APPENDIX C-5

CLIMATE CHANGE AGENT ANALYSIS FOR THE MIDDLE ROCKIES ECOREGION

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1.0 INTRODUCTION

Successful completion of this Rapid Ecoregional Assessment (REA) was based on a sound understanding of the landscape-scale change agents (CAs) and their potential impact on conservation elements (CEs) throughout this ecoregion. CAs are natural or anthropogenic disturbances that influence the current and future status of CEs. Climate change is included in this REA in order to understand how predicted changes in climate may affect resources across the landscape. Additionally, this information can assist regional managers with determining how climate change might affect resources at a regional scale with the recognition that the scale of this analysis was completed at the 15-km level. A variety of the management questions (MQs) apply to this CA. Many of them can be summarized into one primary question: ***Where will CEs be affected by climate change across the ecoregion?***

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2.0 CHANGE AGENT DESCRIPTION

Climate change has been characterized as causing lasting changes in weather patterns over periods ranging from decades to millions of years. Climate change may include changes in precipitation amounts, distribution, and seasonality; frequency and duration of drought episodes; and changes in temperature regimes.

Global climate change has the potential to directly and indirectly affect organisms and communities by changing the locations where species and communities can exist. Although there is a view that climate change toward warmer-drier conditions, for example, would cause communities to move northward (or, in some localized instances, to higher elevations), species are likely to respond individually, as they have in past geologic epochs. Additionally human-caused barriers to movement may affect the ability of species or communities to move in response to changing conditions or become genetically isolated. Climate change is also likely to affect species and communities by affecting the frequency and distribution of fire and threats from invasive species, disease, and insect outbreaks which all have the potential to increase in severity and duration as a result of climate change. These interactions are difficult to understand and map at an ecoregional scale.

Given projections for climate change during the next 50 years, there is interest in identifying areas, species, and ecological features, functions, and services that are sensitive to ecosystem instability and change, as well areas of relative insensitivity to changes in climatic conditions. It is understood that there will be other episodic events other than climate that contribute to the current or future distribution of CEs that cannot be factored into any analysis. Therefore, a method of assessing the important characteristics of current and future climate at a location is necessary to relate that information to other ecological factors that control the distribution of the species or community (Fagre et al. 2009; Littell et al. 2010).

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3.0 METHODS, MODELS, AND TOOLS

3.1 CLIMATE MODELS

Prior to conducting the climate change analysis, various factors were considered to determine the appropriate climate models and data sources to use when considering current climate and future climate status. Observational data are available to support research over the historical record; however, quantitative estimates of past or future climate must be obtained from simulations of global climate with general circulation models (global climate models [GCMs]). Long-term climate simulations (for example, centuries to millennia) have been run at relatively coarse spatial resolutions (on the order of a few degrees in latitude and longitude). GCMs have recently been completed for shorter time periods at a finer resolution; however, the prevailing approach for obtaining finer spatial resolution climate information is to apply techniques for downscaling model outputs (Hostetler et al. 2011).

For this REA, data for present and future climate over Western North America was provided by the USGS from dynamically downscaling global climate simulations using Regional Climate Model (Regional Climate Model Version 3 [RegCM3]). RegCM3 is characterized as a dynamic downscaled regional climate model (RCM) and is composed of a number of mathematical equations representing physical factors that act on climate near the surface of the earth where local effects such as mountain ranges can exert influence on climate. RegCM uses data in the climate model with a spatial resolution or grid size that is much finer (15x15 km) than that of GCMs (160x160 km). Using a technique called nested modeling, the linking of models of different scales within a GCM are used to provide detailed analysis of local (regional) conditions with general analysis of the global output as a driving force for the higher resolution model. Results for a particular region from a coupled GCM are used as initial and boundary conditions for the RCM, which operates at much higher resolution and often, with more detailed topography and physical parameterizations. This enables the RCM to be used to enhance the detailed regional model climatology and this downscaling can be extended to even finer detail in local models. This procedure is particularly attractive for mountain regions and coastal zones, as their complexity is unresolved by the coarse structure of a coupled GCM grid (WMO 2012).

The aggregation and coupling of output data for each regional climate stimulation (present and future) for this REA was conducted using RegCM3 data provided by the USGS (2011). RegCM3 incorporates a nested modeling technique computed by averaging the output of the three GCMs (ECH5, GENMOM, and GFDL CM2.0) to derive present and future climate models. Global climate simulations from the GFDL CM 2.0 (Geophysical Fluid Dynamics Laboratory Climate Model Version 2.0) and the ECH5 (Max Planck Institute for Meteorology ECHAM5) were part of a suite of model outputs used to provide the historical data necessary to derive boundary conditions for the RegCM3. GENMOM simulations of future climate were conducted using a recently developed GCM comprised of the GENESIS Version 3.0 atmospheric GCM and the MOM Version 2.0 oceanic GCM. All three of these component GCMs have been extensively applied to climate research (Hostetler et al. 2011). Boundary condition files with a time step of six hours were created from the GCM history files and are used to drive the RegCM3.

Since the RegCM3 data were not specifically created for use in this REA, some spatial modifications to the Western North America (Hostetler et al. 2011) output was required. The REA data were stored as a spatial subset of the Northern Rocky Mountain (NRM) and the Southern Rocky Mountain (SRM) regions. Since the NRM and the SRM overlapped the Middle Rockies ecoregion, the datasets were merged and clipped to the vicinity encompassing the ecoregion. The northeastern corner of the SRM model contained some anomalies that created artificial error in the data when merged together. Therefore the "blend" option in the merge function of ArcGIS spatial analyst was used to create a more realistic output by focusing the overlap areas on both models rather than just the SRM.

While any level of anthropogenic change could be simulated in a GCM, most models are run for three CO_2 emission scenarios over a 100 year time period which allows for comparison against the standards. The B1 scenario equates to low CO_2 emissions, A1B equates to medium CO_2 emissions, and A2 is defined as high CO_2 emissions. This REA used of the A2 scenario for the future climate change analysis.

