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

Summary

Since the last drought report (November 30, 2009) at least *near normal* precipitation accumulations in the range of 15 to 25 mm were recorded over much of the western half of the Northern and Central Regions, most part of the Southern Region and the southern portion of the Peace Region. Few isolated pockets in the Southern and Central Regions recorded precipitation up to 50 mm. Precipitation accumulations relative to the long term normal in the rest of the reporting area varied from *moderately low* to *low* ranging from 5 to 15 mm (Figure 1).

December 2009 monthly average daily mean temperatures across the plains and southern portion of the Peace Region varied from 4 to 8 °C below the long term average. The rest of the reporting area recorded 2 to 0 °C below the long term average (Figure 2).

Cold Season precipitation (Oct 1 to March 31) accumulations relative to long term normal, to date, across most of the reporting area have been at least *near normal*, with the exception of isolated pockets of *moderately low* accumulations, where two of the larger pockets graded to low/very low accumulations (Figure 3).

Modeled snow pack accumulations to date in the Peace Region graded from at least *near normal* accumulation (30 to 50 mm) in the south and central western portion the region to *low* accumulation (10 to 20 mm range) in the eastern and northern portions of the region; however, accumulation in the south eastern portion of the Peace Region was less than 10 mm. Similarly, snow pack accumulations across the Northern and Central Regions generally graded from at least *near normal* condition (10 to 30 mm) in the west to *low* in the east including two isolated pockets of very low accumulation (less than 10 mm). Snow pack accumulations in most of the Southern Region were at least near normal (10 to 30 mm), with the exception of two isolated pockets of *moderately low* accumulations in the west (Figure 5 & 6).

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 since the November 30, 2009 Drought Report (Figure 1)

Since the last drought report (November 30, 2009) precipitation accumulations relative to long term normal across most of the Southern Region, the western part of the Central and Northern Regions, as well as the southern corner of the Peace Region were at least *near normal* grading to *moderately low* to *low* accumulation in the rest of the reporting area.

Peace Region: Precipitation accumulation across the region graded from 15 to 20 mm range in the southwest to 5 to 10 mm range in central and most of the northern portion of the region. The highest precipitation accumulations were recorded at Beaverlodge RCS station (21.0 mm), followed by Grand Prairie stations (19.1 mm) both located in the southwest, while the lowest accumulations was recorded at Peavine station (6.2 mm) in southeast. Precipitation accumulations, relative to long-term-normal graded from near *normal* in the southwest corner of the region, to *low* in the central and the northern portion of the region.

Northern Region: In general, precipitation accumulations graded from a high of 15 to 40 mm range across the west to less than 10 mm in the east. The highest precipitation accumulations were recorded at Breton Plots station (40.4 mm) in the southwest, followed by Elk Island Nat Park station (30.7 mm) in the central part, while the lowest accumulations of 6.3 mm was recorded at Bodo AGDM station in the southeast corner. Precipitation accumulations relative to long-term-normal graded down from at least *near normal* accumulation, in most portion of the western half of the region to *moderately low* to *low* accumulation in the rest of the region.

Central Region: Similarly, precipitation accumulations graded from a high of 15 to 35 mm range in the northwestern portion of the region to 10 to 15 mm range in the southwestern and central east and then to 5 to 10 mm range in the eastern portion of the region. The highest precipitation accumulations were recorded at Red Deer A station (32.4 mm) followed by Mage Lake station (30.5 mm) both in the northwest, while the lowest accumulations of was recorded at Oyen AGDM Station in the eastern portion of the region. Precipitation accumulations relative to long-term-normal mainly graded from at least *near normal* accumulation, in most portions of the western half of the region to *moderately low* accumulation in the rest of the region.

