Drought Report for the Agricultural Region of Alberta
October 31, 2009

Summary

Since the September 20, 2009 report, precipitation accumulations across the Northern and the Central Regions varied from 20 to 40 mm, with the exception of few isolated pockets in the range of 10 to 20 mm. Most of the Peace and Southern regions recorded precipitation in the range of 40 to 70 mm, with some areas ranging receiving between 20 to 30 mm and others recording above 100 mm. In general, for this period, most of the reporting area recorded at least near normal precipitation accumulations, with some isolated pockets of *high* and *very high* accumulations found in the Southern and Peace Regions (Figure 1). However, areas that currently have *low* to *extremely low* soil moisture reserves will require well above average precipitation between now and the spring to replenish the soil moisture reserves to near normal levels.

Average daily mean temperatures during the past 15-days, relative to the long-term-normal, were at least near normal across the reporting area, with the exception of the northern tip of the Peace Region where they were *moderately high* (Figure 2)

Growing season (April 1, 2009 to Sept 30, 2009) precipitation totals relative to long-term-normal across most parts of the Northern Region and parts of the Central and Peace Regions ranged from *very low* to extremely *low,* with some pockets of *low* to *moderately low* accumulations. In contrast, across the Southern Region, precipitation relative to long-term-normal varied from *near normal* to *moderately low* with some isolated pockets of *low* and *very low*. (Figure and 4).

Cold season (October 1, 2009 to March 31, 2009) precipitation accumulations relative to long-term-normal, to date, across most of the Peace and the Southern Regions as well as in the northern parts of the Northern Region were *high*, with a few pockets of *very high* and *near normal* accumulations. The rest of the reporting area recoded at least *near normal* accumulations (Figure 5).

Modeled soil moisture reserves, relative to long-term-normal (Figure 7 and 8) across most parts of the Northern Region, the western parts of the Central Region, the southwestern parts of the Peace Region and few isolated pockets in the Southern Region varied from *very low* to *extremely low* (less than 25 mm). Reserves across the rest of the reporting area graded up from *low* to *moderately low,* and *near normal*, with few pockets in the Southern Region classified as *moderately high*. The probability that reserves will replenish this fall diminishing rapidly each day as soils begin to freeze and further precipitation is likely to fall as snow. Areas where soil moisture reserves are classified as *very low* and *extremely low* will need well above average snowfall and well above average spring precipitation accumulations to bring return reserves to near normal. As it stands now, these areas are likely to by highly susceptible to drought next year.

A large selection of related maps can be found at http://www.agric.gov.ab.ca/acis, under the Quick Viewer tab. Note these maps are updated once a week (usually by Wednesday) providing updates between drought reports.

Precipitation

Precipitation since the September 20, 2009 Drought Report (Figure 1)

Since the last report, precipitation accumulations across most parts of the Northern and Central Region varied from 20 to 40 mm, with some isolated pockets having received 10 to 20 mm. In contrast, precipitation across the Southern and the Peace Regions varied, from 40 to 70 mm, with a few pockets in the 20 to 30 mm range. Overall, most of the reporting area recorded at least *near normal* precipitation since the last report, with some isolated pockets in the Southern and Peace Regions having received *high* to *very high* accumulations relative to normal over this time frame.

Peace Region: Precipitation accumulations ranged from 50 to 60 mm in the central north, west and southeastern portions of the region to 30 to 40 mm across the central and southeastern portions of the region and from 20 to 30 mm across the north. Precipitation accumulations were the greatest at the Spirit River Auto station (59.4 mm), followed by Cleardale AGDM station (57.6 mm), both in southwest, and the lowest accumulations were recorded at High Level A station (24.5 mm), followed by Fort Vermillion RS station (29.5 mm) both located in the northern corner of the region.

Northern Region: Precipitation accumulations ranged from 30 to 40 mm across the northern portions of the region to 20 to 30 mm across the rest of the region, with the exception of few isolated pockets in the 10 to 20 mm and the 20 to 30 mm range. The highest accumulation in the region was recorded at Lloydminster A station (43.4 mm) in the east, followed by Athabasca AGCM station (41.4 mm) in the north, and the lowest accumulations were recorded at Paddle River Headwaters station (3.9 mm) in the west, followed by Bodo AGDM station (17.2 mm) in the southeast corner of the region.

Central Region: Precipitation totals ranged from 30 to 40 mm across the central, northwest and southeastern portions of the region, to 20 to 30 mm range across the rest of the region, with the exception of few isolated pockets in 40 to 50 mm range. The highest precipitation in the region was recorded at Battle River Headwaters (48.6 mm), followed by Leedale AEDM station (48.6 mm), both in the northwest, while the lowest was recorded at Linden AGCM station (15.3 mm), followed by Olds College AGDM station (17.8 mm), both in west.

Southern Region: Precipitation totals ranged from20 to 30 mm in the central north, up to 30 to 40 mm along most parts of the northern, central-east and southeastern portions of the region and up to 40 to 70 mm across the eastern and western portions of the region with a few pockets recording above 100 mm. Precipitation accumulations were the greatest at Porcupine Lookout station, (127 mm), followed by Beauvais station (122.7 mm), both located in the west, while the lowest accumulations were recorded at Gleichen AGCM station (20.1 mm) in the north, followed by Onefour CDA station (26.2 mm) located in the southeast.

Growing Season Precipitation Accumulations, April 1 to September 30, 2009 (Figure 3 and 4)

Growing season precipitation total relative to long-term-normal across most parts of the Northern Region and parts of the Central and Peace Regions ranged from *very low* to extremely *low* with some pockets of *low* and *moderately low* accumulation, representing the driest areas in the agricultural regions. In contrast, across the Southern Region precipitation accumulations relative to long-term-normal, varied from *near normal* to *moderately low* with some isolated pockets classified as low to *very low*.