Figure C-5-2 shows the GIS process model for the climate change analysis. The process was conducted for both the current and future climate model. The process and the settings associated with these analyses and all subsequent analyses are detailed in the climate change metadata and the ArcGIS toolboxes provided as part of this report.

3.2 BIAS CORRECTION

The accuracy of a climate model's forecasts (i.e. RegCM3) is tested by running the model with data from a known historic period and comparing the results against observed data for that time period. All climate models, regional or general, deviate in some systematic fashion from the observed data and that deviance is defined as the model's bias and that bias is generally removed from the model results before the data are downscaled (Ray et al. 2008). The GCM analyses for the western U.S. typically have a temperature bias of about +2 degrees Fahrenheit in the winter and -3 degrees Fahrenheit in the summer. This inaccuracy is removed from the model output through a process called "bias correction". Bias correction does not necessary make future predictions more accurate because it is based on the dynamics of observed data for the baseline period after being run through simulations using the GCM or RCM. This creates a historical period that is modeled and is consistent with observed climate but assumes that the frequency and magnitude of extreme weather events in the future are the same as they are now.

The current climate model used for this REA is RegCM3 15 x 15 km downscaled data that was bias corrected using the USDA's Parameter-elevation Regressions on Independent Slopes Model (PRISM) 15 x 15 km data (Oregon State University 2011). PRISM is an analytical tool that uses point data, a digital elevation model, and other spatial datasets to generate gridded estimates of monthly, yearly, and event-based climatic parameters, such as precipitation, temperature, snowfall, degree days, and dew point. PRISM uses historical data from weather stations and follows a coordinated set of rules, decisions, and calculations that are typically used by climatologists to create a climate map. Using a weighted linear regression for each station, PRISM interpolates the data across the landscape using the grid square size set in the analysis. The weight is the sum of the weights specified for distance, elevation, cluster, vertical layer, topographic facet, coastal proximity, and effective terrain (Daly and Johnson 2008). Elevation thresholds for the lapse rate function can be set in PRISM to compensate for the winter temperature inversions that are common in mountainous terrain in the western U.S. due to down-slope cold air drainage with valleys and canyons (Wyoming's Bighorn Valley for example) being colder than mid-slope areas (Daly and Johnson 2008; Daly et al. 2008; 2009). PRISM's spatial resolution is approximately 3 x 4 km but 800 m x 800 m data has been made available for the REA. Currently, only monthly and annual minimum, maximum, and mean temperatures, monthly and annual mean diurnal temperature range and monthly and annual mean total precipitation are available as outputs from PRISM.

3.3 TIME PERIODS

Current climate data were based on models for the period of 1980 to 1999. Data for the period between 2000 and 2010 was not available for the REA analysis. The current RegCM3 data were stored as decadal climate data (i.e., 1980 to 1989 and 1990 to 1999). Therefore these data were merged and averaged across all three GCMs to create an output raster for the current period of 1980 to 1999 (Figure C-5-2).

Future climate data were based on the models for the period of 2050 to 2069. The target date for this REA was 2060. Because the RegCM3 models were based on decadal periods, a date range encompassing this date was used in the analysis. The future RegCM3 data were stored as decadal climate data (i.e., 2050 to 2059 and 2060 to 2069). Therefore these data were merged and averaged across all three GCMs to create an output raster for the future period of 2050 to 2069 (Figure C-5-2).

For both the current and future time periods, climate change analysis was also evaluated based on seasonal data. Initially, quarterly seasonal periods were proposed for the climate change analysis. PRISM data for the period 1971 to 2000 was acquired for the lower 48 states to understand and document the seasonality of regional climate patterns. A finer scale set of figures was also generated for the Middle Rockies ecoregion.

Based on the preliminary evaluation of the PRISM climate data and in consideration of the characteristics of temperature and precipitation that are important for the CEs and other CAs, the time periods were revised. These time periods are shown in Table C-5-1 and represent four bimonthly seasonal periods within a year as well as a four-month winter snow season and an annual period to supply a context for between seasonal changes. Additionally, for the Middle Rockies ecoregion, snow water equivalent (SWE) for the month of April was analyzed as a surrogate variable to approximate late winter changes in snow pack depth. The bimonthly periods were developed in consideration of transitional periods where changes in temperature and precipitation are more critical to plants and animal species within this ecoregion. For example, increasing temperatures in March due to climate change would reduce the amount of spring snow cover, an important habitat criteria for the wolverine. Under current climatic conditions, many mule deer and elk populations migrate seasonally between higher elevation summer ranges and lower elevation winter ranges, often occupying mid-elevation transitional range. Increases in snowfall during winter months or migration periods would restrict movement, foraging, and forage availability and quality (deVos and McKinney 2007). The infestation level of the pine bark beetle is traditionally kept in check by annual die-offs caused by cold weather. The onset of warmer temperatures during winter in the region has resulted in increases in beetle breeding and subsequently the beetles have caused unprecedented damage to the region's mature stands of pine, especially Lodgepole pine (Barrera 2009).

For each time period, monthly data were merged by time period and averaged to create pertinent current and future output models (Figure C-5-2). Annual data were also analyzed for temperature and precipitation to create a useful overall model for comparison against similar climate models (e.g., PRISM) as discussed in Section 3.2. Additionally, this provided some relative context for the bimonthly data comparison.

Table C-5-1. Time Periods Analyzed in Current and Future Climate Scenarios (Temperature and Precipitation)

Period	Seasonal Characteristics
March – April	Transition to Spring Wet Season
May – June	Spring Wet Season
July – August	Summer Heat Stress Season
September-October	Transition to Winter
November-February	Winter Snow Season
April*	Snow Melt Period
Annual	Overall Comparison

*The month of April was separately analyzed for Snow Water Equivalent (SWE).

3.4 ANALYSIS OUTPUT

The analysis of climate change was conducted using delta outputs which were created using inherent GIS processes related to spatial analysis. After the data were aggregated into the appropriate time periods, the current climate data were subtracted from the future climate data on a cell by cell basis. This provided the data for the comparison of current climate patterns to future modeled climate patterns and resulted in the delta (change) output figures (Figure C-5-2). For all other CAs, the delta outputs were clipped to the ecoregion boundaries upon completion of the analysis in order to create an output that was consistent among CAs. The climate change data were not modified in this way because of the potential loss of pertinent regional information in the comparison phase. This enabled climatologists to observe patterns affecting the ecoregion rather than simply looking at the smaller ecoregional scale.