Southern Region: In general, precipitation accumulation across most of the region varied from 15 to 25 mm range grading down to 5 to 10 mm range in the north western, north central and north eastern portion of the region. Three isolated pockets in the region and the Foothill area recorded accumulations above 30 mm. The highest precipitation accumulations in the plains areas were recorded at Milk River Ridge 11 station (59.4 mm) in the south followed by Medicine Lodge station (40.7 mm) in the east, while the lowest accumulation was recorded at Fort Macleod AGCM station (9.3 mm) located in the central west. Precipitation accumulations relative to long-term-normal across most of the region were at least *near normal* with the exception of pockets in the west and northeastern portion of the region.

Cold Season Precipitation Accumulations relative to Long Term Normal (1961 - 2005) (Figure 3)

Cold Season precipitation (Oct 1 to March 31) accumulations relative to long term normal, to date, across most of the reporting area are at least *near normal*, grading to moderately low to low in isolated pockets and an extended area in the eastern and northern portion of the Peace Region, the eastern portion of the Northern and Central Regions.

Peace Region: Most of the south western and part of the central portion of the region's Cold Season precipitation accumulations are at least *near normal* grading to *moderately low* accumulations to the rest of the region.

Northern Region: Cold season precipitation accumulations in most part of the region were at least near normal grading to isolated pockets of *moderately low* accumulations.

Central Region: Similarly cold season precipitation accumulations in most portion of the region were *near normal* grading to *moderately low* to *low* accumulations in isolated pockets mainly in the eastern portion of the region.

Southern Region: Cold season precipitation accumulations in foothills and across the central west to east corridor of the region were at least *moderately high,* grading to near normal across the rest of the region with the exception of two isolated pockets of *moderately low* in the northwest and southeast portion of the region.

Average Precipitation Accumulations for January (Figure 4)

January is a typically a dry month across the reporting area, with on average about 4.9 percent of the annual precipitation falling. During this month precipitation totals range from 10 to 20 mm across most the central and Southern Regions, increasing to 30 to 40 mm in the west along the foothills. Across the Northern and Peace Regions, precipitation totals typically range between 20 to 30 mm, with the exception of the south half of the Peace Region where between 30 to 40 mm is typically recorded.

Snow pack conditions (Figure 5 and Figure 6)

Modeled snow pack conditions expressed as snow water equivalent (SWE) are shown in Figure 5 and snow pack accumulations relative to long term normal are shown in Figure 6. These maps represent the current snow pack estimates in stubble fields and reflect a 30 percent precipitation loss due to blowing; in addition to losses due to sublimation and snow melt process.

Peace Region: In general SWEs graded down from 30 to 50 mm range across the west to 10 to 30 mm range in most part of the region with the exception of the southeastern portion where accumulation were less than 10 mm. Similarly, snow pack accumulations relative to long term normal graded down from at least *near normal* accumulation in the west to *moderately low* and *low* in the rest of the rest of the region.

Northern Region: SWEs varied from 10 to 30 mm range in most of the western half of the region to less than 10 mm in the eastern portion of the region. Relative to long term normal, SWEs, graded from *near normal* and *moderately low* in the western half of the region to *low* and *very low* accumulations in the eastern part of the region.

Central Region: Similarly SWEs varied from 10 to 30 mm range in the western half of the region to less than 10 mm across the eastern half of the region. Relative to long term normal, SWEs varied from *near normal* accumulation in west to *moderately low* and *low* accumulation in the eastern portion of the region.

Southern Region: SWEs in the Foothills and few isolated pockets were above 30 mm, grading down to 10 to 30 mm range across the rest of the region with the exceptions of less than 10 mm accumulation in the northeastern boarder of the region. Relative to long term normal, SWEs are at least *near normal* across the region, with the exception of two isolated pockets of *moderately low* accumulation located in the western part of region.

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 normals.

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 are 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 millimetres (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.

Report prepared by the Drought Reporting Team
Ralph Wright, Daniel Itenfisu and Isabel Simons-Everett
Alberta Agriculture and Rural Development
Edmonton, AB T6R 5T6
Contact: Ralph Wright; ph (780) 427-3556

This report was created on January 12, 2010.

Drought analysis is currently scheduled at monthly intervals between October 31 and April 31, and twice monthly from May 1 to September 30. This report updates the previous report of November 30, 2009.