Peace Region: Growing season accumulations relative to long-term-normal varied from (200 to 250 mm), across the southwestern and northern parts of the region to *very low* and *extremely low* (100 to 200 mm) across most of the central and southeastern portions of the region. The growing season totals across much of the region were 50 to 80 percent of the normal, with the exception of pockets in the central east that received 25 to 50 percent of normal.

Northern Region: Growing season precipitation relative to long-term-normal varied from *moderately low* to *low* (200 to 350 mm) in the western and northwestern portions of the region, with the rest of the region having *very low* to *extremely low* accumulations (100 to 200 mm). For most of the region growing season precipitation ranged from 50 to 80 percent of normal, with the exception of the central and south-central portions of the region where only 25 to 50 percent of normal precipitation fell.

Central Region: Growing season precipitation relative to long-term normal across the western and the northeastern portions the region varied from *very low* to *extremely low* (100 to 200 mm), grading up to *low* and *moderately low* (200 to 250 mm) in the central and southeastern portions of the region. The growing season totals for most parts of the region were 50 to 80 percent of normal, with the exception of pockets in the west and northeastern parts of the region, where only 25 to 50 percent of the normal precipitation fell.

Southern Region: Growing season precipitation relative to long-term-normal across the region varied from *near normal* and *high* (200 to 450 mm) to *moderately low*, *low* and *very low* (150 to 200 mm). Growing season totals as percentage of the normal varied from 80 to 120 percent, of normal across about 60percent of the region, with the remaining areas receiving 50 to 80 percent of normal precipitation.

Cold Season Precipitation Accumulations relative to Long-term-normal (1961 - 2005) (Figure 5)

Cold Season precipitation (October 1 to March 31) accumulations relative to long-term-normal, to date, across most of the Peace Region, the northern parts of the Northern Region, pockets in the Central Region and most of the Southern Regions were at least *near normal*. Accumulations across the rest of the reporting area varied from *near normal to moderately high.*

Peace Region: Cold season precipitation accumulations across most of the Peace Region are at least *high* with the exception of few pockets classified as having *moderately high* to *near normal* accumulations.

Northern Region: Cold season precipitation accumulations in the region graded from *high* in the northern and eastern parts of the region, to *near normal* and *moderately high* accumulations across the rest of the region.

Central Region: Cold season precipitation accumulations in the region graded up from *near normal* to *moderately high* in the north, to *high* and *very high* across the south.

Southern Region: Cold season precipitation accumulations across most of the region were at least *high*, with the exception of few isolated pockets of *near normal to moderately high* accumulations.

Average Precipitation Accumulations for November (Figure 6)

Across the reporting area, on average only about 4.3 percent of the annual precipitation falls in November. During this month, average precipitation ranges from 10 to 20 mm across the eastern-half of the reporting area, grading up to 40 to 50 mm in the foothills in the southwestern corner of the Southern Region, and up to 20 to 30 mm in the northwest corner of the Central

Region and the western parts of the Northern Region. Across the Peace Region, on average 20 to 30 mm of precipitation falls during the month of November.

Soil moisture in the agricultural regions of Alberta (Figure 7 and 8)

Modeled soil moisture reserves, relative to long-term-normal across most parts of the Northern Region, the western parts of the Central Region, the southwestern parts of the Peace Region and also in a few isolated pockets in the Southern Region varied from *very low* to *extremely low* (less than 25 mm). Reserves across the rest of the reporting area varied from *low* to *moderately low* and *near normal*, with few pockets in the Southern Region classified as *moderately high*.

Peace Region: Modeled soil moisture levels were in the 25 to 50 mm range across most parts of the region, with the exception of few pockets in southwestern and central portions of the region, where reserves are estimated to be below 25 mm. Soil moisture reserves, relative to long-term normal, varied from *moderately low* and *low* in the central and northern portions of the region to *very low* and *extremely low* in the south.

Northern Region: Modeled soil moisture levels across most of the region were less than 25 mm. Soil moisture reserves, relative to long-term normal, varied from *moderately low* and *low* in the western, northwestern and the eastern portions of the region to *very low* and *extremely low* across the rest of the region. The Northern Region is clearly the driest region in the reporting area.

Central Region: Modeled soil moisture levels across most of the region were less than 25 mm with the exception of areas along the extreme western boarder where reserves were in 50 to 75 mm range. Relative to long-term-normal, soil moisture reserves across the region were *extremely low* to *low*, in the west, grading up to *moderately low* and to *near normal* across the eastern parts of the region.

Southern Region: Modeled soil moisture levels across most of the region were in the 25 to 50 mm range with the exception of highs of 50 to 100 mm along the foothills and lows of less than 25 mm in isolated pockets in the plains. Relative to long-term-normal, soil moisture reserves across most of the region are at least *near normal* with the exception of few pockets confined mainly to the northwestern corner of the region, classified as having *moderately low* to *low* reserves.

Data Sources:

Near Real Time Weather data

Daily and hourly near-real-time raw weather data is brought in via daily data feeds from Alberta Environment (AENV) and Environment Canada (EC). The data undergoes a preliminary computer assisted QA/QC check performed by Alberta Agriculture and Rural Development (ARD) staff. Suspicious values are checked and verified and daily missing values are filled using archived data from AENV databases or from the EC web site. If daily data is still missing, it is estimated using data from nearby stations. Maps describing current conditions are based on preliminary data that is subject to change under further review by ARD, AENV and EC.

Historical Weather data

Historical weather data was provided by Environment Canada. This data was then converted to a 10 km daily gridded weather data set that used all available daily data to generate historical climate and soil moisture normal.