The RegCM3 data format was based on 15-km ESRI grids and was created for broad (regional) analysis. Although this provided a better overall approach for the ecoregional model than the GCMs, the accuracy of this model across areas of great topographical variation presented problems in the overall analysis. This topographical variation between mountains and plains result in data skewing when determining values for the output symbology and classification. The mountainous areas significantly biased the output across lower elevations. This issue was remedied by the discriminate removal of outlying cell values within the mountainous regions.

3.5 VULNERABILITY ASSESSMENT

Although scientists have been concerned about climate change for decades, the consequences of ongoing climate change are becoming readily observable, and as a result, managers are being asked which of the species on the lands they manage are most vulnerable to climate change. The answer is difficult in part, because assessing exposure to climatic factors is complex, and also because species physiologically respond differently to changes in temperature and precipitation. To handle the complexity posed by this problem, managers need a way to group species based on similar drivers of vulnerability, and a way to flag species for which specific management actions could promote greater resilience to ongoing changes in climate. To address these needs, NatureServe's Climate Change Vulnerability Index (NSCCVI) was used (NatureServe 2011).

This REA uses NSCCVI to assess the potential effects of climate change on the fine-filter CEs. This Microsoft Excel-based tool facilitates a fairly rapid assessment of the vulnerability of a terrestrial plant or animal species to climate change in a defined geographic area. The NSCCVI process uses a range of attributes for each species that, when assessed with the forecasted climatic change, determines a species' vulnerability. The basic assumption of the NSCCVI is that a highly sensitive species will not suffer if the climate where it occurs remains stable. Similarly, an adaptable species will not decline even in the face of significant changes in temperature and/or precipitation (NatureServe 2011).

The NSCCVI approach is divided into an exposure assessment and a sensitivity assessment. Exposure is a CE's range location with respect to areas of greatest climate change, while sensitivity is the species' biologic and ecologic ability to survive or adapt to climate change. Exposure to climate change is measured by examining the magnitude of predicted temperature and moisture changes across the range of the species within the assessment area. Sensitivity is assessed by scoring species against 20 factors within two categories, indirect exposure to climate change and species-specific sensitivity. Readily available information about a species' natural history, distribution and landscape circumstances is used to predict whether a range contraction and/or population reductions are likely to occur (NatureServe 2011). The NSCCVI also considers the results of studies documenting or modeling vulnerability to climate change if research of this nature has been conducted on the species (NatureServe 2011). Information on exposure and sensitivity are combined to produce a numerical sum which is then converted into a categorical score for each species by comparing it to threshold values. The NSCCVI uses climate change information from the RegCM3 15 x 15 km dynamic downscaled data that were statistically downscaled and bias corrected and then appended to PRISM data at the 15 x 15 km resolution (Young et al. 2010). For purposes of this REA, it is assumed that bias correction was done for the PRISM data by the USGS.

The distribution of each species was classified according to the vulnerability values under the climate scenarios and also compared to natural and anthropogenic factors to determine their relative contributions to vulnerability. Other climatic drivers or indices such as precipitation, evaporation, evapotranspiration, or SWE were also used to address the MQs related to climate change. Species are scored as extremely vulnerable, highly vulnerable, moderately vulnerable, not vulnerable/presumed stable, not vulnerable/increase likely, and insufficient evidence (NatureServe 2011). The results of the NSCCVI analysis are presented for each fine-filter CE in Appendix E. The attributes used for each analysis were taken from various literature sources as summarized in Appendix H.

4.0 RESULTS

The climate change analysis is presented as a series of figures consisting of three subfigures generated using the RegCM3 15-km pixel regional climate change model data. The three subfigures depict the:

1. Current or baseline period (1980 to 1999);
2. Predicted future climate period, (2050 to 2069); and
3. Predicted change (delta output).

The mean temperature data in degrees Centigrade (°C) for each month within each respective seasonal time period (Table D-5-1) were averaged to calculate the mean temperature for a particular seasonal period. For precipitation, the model output of mean millimeters per day precipitation for a particular month was multiplied by the number of days in the month to calculate the mean amount of precipitation in a month. The monthly means were then summed to calculate the total amount of precipitation within each of the seasonal periods. SWE was obtained directly from the model output.

The climate parameters analyzed (precipitation, SWE, and temperature) measure different physical properties and have different scales. Precipitation and SWE have the property of accumulating a quantity and are represented on a zero to maximum scale with a very broad range (0 to 3,000 millimeters). Also, cumulative totals of precipitation and SWE are not inherently meaningful without an environmental context (e.g. when the precipitation occurs is as important as the cumulative amount of precipitation). In contrast, temperature in degrees centigrade ranges from below freezing to above freezing and the freezing point of water greatly determines biological activity. Additionally, temperature cannot accumulate and occurs within a relatively contracted range (-20 to 30^{0}C). For these reasons, precipitation and temperature are depicted differently in the figures. For temperature, the baseline and future intervals also include an interval centered on zero that represents the freezing point of water while the range for the change figure was broken into intervals or approximately 2^{0}C. In contrast, five intervals are shown for all of the precipitation and SWE subfigures and each interval was defined relative to the range within each of the five seasonal periods. Expansion of the number of intervals beyond five made the data more difficult to interpret because the coarseness of the 15-km pixels greatly reduced the number of pixels displayed for any interval as the number of intervals was increased beyond five.

4.1 CURRENT CLIMATE ANALYSIS

The current period figures for the annual average precipitation and temperatures (Figure C-5-1 and Figure C-5-8 were visually compared to the PRISM climate maps for the 1971 to 2000 period. RegCM3 appears to produce patterns similar to the PRISM maps across the ecoregion. The patterns depicted in these two figures generated using the RegCM3 data also closely matched the locations of geographical features and the boundary of the Middle Rockies ecoregion. Due to the large elevation range in the Middle Rockies ecoregion there were corresponding broad ranges in temperature and precipitation within the boundaries of this ecoregion. The expanded ranges in the buffer region made it impossible to graphically present the data using a single scale so thresholds (temperature floors and precipitation ceilings) were determined empirically and then used to mask out the outliers in the buffer region. The great majority of the masked pixels are depicted in the Middle Rockies ecoregion climate change figures.