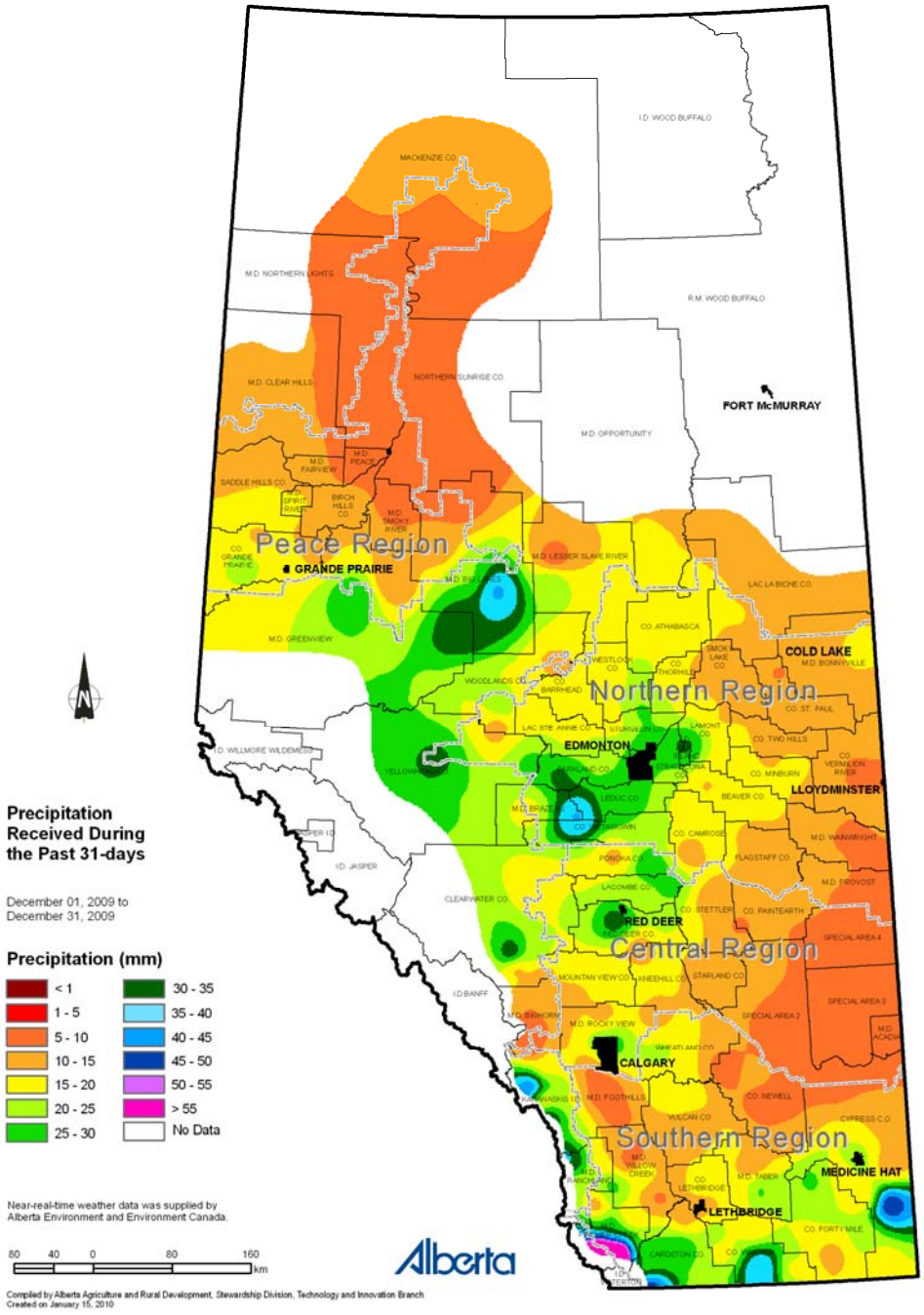

Figure 1. Precipitation (mm) received since the November 30, 2009 Drought Report, as of December 31, 2009.