Explanation of Terms

Precipitation Accumulation - Frequency of Occurrence

Precipitation accumulation, expressed as a frequency of occurrence are computed for various periods and can be found on our web site at www.agric.gov.ab.ca\acis, under the Quick Viewer tab. Maps are routinely produced for the following periods:

- Past 365-days
- Past 180-days,
- Past 90-days
- Past 30-days,
- Growing season to date –Starting April 1st
- Cold Season to date- Starting October 1st

Selected maps from this series are included in this report.

Precipitation accumulation for each period is then determined by ranking the precipitation accumulation during similar period dating back from 1961 to present. The current accumulation is compared to the ranked values, yielding the frequency of occurrence, based on percentiles. The percentile points were then put into arbitrary but intuitive classification fields that describe the current state as drier, near or wetter than the long-term-normal. The resulting map thus answers the question "how often does this occur?" The classifications are as follows:

Extremely low.....drier than this, on average, less than 1 once in 25-years
very low.....drier than this, on average, less than 1 once in 12-years
low.....drier than this, on average, less than 1 once in 6-years
moderately low.....drier than this, on average, less than 1 once in 3-years
near normal.....on average, this occurs at least 1 in 3-years
moderately high .....wetter than this, on average, less than 1 once in 3-years
high .....wetter than this, on average, less than 1 once in 6-years
very high.....wetter than this, on average, less than 1 once in 12-years
extremely high..... wetter than this, on average, less than 1 once in 25-years

This same scheme is then used for similar maps of soil moisture and snow pack accumulation so that comparisons can readily be made across the various map types.

Snow pack (reported during the winter season only)
Snow pack snow water equivalents (SWE) are modeled for stubble fields. SWE is defined as the equivalent depth of water (mm) that the snow pack contains if it were to be melted. SWE 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 percent of the total precipitation is allowed to accumulate resulting in a 30 percent 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 SWE.

Soil moisture (reported during the growing season months only)
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 reported on from May through to October.

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. Poor 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. Current soil moisture levels are compared against soil moisture levels for the same day in each year from 1961 to present. The frequency of occurrence is computed based on the percentile points, using the same method that was used for similar maps that were generated for precipitation. The frequency of occurrence is then plotted using the same class scheme as is used in the long-term (hydrologic) drought map (see table above). Soil moisture reserves with a modifier of *low*, indicate a need for more precipitation to restore reserves.

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 average soil moisture (spring or fall), computed using model runs dating back from 1961 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 since 1961 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 average. However, currently this process is unable to account for snow currently existing on the ground and as such is not as accurate where snow packs exist.

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This report was created on October 31, 2009.
Drought analysis is currently scheduled at monthly intervals.
This report updates the previous report of September 20, 2009.

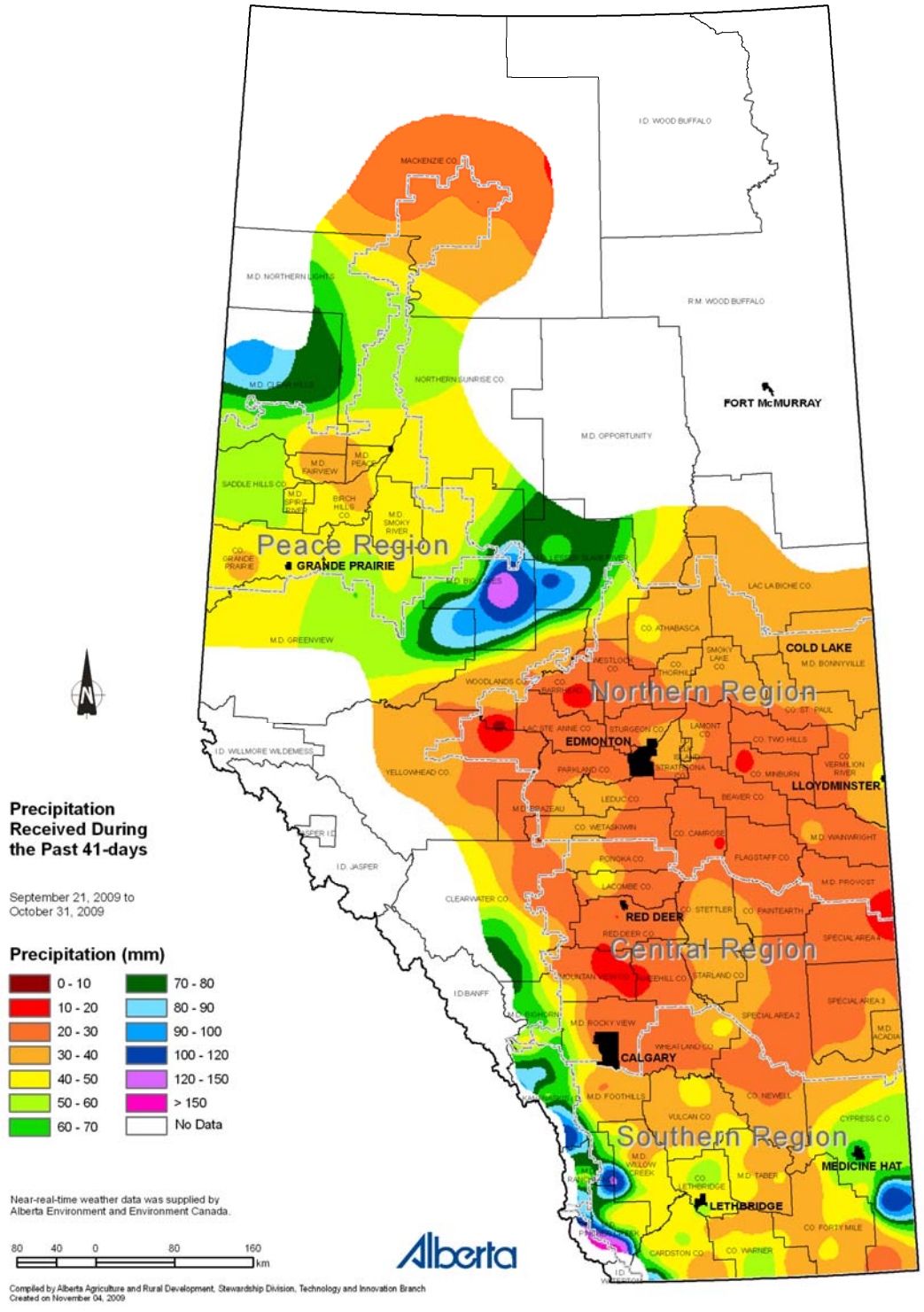

Figure 1. Precipitation (mm) received since the September 20, 2009 Drought Report, as of October 31, 2009.

