Drought Report for the Agricultural Region of Alberta:
December 31, 2005

Summary

December 2005 was warmer and drier than normal in Alberta. Although warm, dry weather prevailed across most of the province since the November 30, 2005 report, precipitation totals ranged from less than 10 mm to more than 130 mm in the foothills area of the Southern Region. As a result of *Much Below Normal* precipitation, areas classified as *Drought Alert* have expanded and currently extend across central parts of the Northern Region, including the City of Edmonton, as well as two large pockets in the central and southern parts of the Peace Region.

Across much of the Peace and Northern Regions, *Much Below Normal* precipitation for the months of November and December has resulted in expansion of areas exhibiting a 90-day trend towards *Drought*, particularly in the eastern parts of both regions. Two small areas are showing a 90-day trend towards *Exceptional Drought*; one in the Northern Region in the western part of the County of Wainwright and one in the Central Region, southwest of the City of Red Deer.

The 90-day trend in the rest of the Central Region and throughout the Southern Region is toward *Normal*, with the exception of two isolated pockets in the central and southeastern portions of the Southern Region that indicate a trend from *Drought Alert* to *Drought.*

Normal precipitation accumulation during the past 90 days represents only about 15 % of average annual precipitation, therefore, at this time of year, the above mentioned trends toward drought simply serve as a warning, considering that total yearly precipitation remains normal across many of the areas showing these trends.

The snow pack across most of the reporting area is *Much Below Normal*, with few exceptions.

Current Situation

Drought Indices

Long-term Drought (Figure 1**)**
Since the November 30, 2005 report, *Much Below Normal* precipitation in most of the Northern and Peace Regions resulted in the expansion of existing *Drought Alert* areas from 6.4 % to 10.64 %. Currently areas in *Drought Alert* in the Northern Region include Sturgeon and Westlock Counties, and parts of Counties of Athabasca, Thorhild, St. Paul, Two Hills, Camrose, Smoky Lake, Lamont, Strathcona, Leduc, and Parkland. Similarly, in the Peace Region *Drought Alert* exists in parts of the Municipal District (MD) of Greenview and Big Lakes in the south and Northern Sunrise and Northern Lights in the center. Other areas are reporting *Normal* to *Above Normal*, with areas in foothills reporting *Wet* conditions.

Recent (90-day) trend in long-term Drought conditions (Figure 2**)**
Much Below Normal precipitation since the last drought report resulted in the expansion of the 90-day trend toward *Drought Alert* and *Drought* in much of the Peace and Northern Regions, and the northwestern parts of the Central Region. The 90-day trend in the rest of the Central and Southern Regions is towards *Normal,* with the exception of two isolated pockets in the central

and southeastern portions of the Southern Region that indicate a trend ranging from *Drought Alert* to *Drought.*

Across much of the Peace and Northern Regions, *Much Below Normal* precipitation for the months of November and December has resulted in significant expansion of the areas exhibiting a 90-day trend towards *Drought*, particularly in the eastern parts of both regions. Two small areas are showing a 90-day trend towards *Exceptional Drought*; one in the Northern Region in the western part of the County of Wainwright and one in the Central Region, southwest of the City of Red Deer.

Normal precipitation accumulations at this time of the year (October 2 to December 31) represent only about 15 % of the total average annual precipitation, therefore, the above mentioned trends toward drought simply serve as a warning, bearing in mind that total yearly precipitation remains normal across many of the areas showing these trends.

If current trends continue, expect to see areas of *Drought Alert* grow rapidly in size, with some existing *Drought Alert* areas moving into *Drought*. Elsewhere in the reporting area, the 90-day trend is at least *Normal*, indicating a low risk of *Drought*.

Precipitation

Precipitation since the November 30th, 2005 Drought Report (Figure 3**)**
Since the last Drought Report, most of the reporting area received *Much Below Normal* precipitation. In the Southern Region, precipitation was greatest in the foothills areas with 177.5 mm being recorded at Lost Creek station, grading to less than 10 mm in the central and eastern parts, with the exception of Vauxhall CDA station in MD of Taber with 19.5 mm. Most of the Central Region recorded less than 5 mm except at Esther station (13.7 mm) in Special Area 3. Similarly, most of the Northern Region recorded less than 10 mm with the exception of three isolated pockets based on station data of Atmore AGDM (20.0 mm) in the County of Athabasca, Paddle River Headwater (36.8 mm) in Woodland County and Killam AGDM (12.6 mm) in Flagstaff County. The central and southern half of Peace Region, received less than 10 mm of precipitation, while the northern and parts of the central and western half of the Peace Region received precipitation between 12 to 16 mm, grading to a highs of 50.9 mm at White Mtn. LO station in the MD of Saddle Hills and 33.2 mm at Beaverlodge station in the County of Grande Prairie.

90-day precipitation departures (Figure 4**)**
Over the past 90-days, precipitation accumulations in the Southern Region have been *Much Above Normal* to *Near Normal* in the Foothills area grading to *Below Normal* in central and eastern parts of the region, with the exception of a few pockets of *Near Normal* precipitation in central locations including in the south, along the Canada-US boarder. In contrast, *Much Below Normal* precipitation was recorded in the southeast corner of the region. In the Central Region, precipitation accumulations graded from *Above Normal* to *Near Normal* in east to *Below Normal* and *Much Below Normal* precipitation in the west. A large part of the Northern Region received *Much Below Normal* precipitation with a few exceptions of *Below Normal* precipitation. Most of the Peace Region reported *Much Below Normal* precipitation except for the northern corner with *Below Normal* precipitation and the southwestern corner grading from *Below Normal* to *Near Normal*.