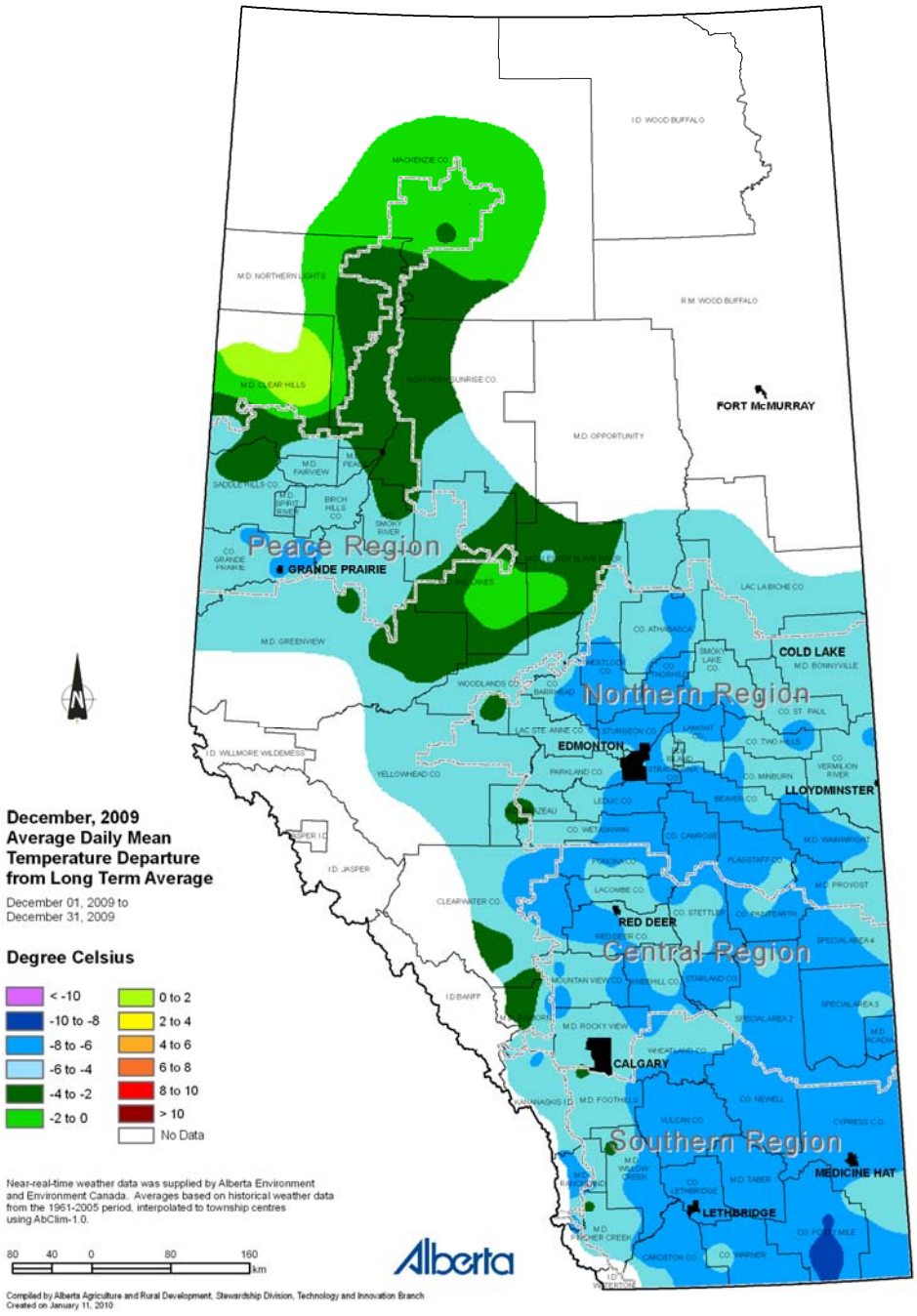

Figure 2. December 2009, average daily mean temperature departure from long term average.