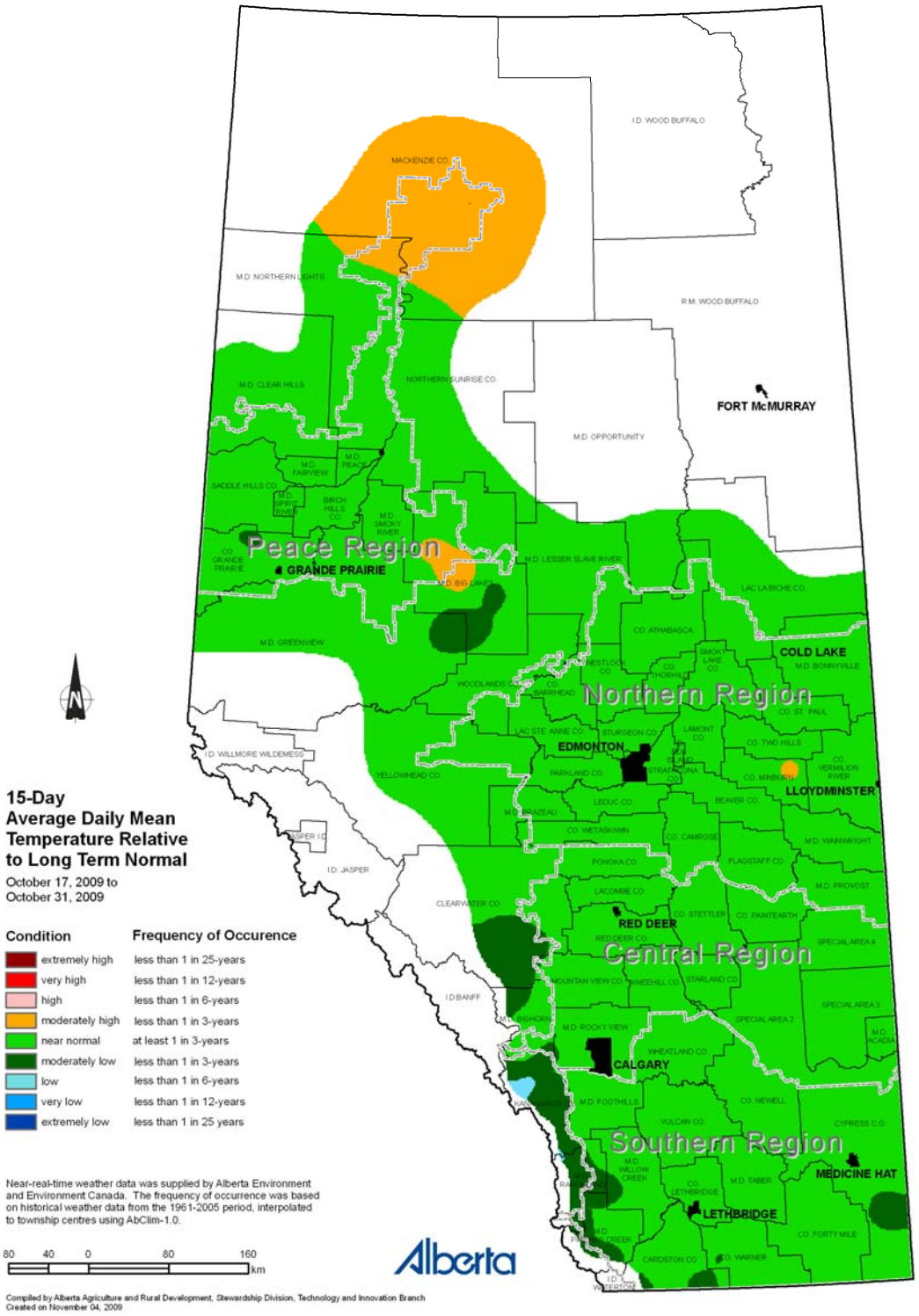

Figure 2. 15-day average daily mean temperature trend, relative to long-term normal, prior to October 31, 2009.