4.1.1 Precipitation and SWE Patterns

The general precipitation pattern is presented on Figure C-5-1. The general precipitation pattern for the mountainous areas of the Middle Rockies ecoregion is for storms to begin moving through the mountains of the western part of the ecoregion in September and October with the majority of the precipitation falling in the November through February and the March and April periods. This pattern changes eastward due to precipitation shadows east of the western ranges and due to seasonal changes that shift to predominately warm season precipitation in May, June, July, and August in the Black Hills. The Absaroka Range in northwestern Wyoming and south central Montana experiences the beginning of this trend which becomes more apparent in the Bighorn Range in central Wyoming.

4.1.2 Temperature Patterns

The mean annual temperature for current climate trends in the Middle Rockies is presented in Figure C-5-8. Interestingly, the RegCM3 shows the mountain ranges in central and western Wyoming and those along the southwestern border of Montana being significantly colder the ranges to the north and the Black Hills in every season. The 15-km pixel resolution of the data did not permit visualization of temperature fluctuations in the inter-mountain basins and valleys. Model outputs show the basin and range area to the southwest of the ecoregion and the basins and plains along the eastern border of the ecoregion being potentially significantly warmer than the majority of the Middle Rockies ecoregion.

4.2 FUTURE CLIMATE ANALYSIS

4.2.1 Precipitation and SWE Patterns

In general, the RegCM3 model for the annual data, as presented on Figure C-5-1, indicates that the western and northern mountain ranges could experience a modest increase in annual precipitation. In addition, the data indicate that the Wind River Range, the Owl Creek Mountains, and the Bighorn Range could experience a modest decrease in precipitation with the basins remaining relatively unchanged.

During March and April, the output presented on Figure C-5-2 indicates slight increases in precipitation in the mountains throughout the ecoregion while the data show precipitation in the basins remaining mostly unchanged. Also, during May and June (Figure C-5-3), the data show slight increases in precipitation in the mountains throughout the ecoregion while the precipitation in the basins remains mostly unchanged. The data further indicate that the highest elevations in the southern Bighorn Range could experience a significant drop in precipitation through the 2060 period.

Climate change model outputs for July and August for the Caribou Range, the Lost River Range, the Lemhi Range, and the Beaverhead Mountains in Idaho and the Teton Range show slight increases in precipitation (Figure C-5-4). The data also indicate that the Wyoming Range, the Absaroka Range, the Wind River Range and the Bighorn Range could experiences a significant decrease in precipitation. Model outputs for the Black Hills indicate potentially significant decreases in precipitation representing a significant amount of its wet season precipitation during a period with high evapotranspiration rates.

For September and October (Figure C-5-5), the model data indicates that most of the mountain ranges could receive slightly less precipitation although the effect in the Lost River Range, the Lemhi Range, and the Beaverhead Mountains of Idaho will be relatively greater as will the effect in the basins lying between those ranges and that areas of the Black Hills could receive a slight increase in precipitation.

During November to February, the model indicates that the amount of precipitation could remain unchanged for most of the ecoregion (Figure C-5-6) except for the Caribou Range in Idaho and the Teton Range, which could receive a substantial increase in precipitation while the Garnet Range and Sapphire Mountains of Montana might experience a slight decrease in precipitation.

Based on the RegCM3 data presented on Figure C-5-7, the most northern ranges such as the Sweet Grass Hills as well as the Black Hills at the eastern margin of the ecoregion might not necessarily experience a change in April SWE. Data show that the western ranges in Montana from the Big Belt Mountains westward to the Anaconda Range could experience significant decreases as could the ranges from the Wyoming Range westward to the Lost River Range in Idaho. The model shows the Absaroka Range, the Wind River Range, the Beartooth Mountains, and the Bighorn Range could be especially affected with losses of over 1,000 millimeters of SWE on the highest peaks such as Hazelton Peak in the Bighorn Range.

4.2.2 Future Temperature Patterns

As presented on Figure C-5-8, the RegCM3 data indicate that most of the ecoregion could experience a mean annual temperature increase of between 1.9 to 2.4^{0}C. The March to April seasonal period is especially important because of its effect on April SWE. There are three critical effects as presented on

Figure C-5-9. First, the data show that actual mean temperature for the colder mountain ranges in central and western Wyoming and those along the southwestern border of Montana could increase from below zero to zero^0 C likely resulting in more frequent freeze thaw cycles. Second, the data show that the higher elevations could experience increases of 3 to 5^{0}C while the highest peaks in the Bighorn range could experience up to a 6.7^{0}C increase. Third, while the general increase for the entire ecoregion could be between 1.1 to 3^{0}C during this seasonal period, the areas where the increases are at the higher end of the interval would be adjacent to the highest peaks. The model shows an interesting pattern of cooling temperature on the eastern slopes of the Wind River Range and the Bighorn Range.

During May and June, the data show that most of the ecoregion could be 0.6 to 3.3^{0}C warmer (Figure C-5-10) with the colder mountain ranges in central and western Wyoming and those along the southwestern border of Montana potentially increasing from zero to above-zero ^{0}C. This increase, while not as great as that of some other seasons, is important because it occurs during the warm wet season. With warmer temperatures plant growth could start earlier in the year and evapotranspiration rates would increase. These increased evapotranspiration rates would especially affect the Black Hills because it is primarily a warm precipitation-dependent area.

The future climate patterns for July and August are presented on Figure C-5-11. This is a season of convective storms and temperatures in the mountains are predicted to increase from 3.1 to 5^{0}C at middle elevations and from 5.1 to 8.7 ^{0}C at higher elevations. If this happens, these increases would significantly increase evapotranspiration rates and reduce the water content of dead vegetation and litter. Both conditions could likely increase water stress in plants and provide more flammable materials for wildfires.