Precipitation departures for the month of December (Figure 5**)**
For the month of December, precipitation accumulations were *Much Below Normal* across most of the reporting area with the exception of the part of the foothills in the Southern Region and the southwestern part of the Peace Region, which received precipitation in a range of *Much Above Normal* to *Near Normal* and isolated pocket areas with *Near Normal* or/and *Below Normal* precipitation scattered across the rest of the reporting area.

Normal precipitation for the month December(Figure 6**)**
Provincially, about 4.7% of the annual precipitation falls in December. During this month precipitation totals range from 10 to 20 mm across the Southern and most parts of the Central Regions, and 20 to 30 mm through most of the Peace and Northern Regions, with upwards of 30 to 40 mm falling in the southwestern corner of the Peace Region.

Snow pack conditions (Figure 7)
Modeled snow pack conditions are shown in Figure 7. This represents the current snow pack estimates in stubble fields and reflects a 30% precipitation loss due to blowing; in addition to losses due to sublimation and snow melt process. Snow water equivalents in most part of the reporting area are less than 1 mm, with the exceptions of the foothills area in the Southern Region (50 to 160 mm), and the Peace Region's southwestern corner (25 to 50 mm) and the northern part (10 to 25 mm).

Snow pack conditions percent of Normal (Figure 8**)**
Snow pack accumulations for the end of December are *Much Below Normal* across most parts of the reporting area, except parts of the foothills area of the Southern Region and the southwestern corner of the Peace Region, where *Below to Much Above Normal* accumulations are estimated to occur.

Winter season (October1 to March 31) precipitation accumulations (Figure 9)
In the agricultural areas of the province, average precipitation totals in the relatively dry, winter season from October 1 to March 31 account for about 27% of the total annual precipitation. As such, for many areas, large monthly deficits relative to normal during this time do not necessarily represent significant moisture deficits, nor do large monthly surpluses relative to normal represent an immediate amelioration of dry conditions. Figure 9 shows the percent of average annual precipitation received from October 1 to March 31. The importance of winter precipitation varies from region to region and even within a region. In the Central and Northern Regions, over winter precipitation normally accounts for about 24 % of the total average annual precipitation. Across much of the Peace Region, precipitation during this period accounts for 30-35% of the average annual precipitation. Thus, the precipitation over this period is relatively more important to the region's annual water balance. Across the plains of the Southern Region, over-winter precipitation accounts for about 25-30% of the average annual precipitation. In the Southern Region, west of the City of Lethbridge, winter precipitation becomes increasingly more important, particularly in the mountains and foothills, a source of much irrigation water, where the October to March precipitation accounts for up to 50 % of the average annual precipitation.

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.

Report prepared by the Drought Reporting Team
Ralph Wright, Daniel Itenfisu and Isabel Simons-Everett
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 December 31, 2005.
Drought analysis is currently scheduled at monthly intervals between October 30 and May 1. This report updates the previous report of November 30, 2005.

