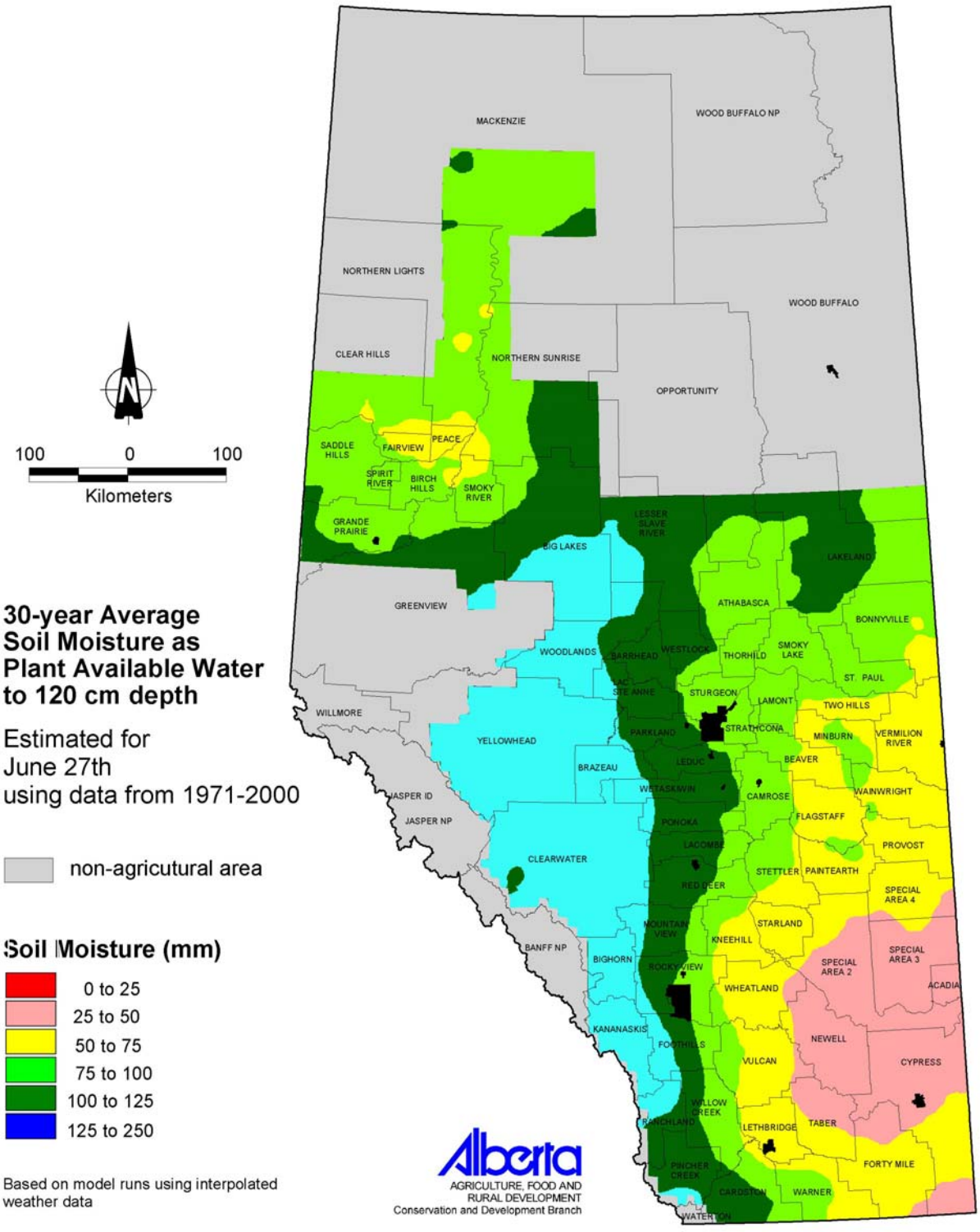

Figure 9. Modeled 30- year average soil moisture conditions for June 27.