The RegCM3 data for September to October (Figure C-5-12) indicate that most of the ecoregion could be 1.1 to 3^{0}C warmer with potential increases up to 7.2^{0}C in the higher areas such the Teton Range, the Wyoming Range, the Wind River Range, and especially in the Bighorn Range. For the November to February timeframe, the data show similar increases to that for the September to October period with potential increases of up to 6.2^{0}C in the higher mountain ranges (Figure C-5-13).

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5.0 MANAGEMENT QUESTIONS

Although some of the original MQs were specific to the CAs, all of these are addressed in the specific CE packages contained in Appendices D and E. The individual KEA maps and the resulting overall current status output contained in these appendices answer all of the MQs specific to CAs.

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APPENDIX C-5

FIGURES

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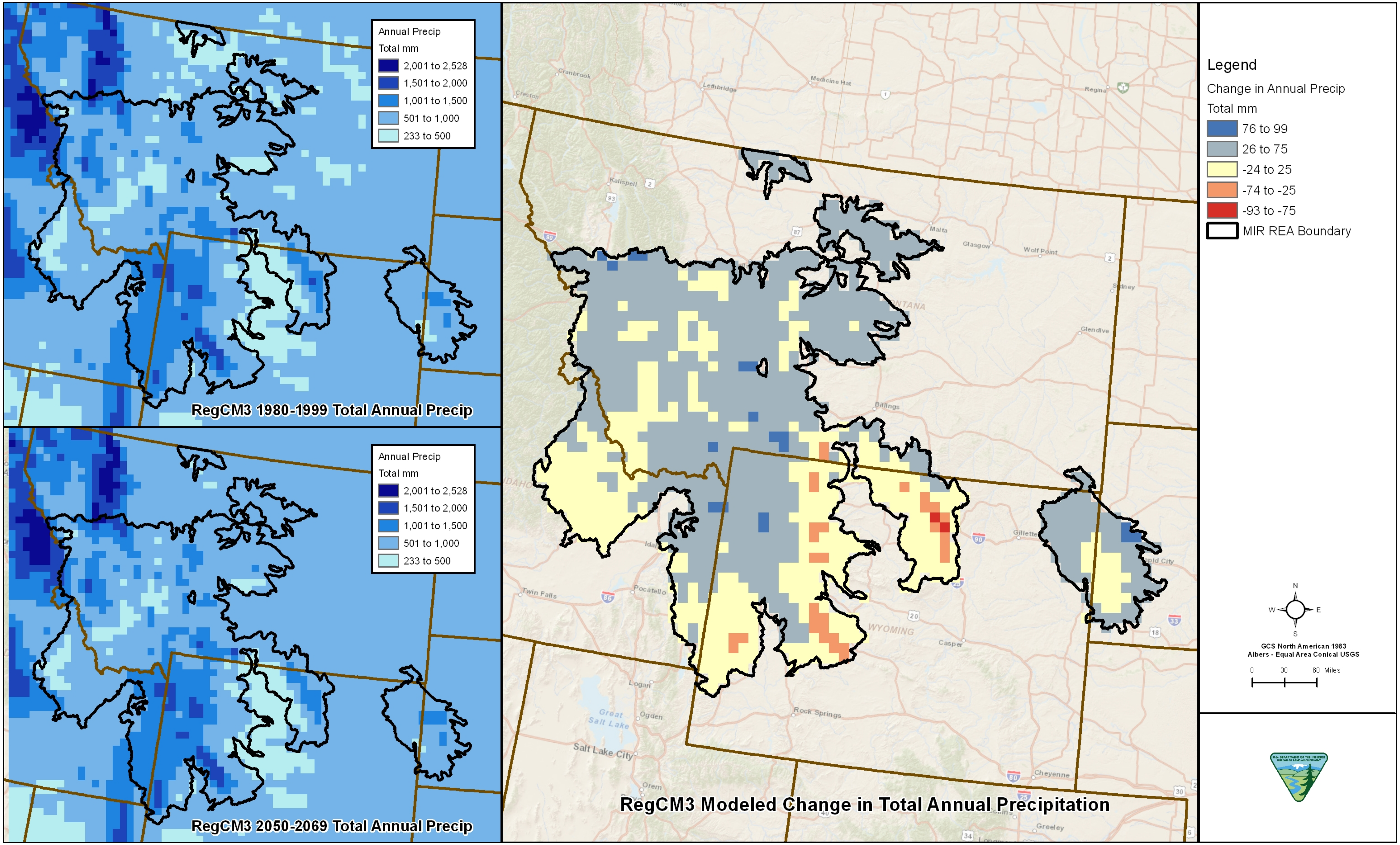