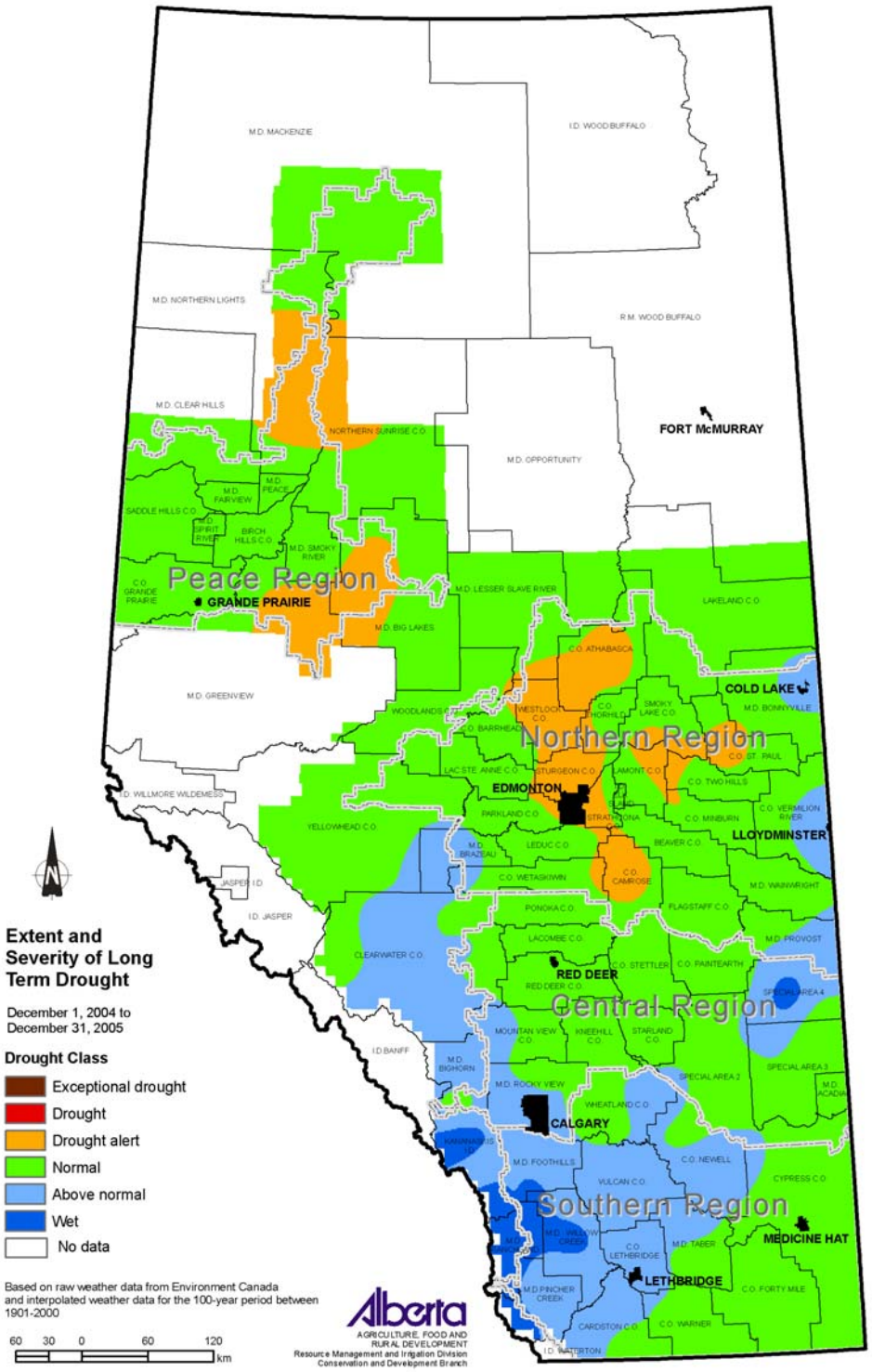

Figure 1. Extent and severity of long-term drought in the agricultural region of Alberta, as of December 31st , 2005.

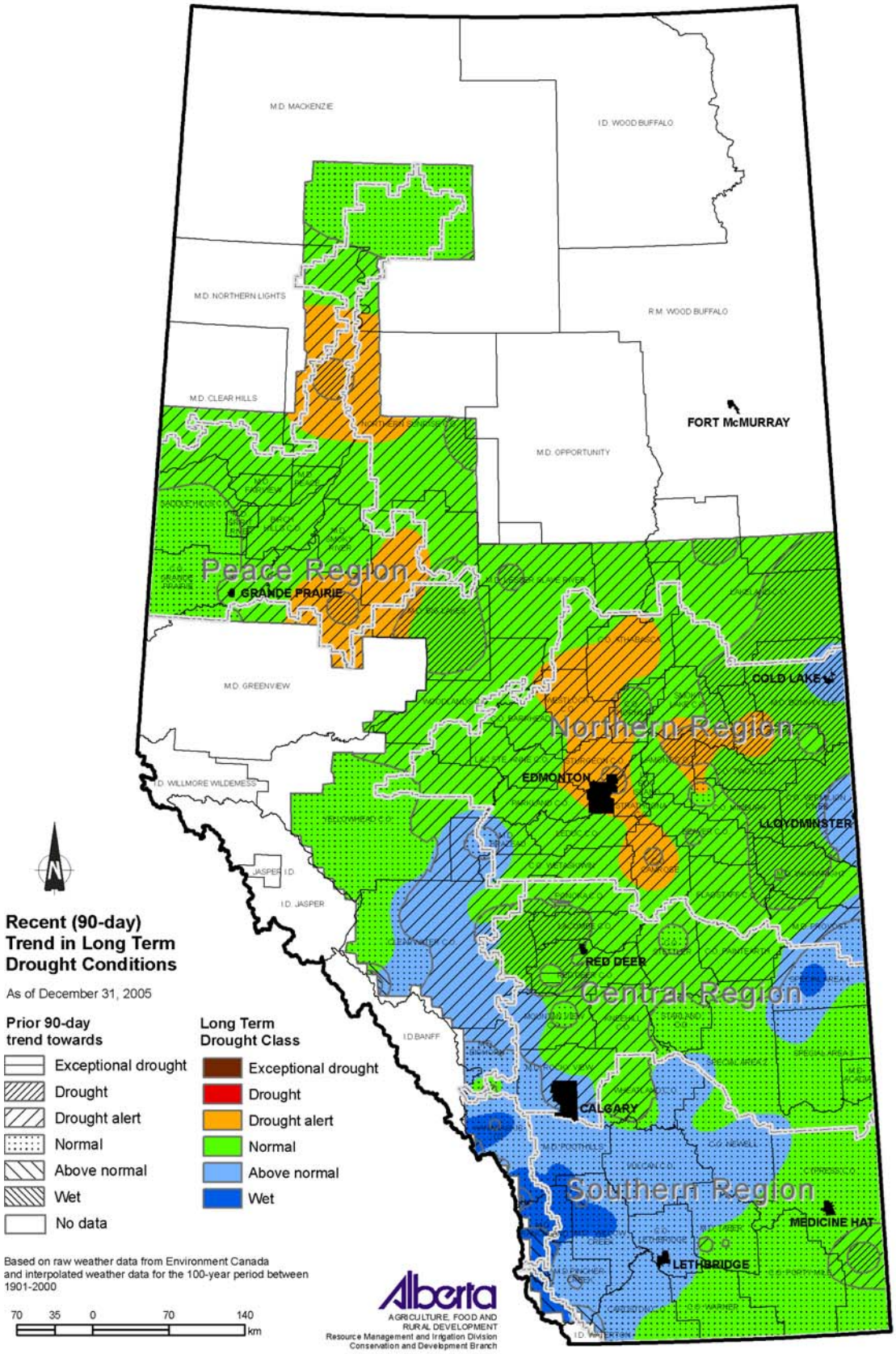

Figure 2. Recent (90-day) trend in drought conditions for the agricultural region of Alberta, as of December 31st, 2005.