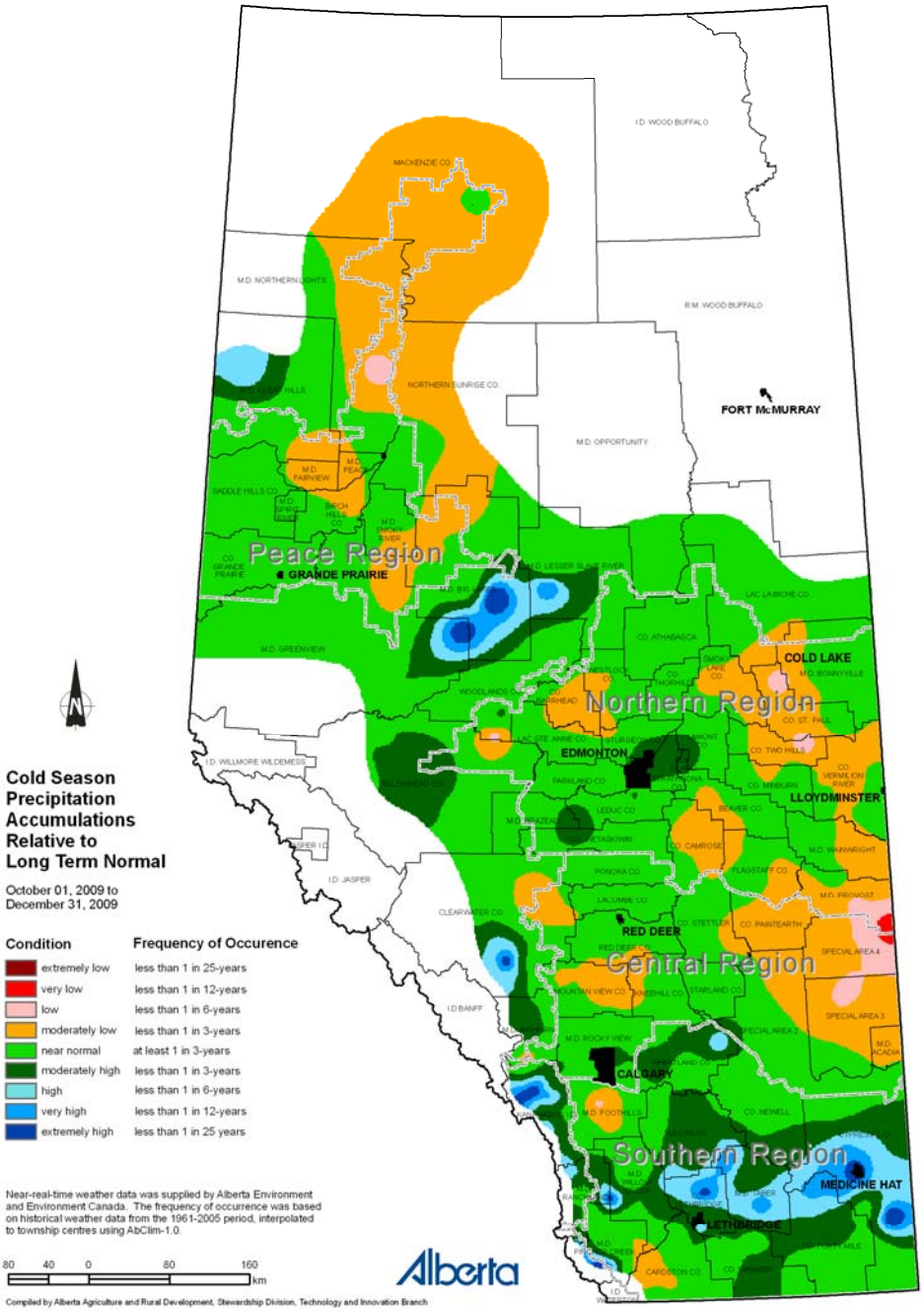

Figure 3. Cold season (October to March) precipitation accumulations to date, relative to long term normal, as of December 31, 2009.