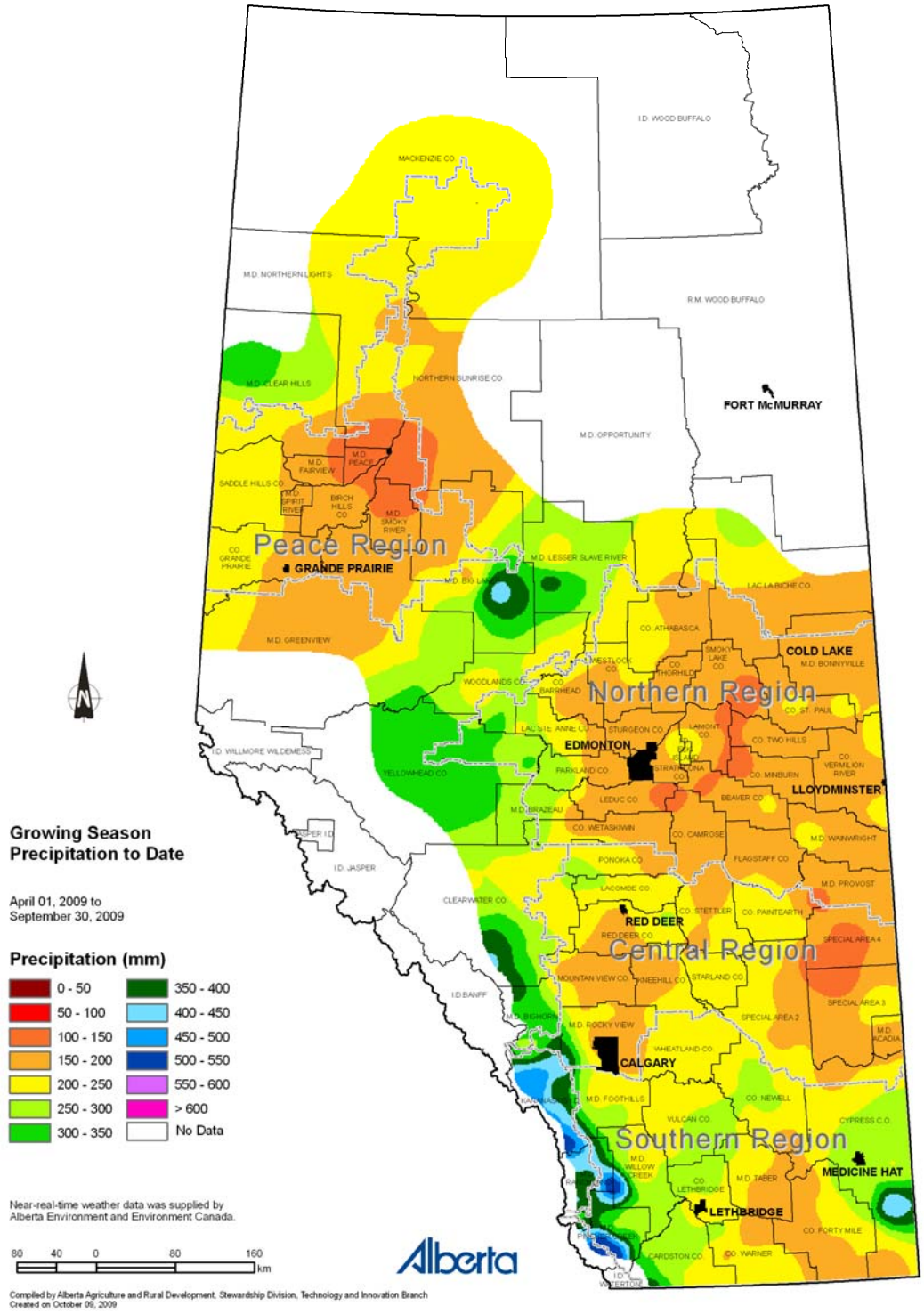

Figure 3. 2009 Growing Season precipitation accumulations (April 1 to September 30, 2009).