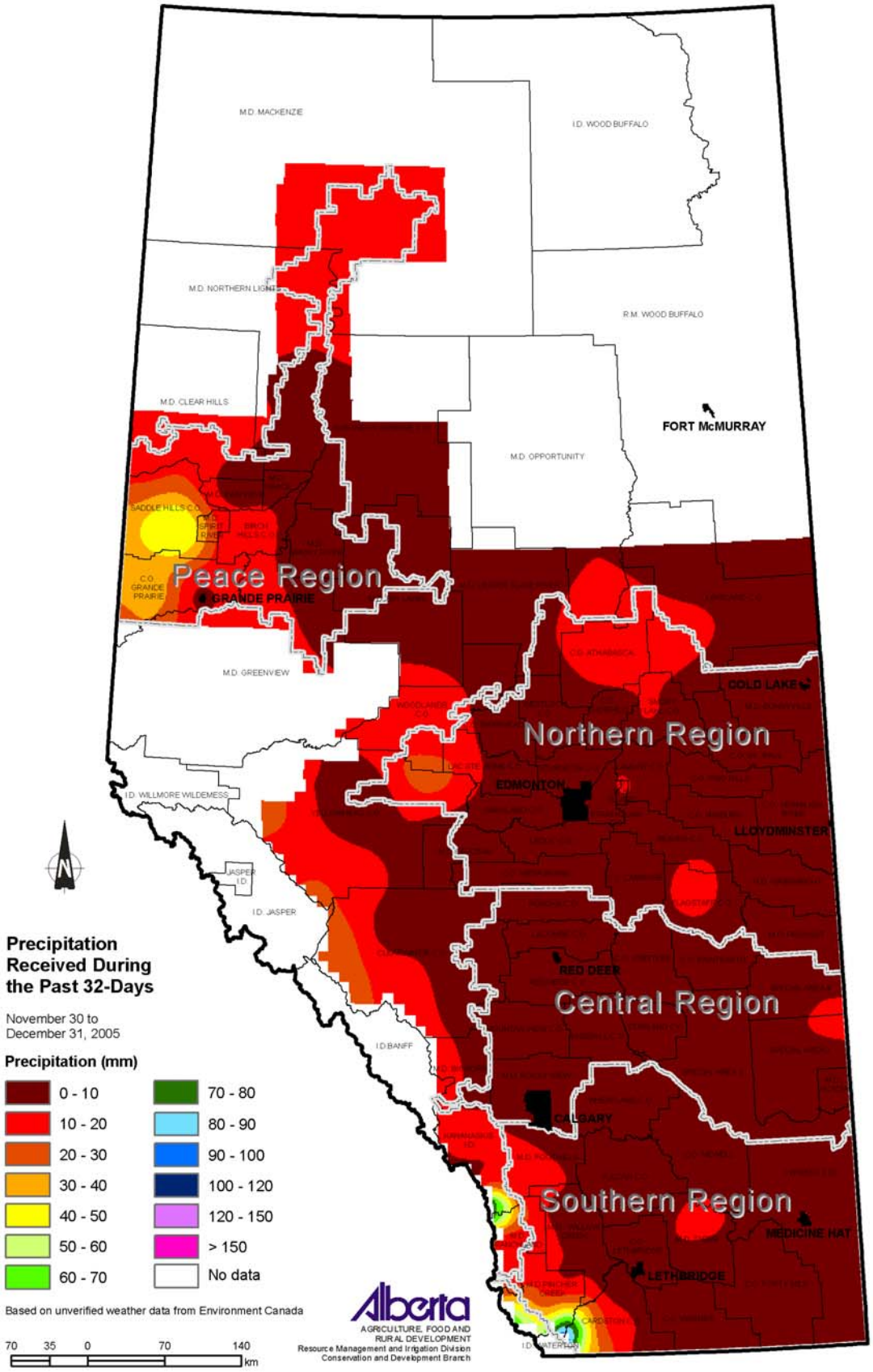

Figure 3. Precipitation (mm), since the November 30th, 2005 Drought Report, in the agricultural region of Alberta as of December 31st, 2005