Figure C-5-1. Annual Precipitation

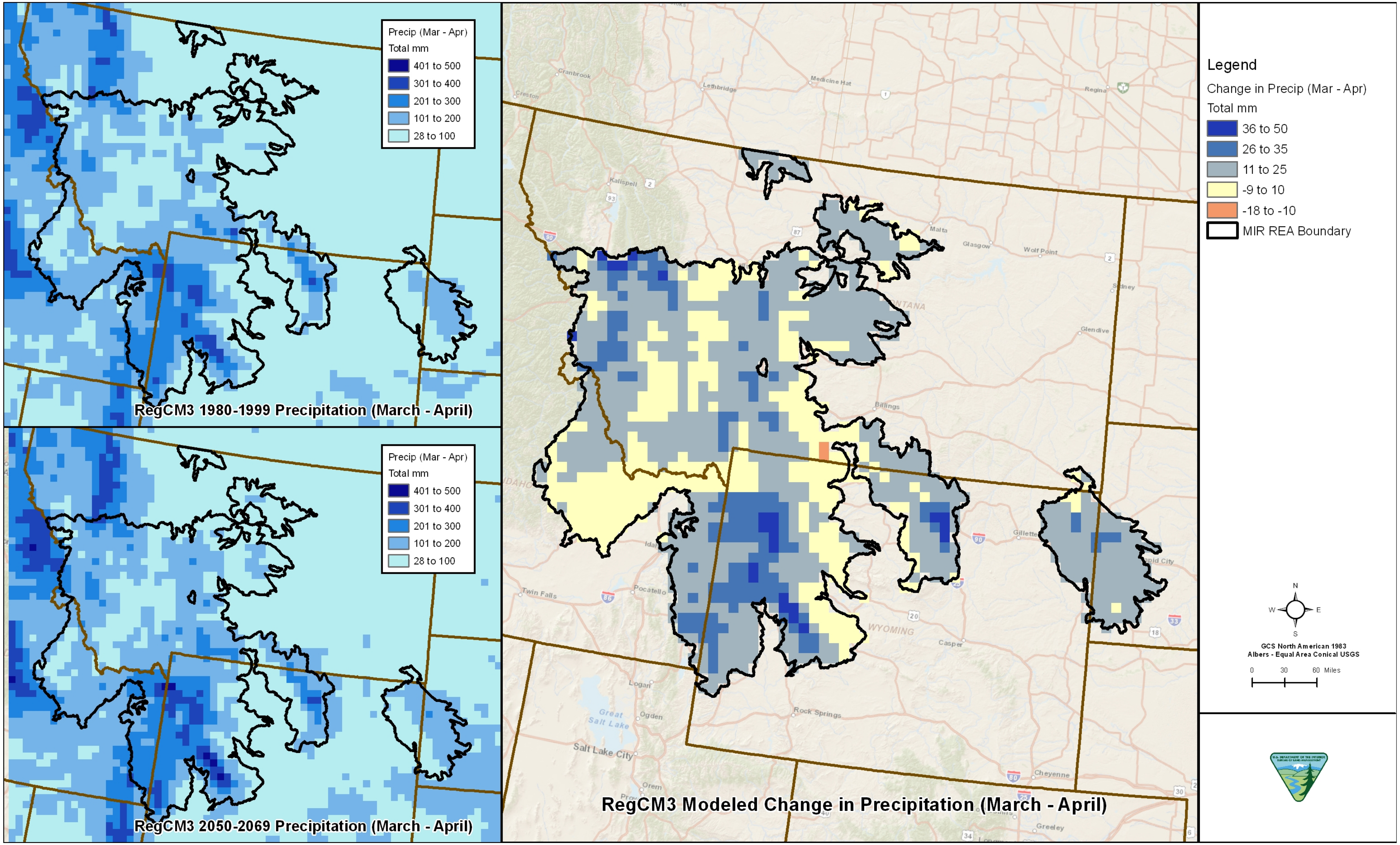

Figure C-5-2. Precipitation March and April

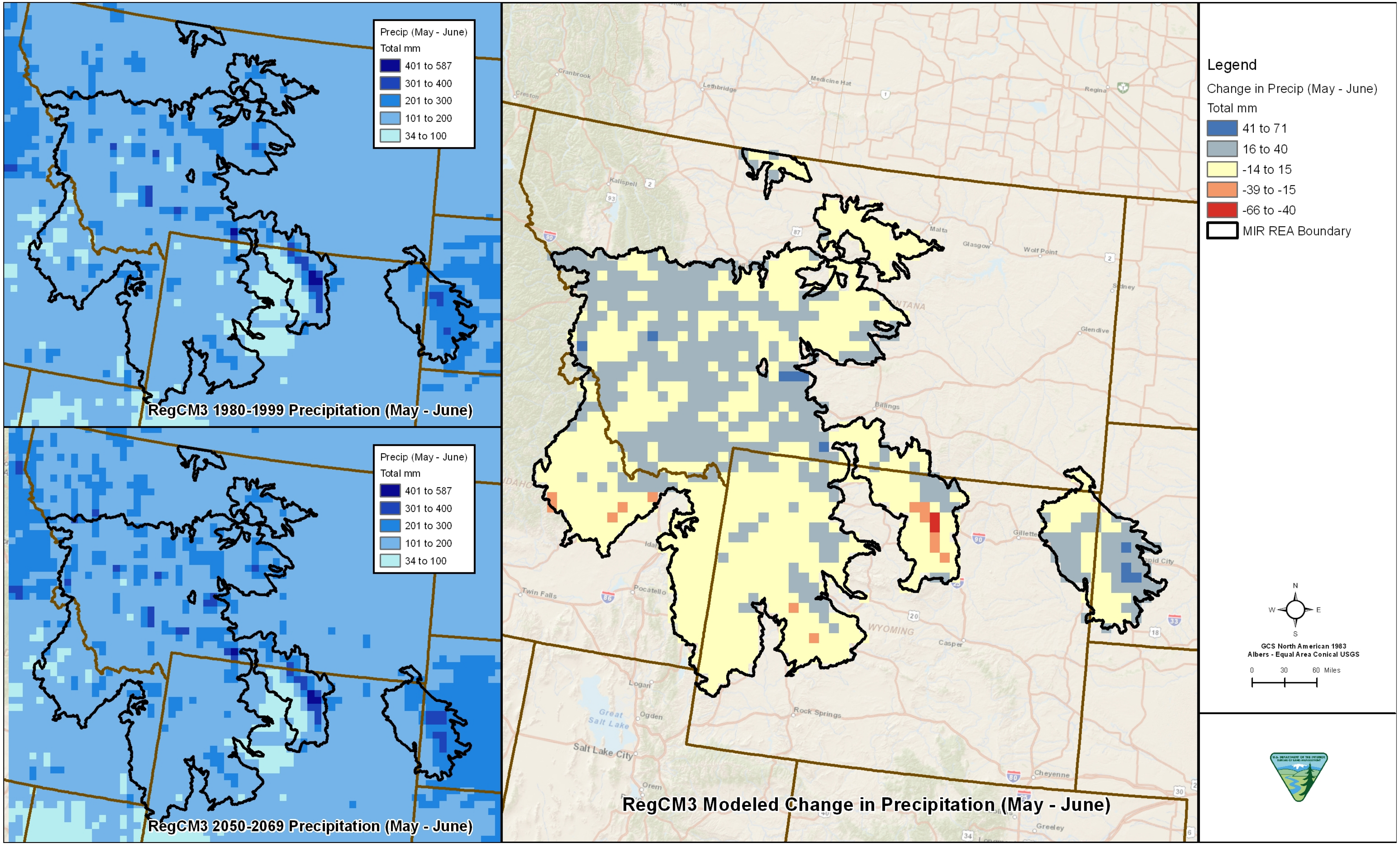