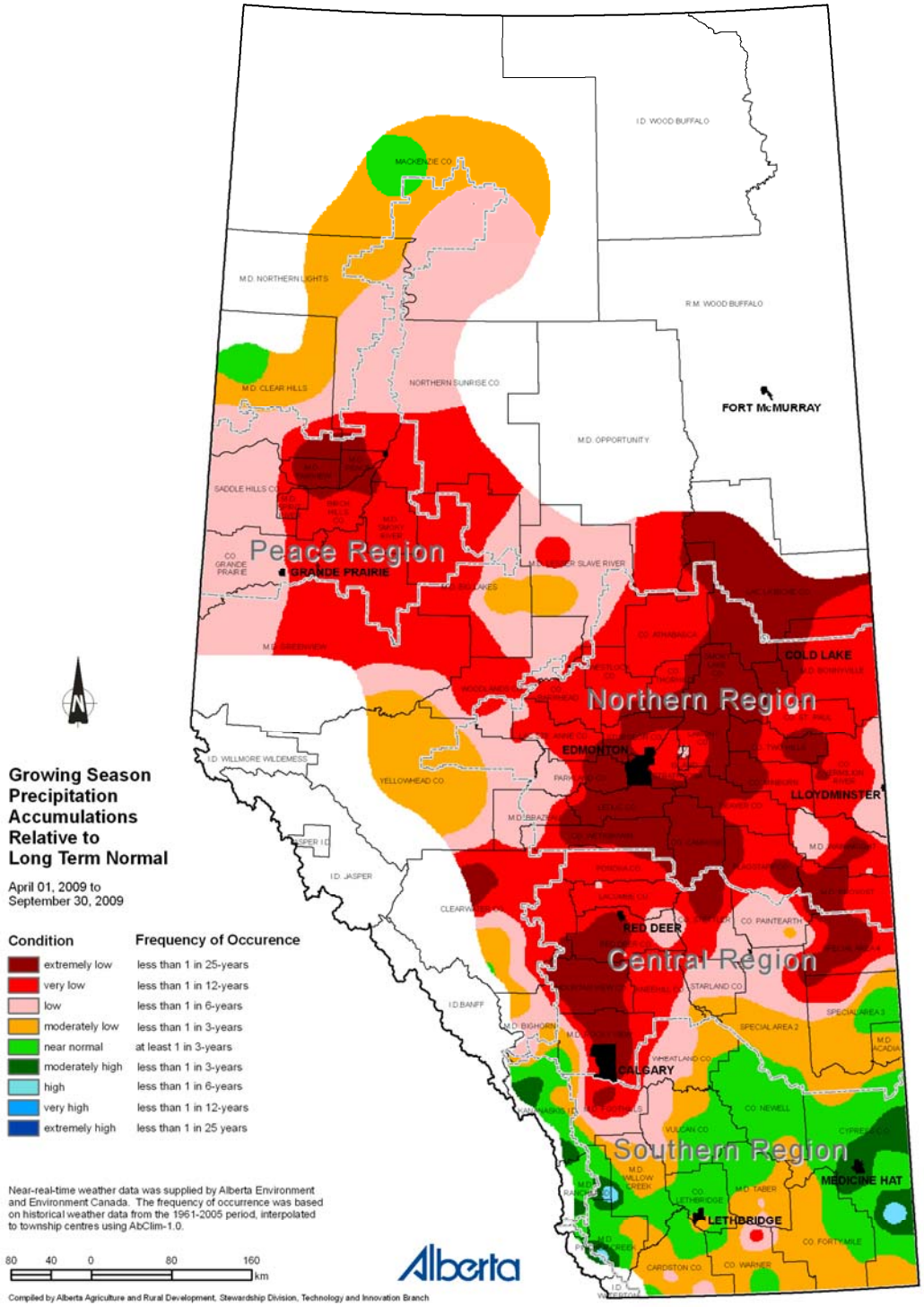

Figure 4. 2009 Growing Season precipitation accumulations, relative to long-term-normal (April 1 to September 30, 2009)

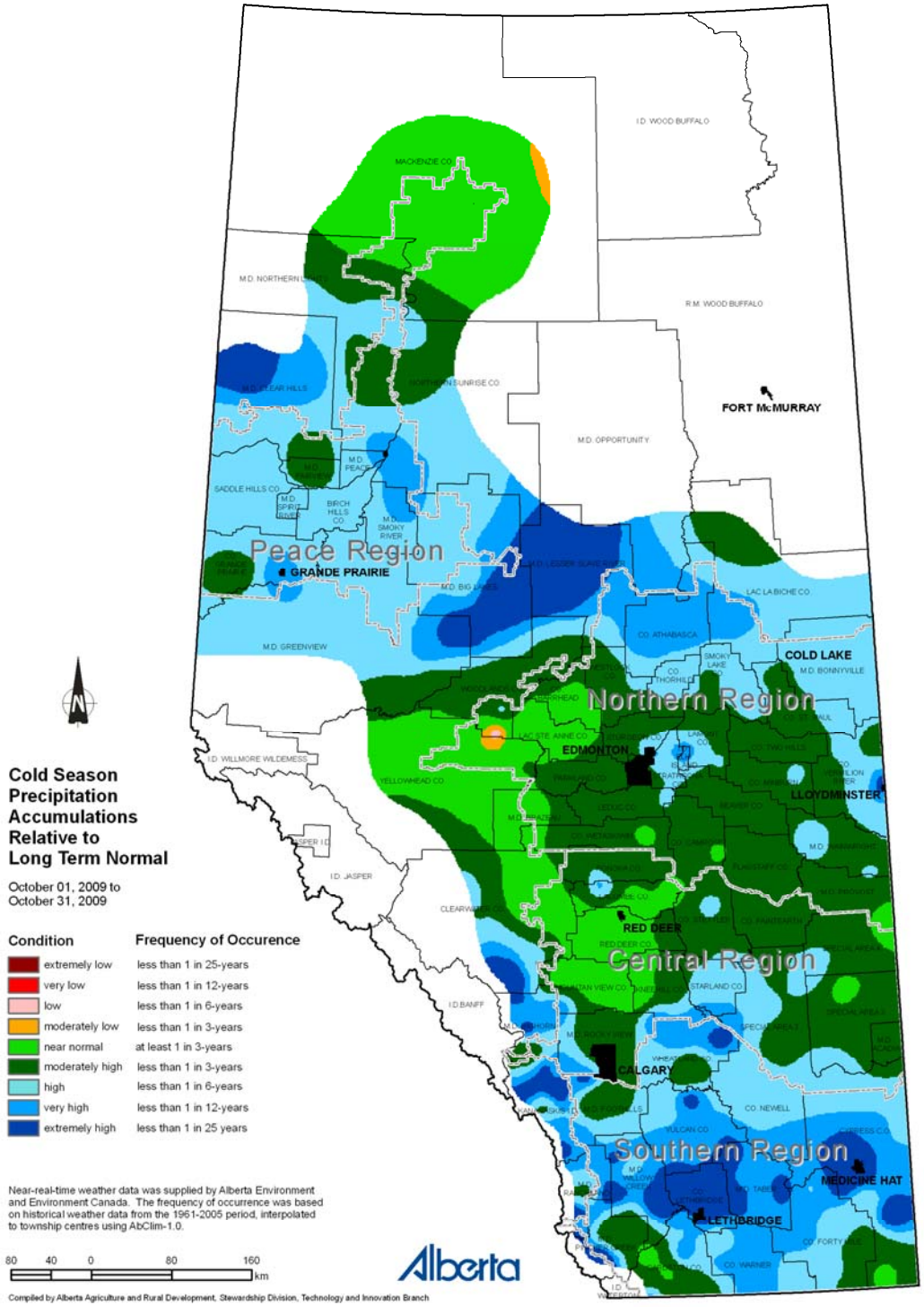

Figure 5. Cold Season precipitation accumulations to date, relative to long-term-normal, as of October 31, 2009.