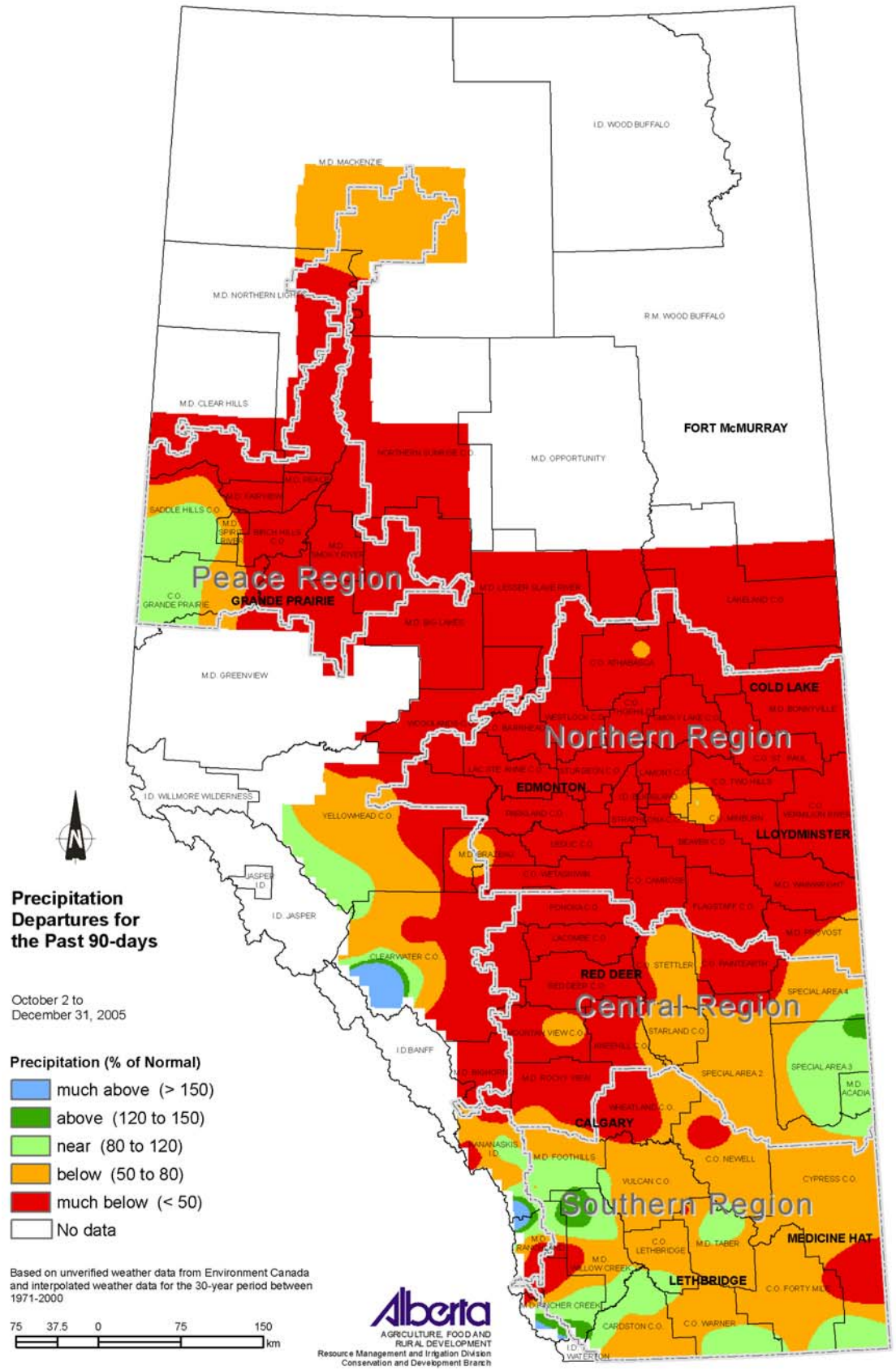

Figure 4. 90-day precipitation departures in the agricultural region of Alberta, as of December 31st, 2005.

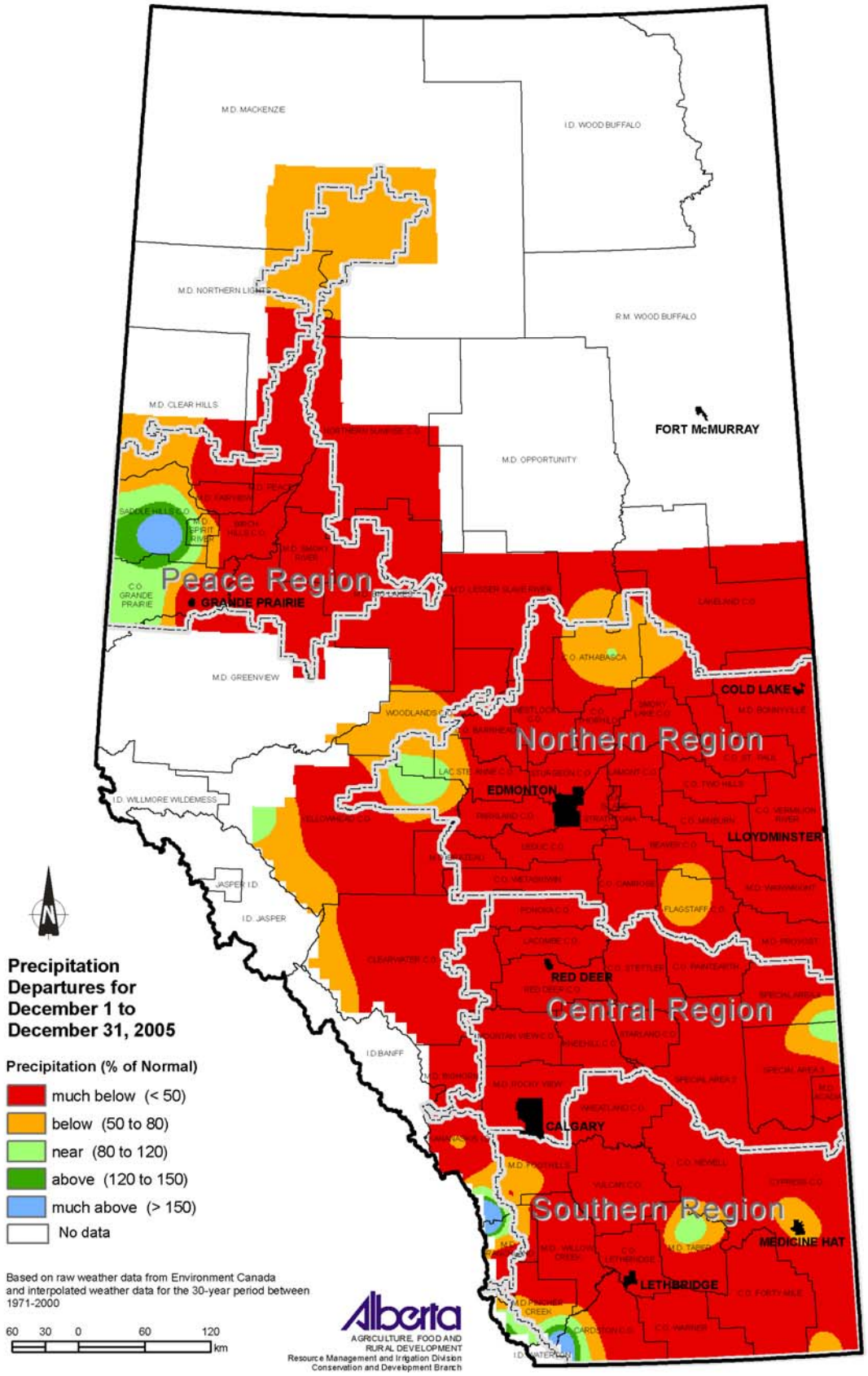

Figure 5. Percent of Normal Precipitation (mm), received during the month of December, 2005.