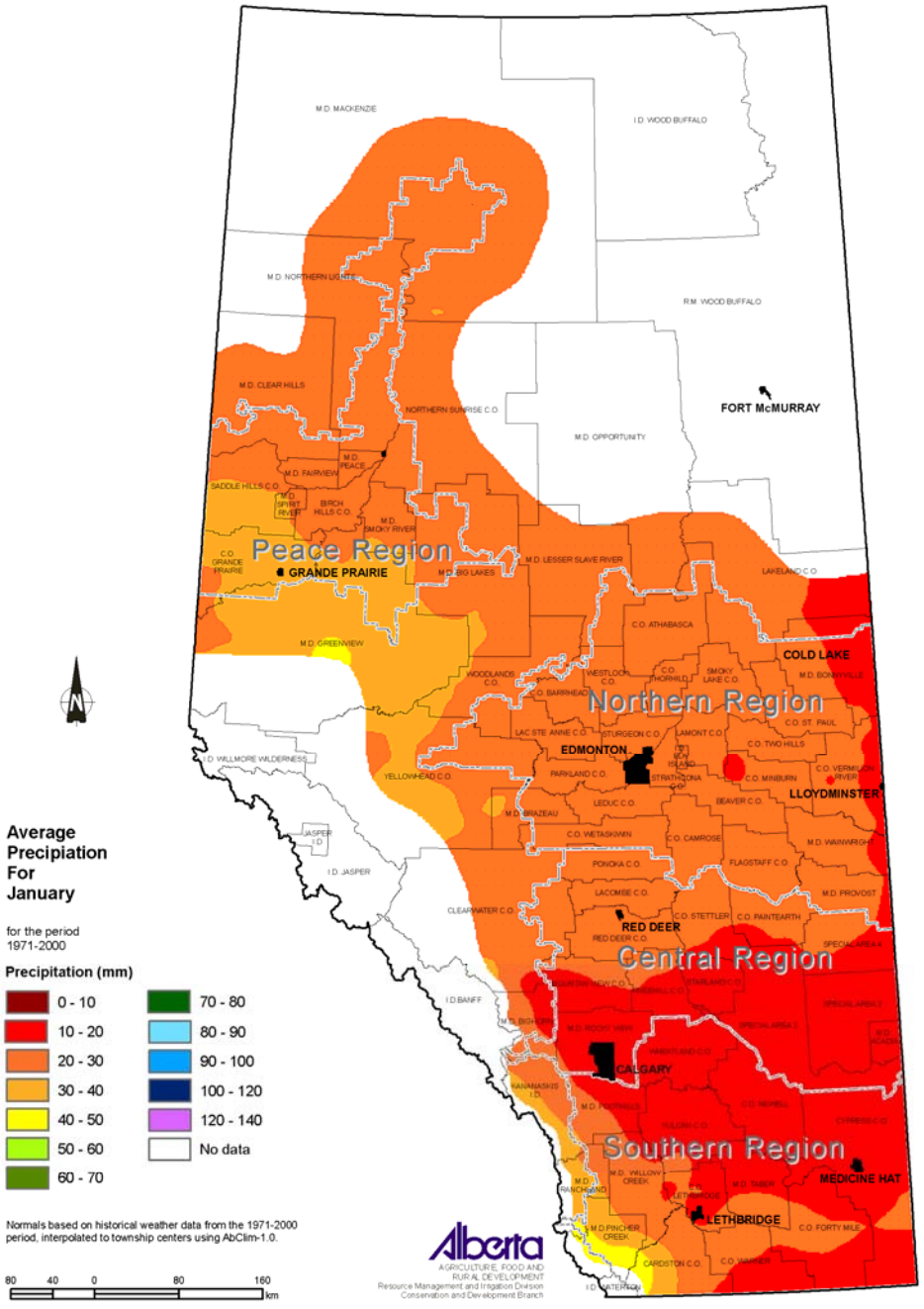

Figure 4. Average (1971-2000) precipitation for January.