Figure C-5-3. Precipitation May and June

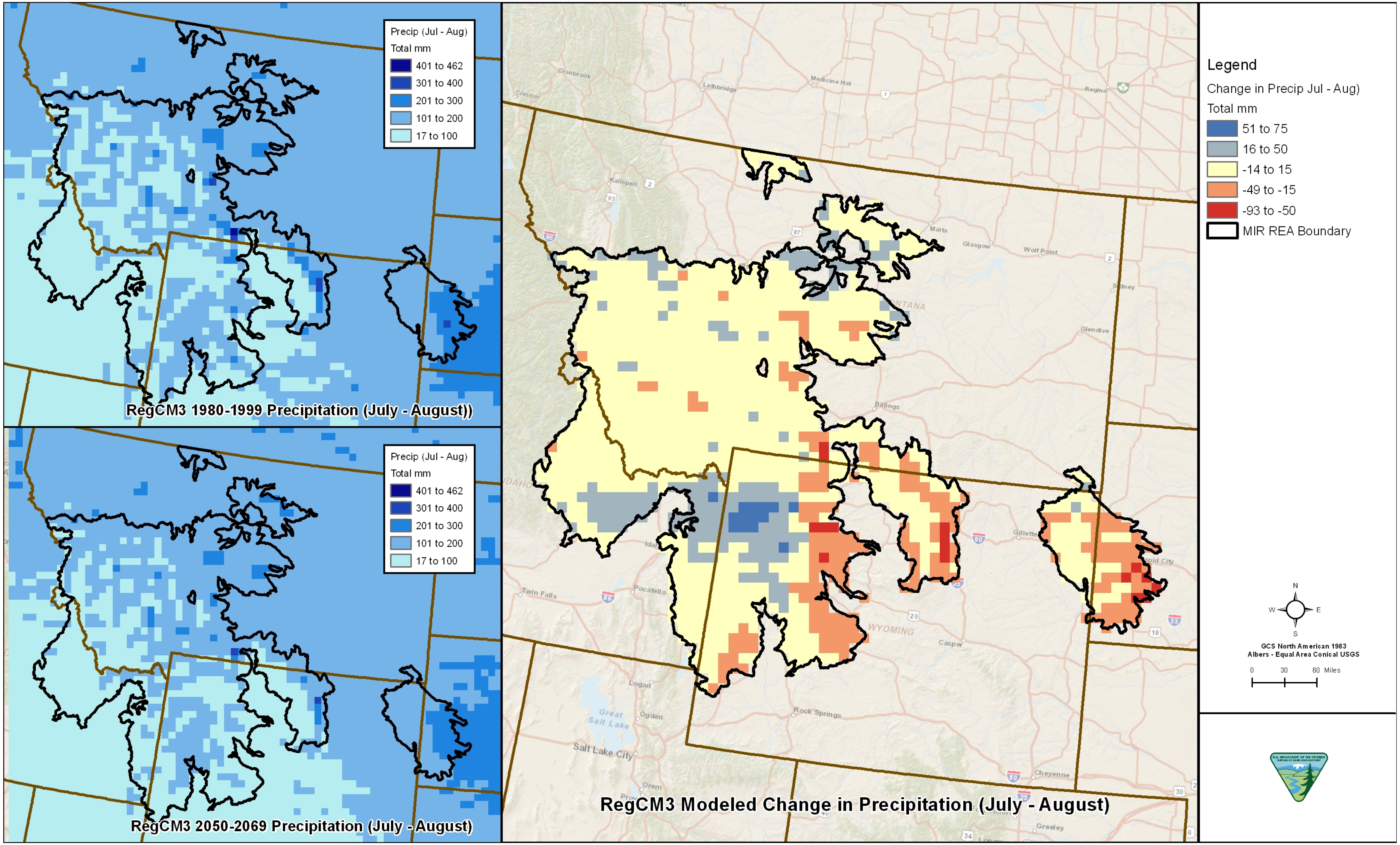

Figure C-5-4. Precipitation July and August

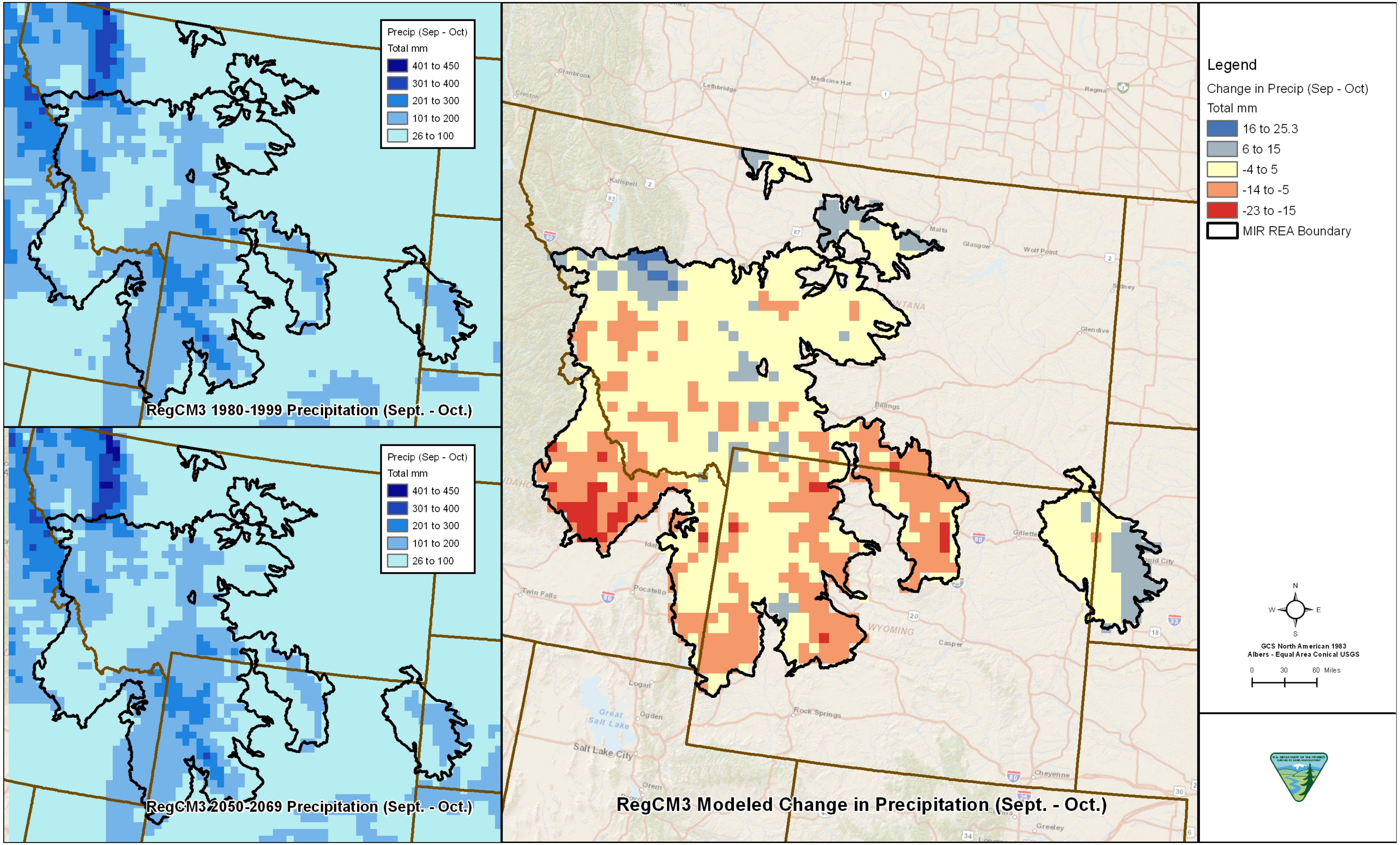