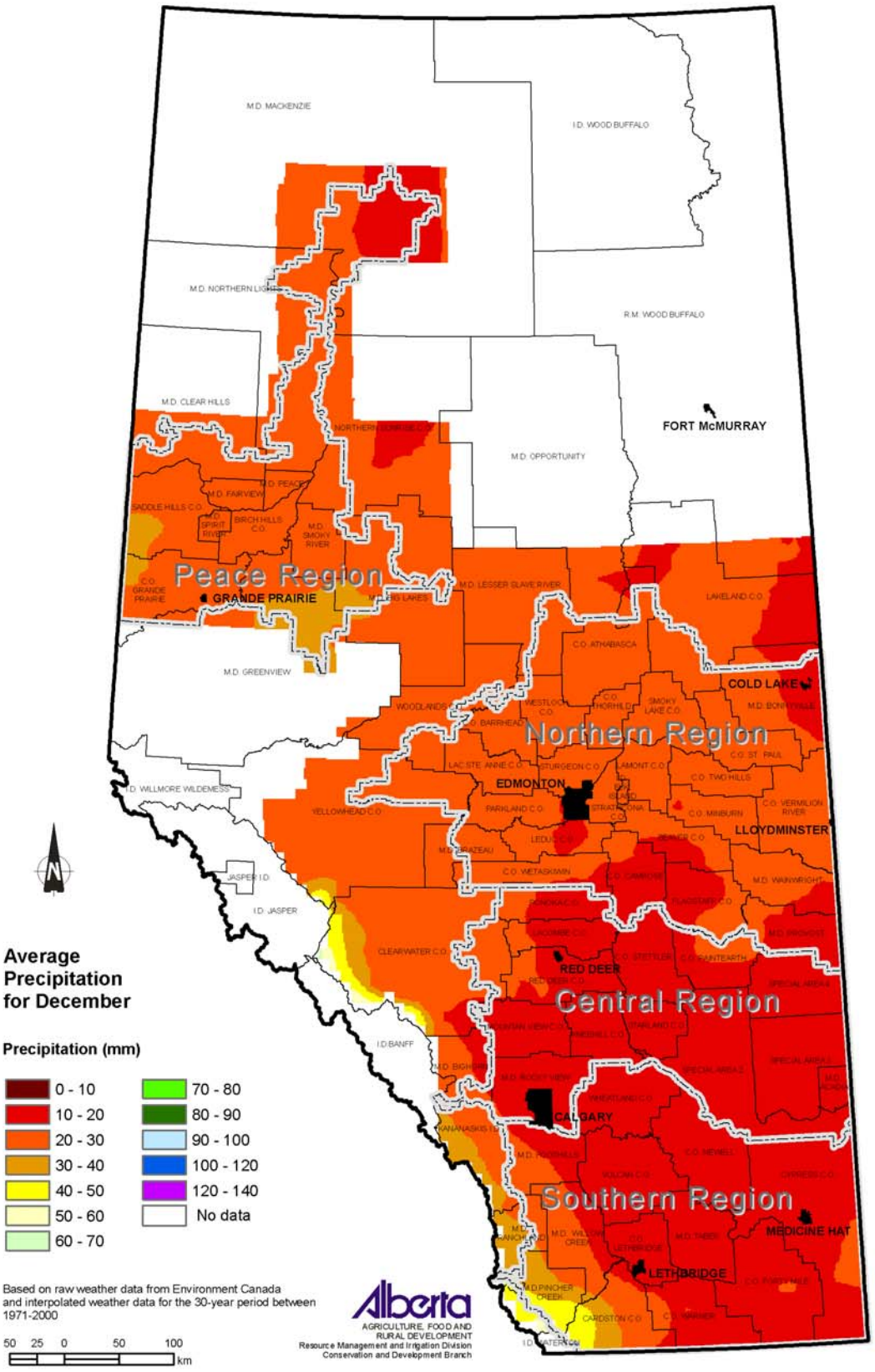

Figure 6. Average (1971-2000) precipitation for December in the agricultural region of Alberta.