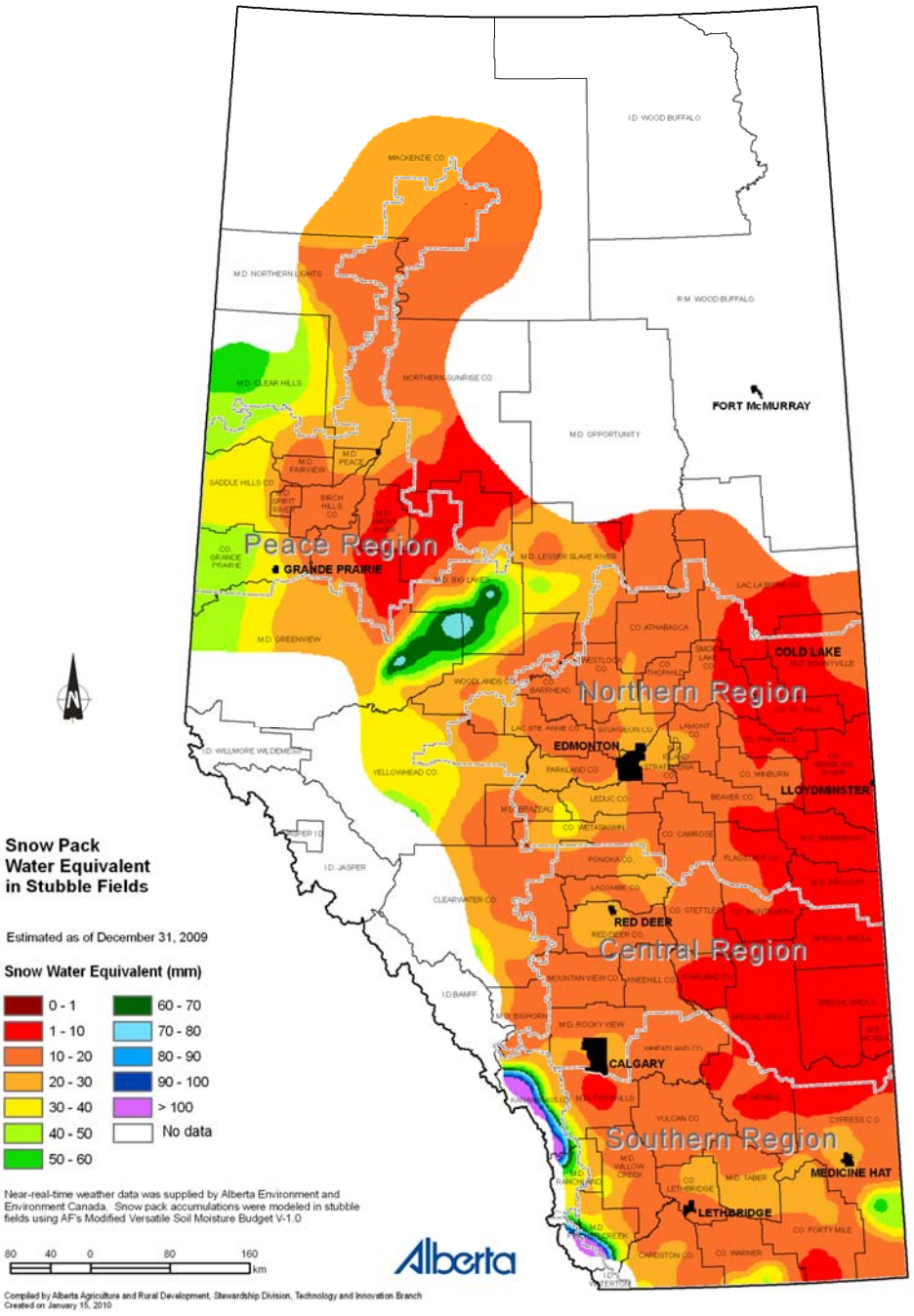

Figure 5. Modeled snow pack water equivalent (mm) on stubble fields as of December 31, 2009.