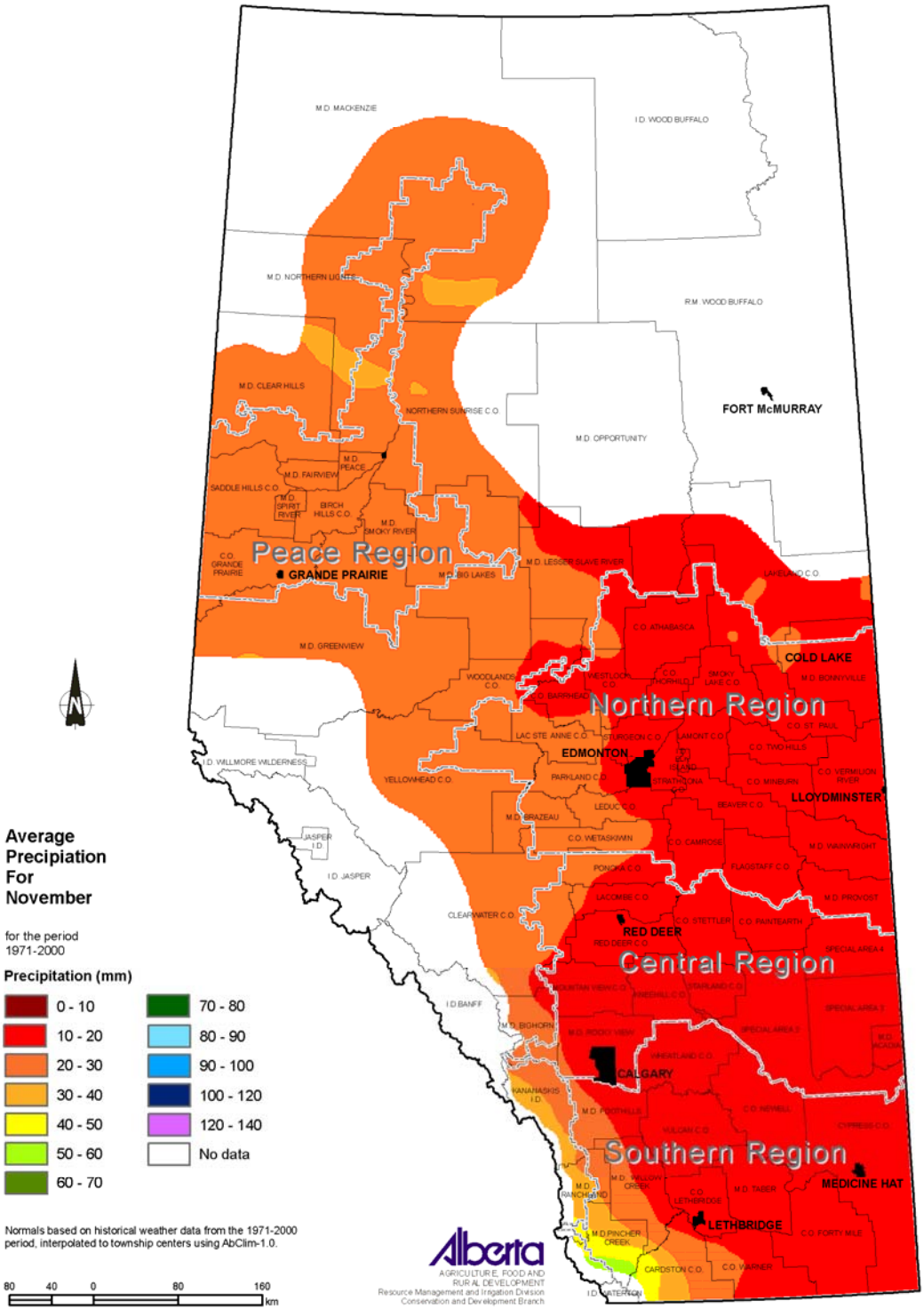

Figure 6. Average (1971-2000) precipitation for November.