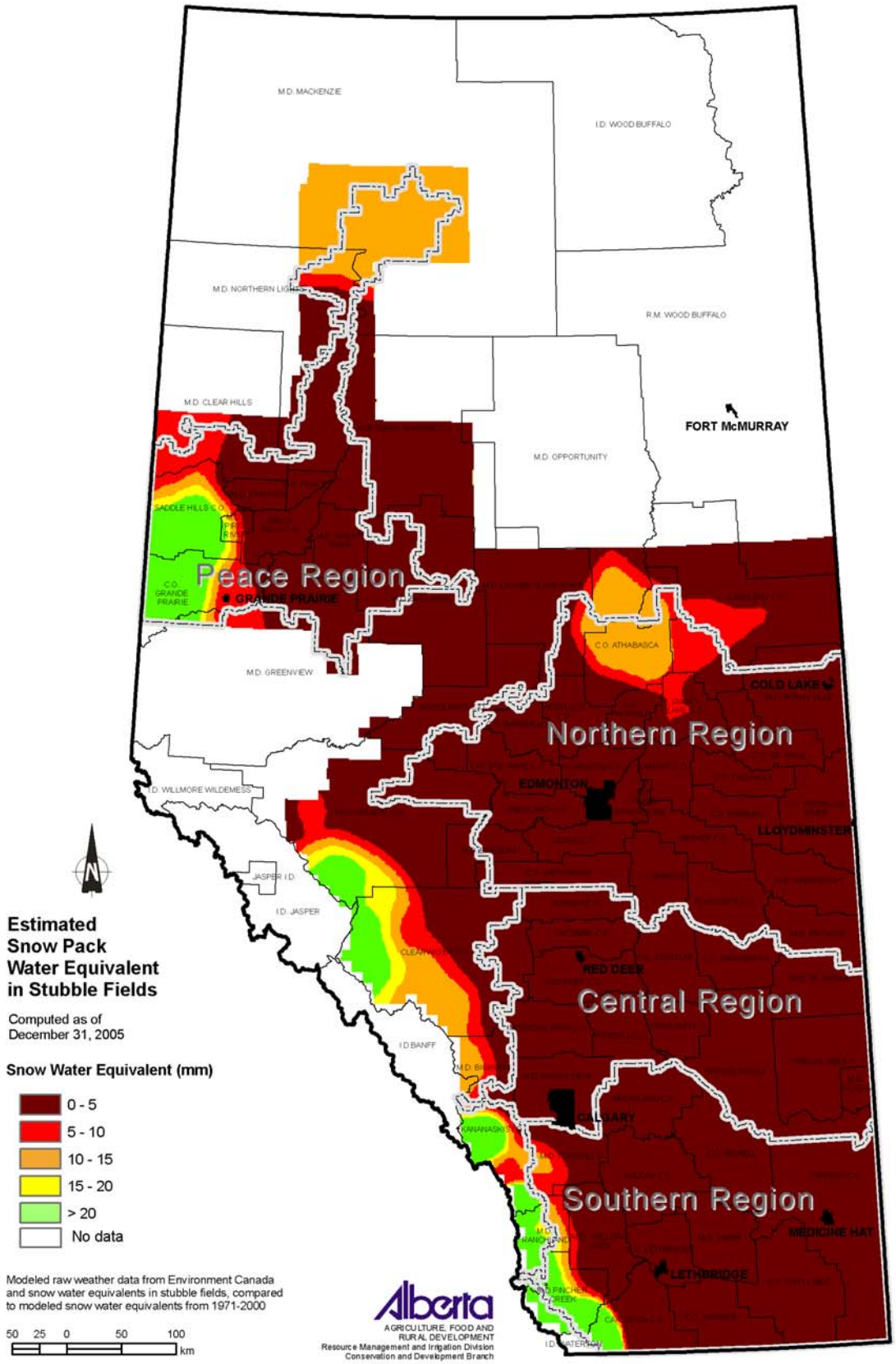

Figure 7. Modeled snow pack water equivalent (mm) on stubble fields for December 31st, 2005.