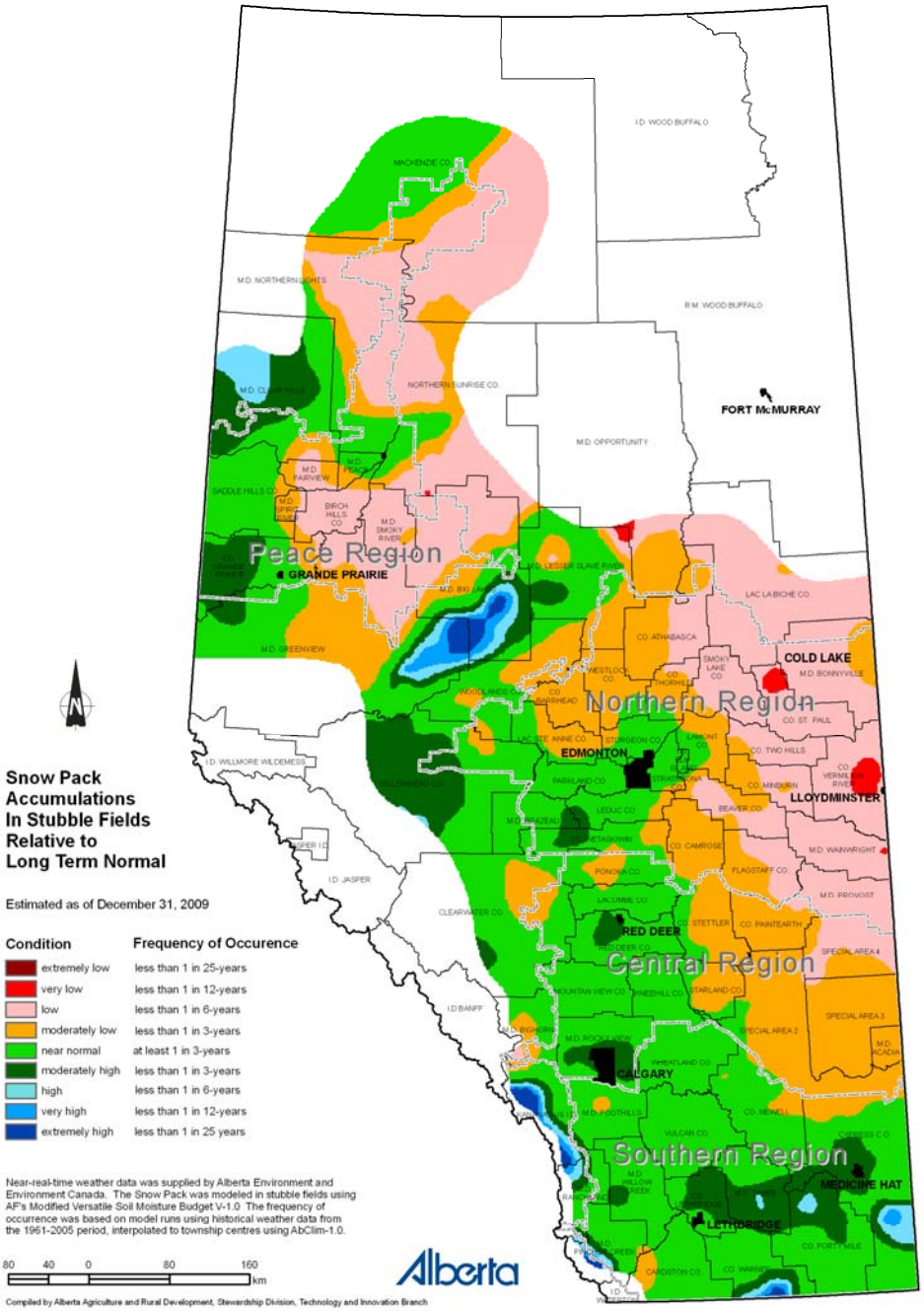

Figure 6. Modeled snow pack water equivalents on stubble fields relative to long term normal, as of December 31, 2009.