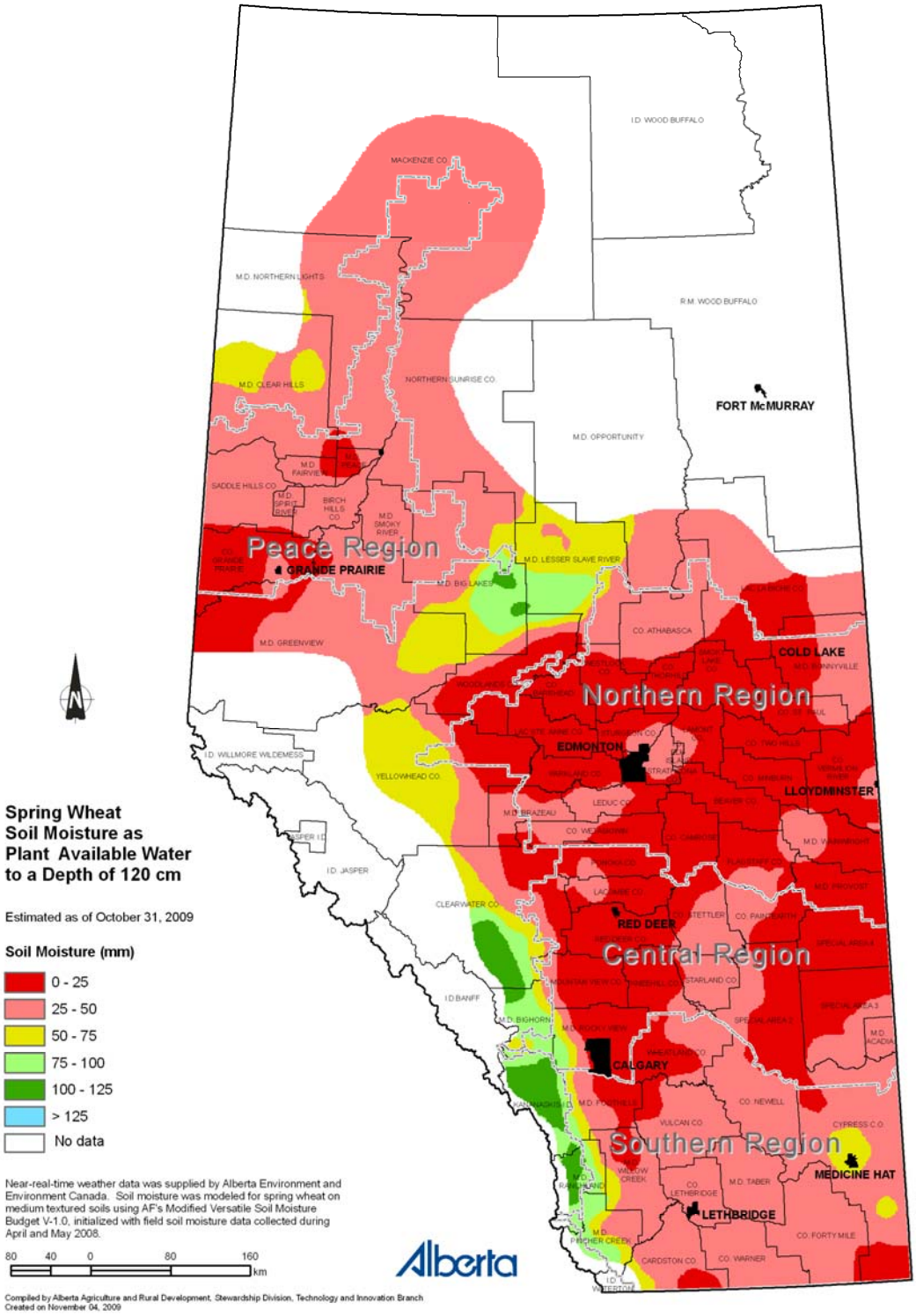

Figure 7. Modeled soil moisture in the agricultural region of Alberta, as of October 31, 2009.

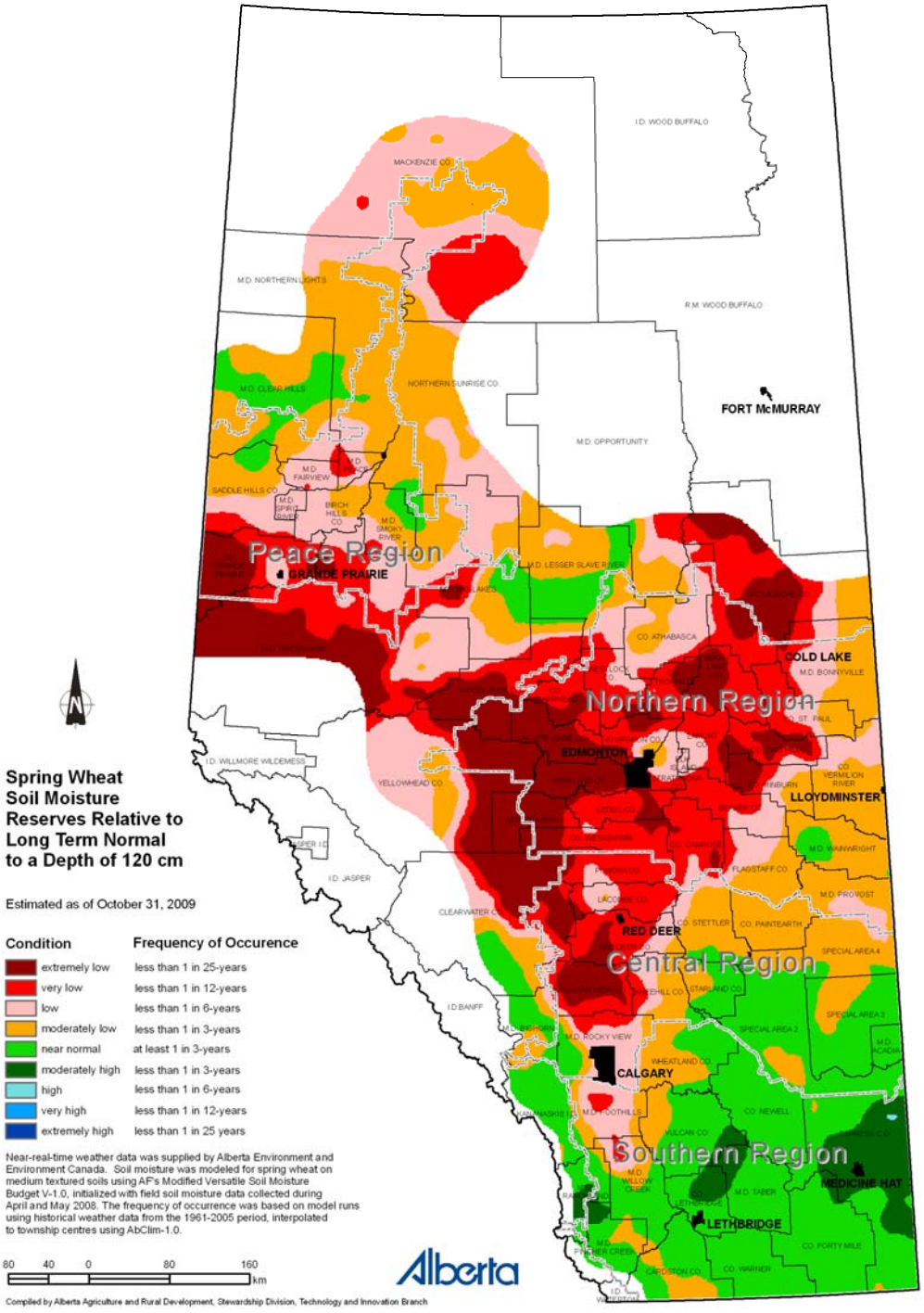

Figure 8. Soil moisture reserves relative to long-term-normal soil moisture conditions for October 31, 2009.