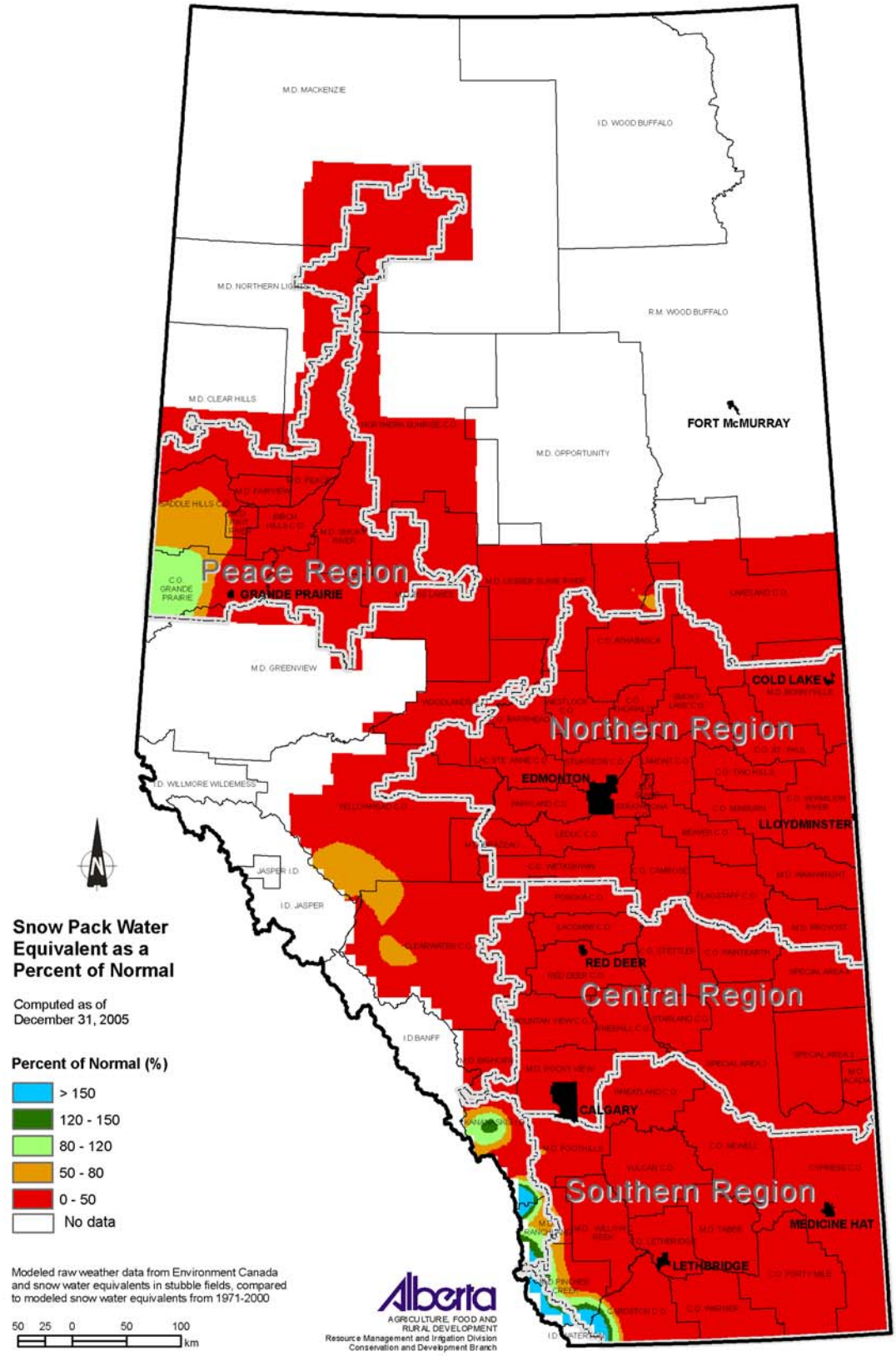

Figure 8. Modeled snow pack water equivalent on stubble fields as a percent of the Modeled 30-year Normal for December 31st, 2005 based on the period between 1971-2000.

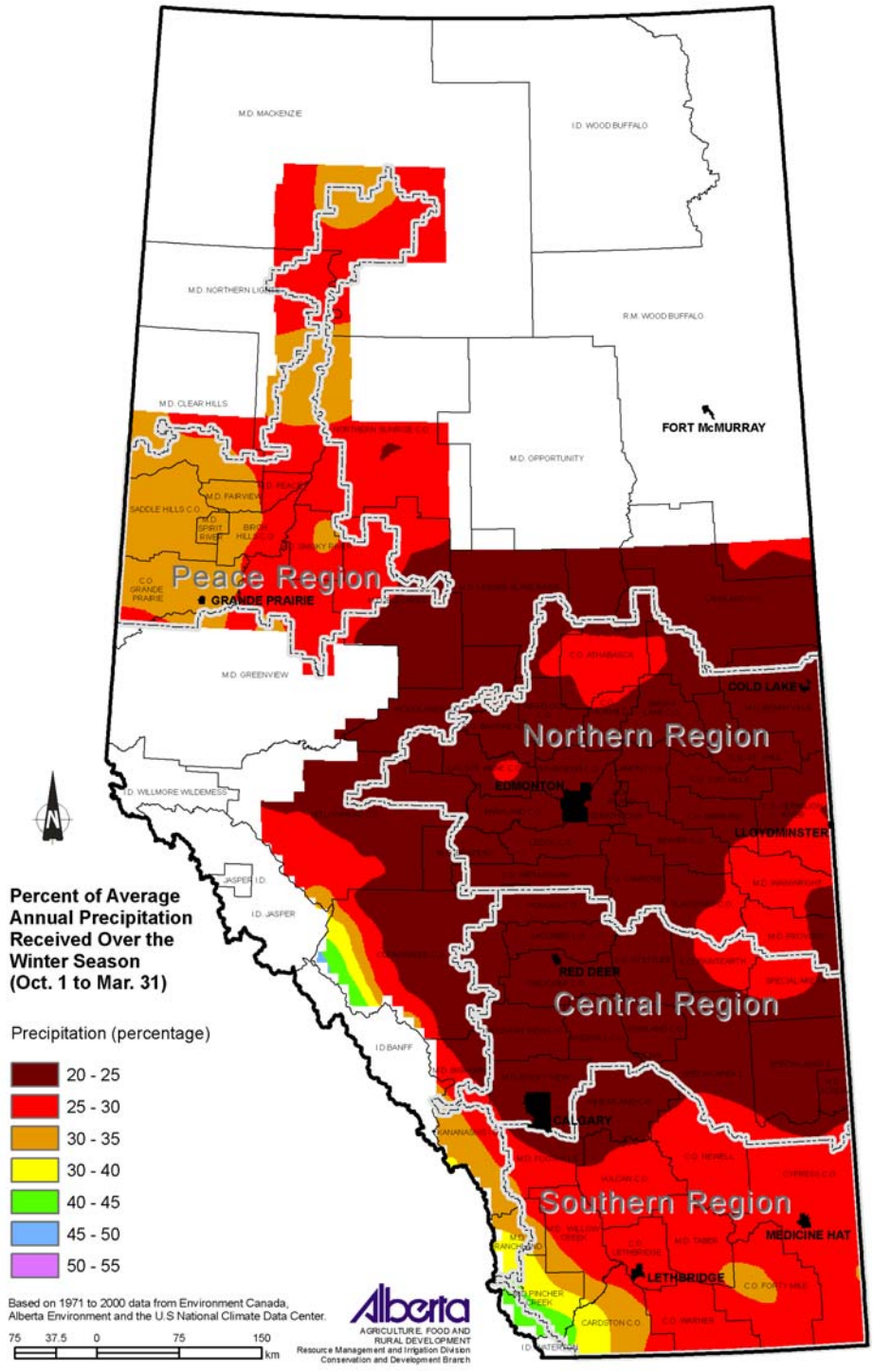

Figure 9. Percent of Average Annual Precipitation received over the Winter Season