Figure C-5-5. Precipitation September to October

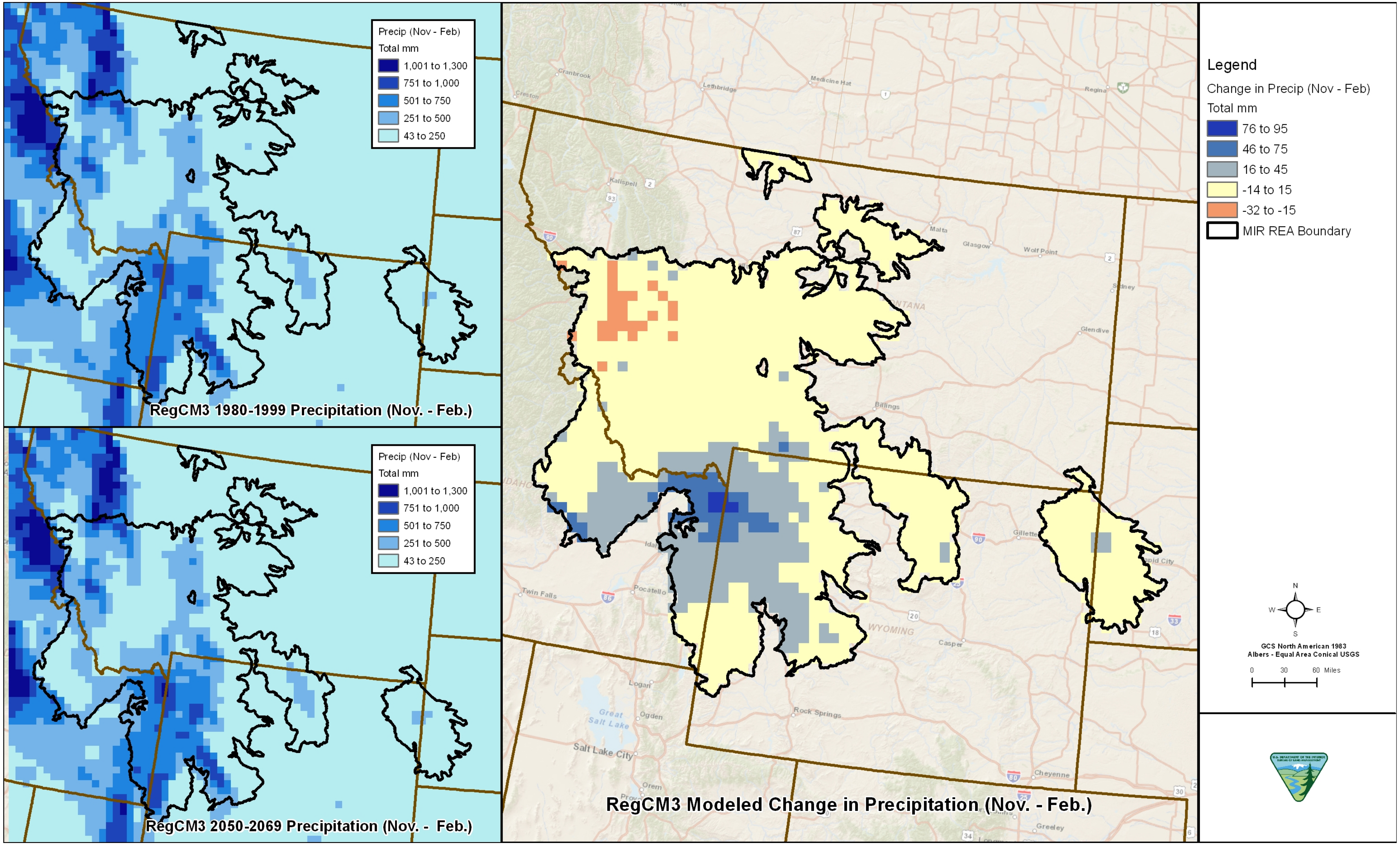

Figure C-5-6. Precipitation November to February

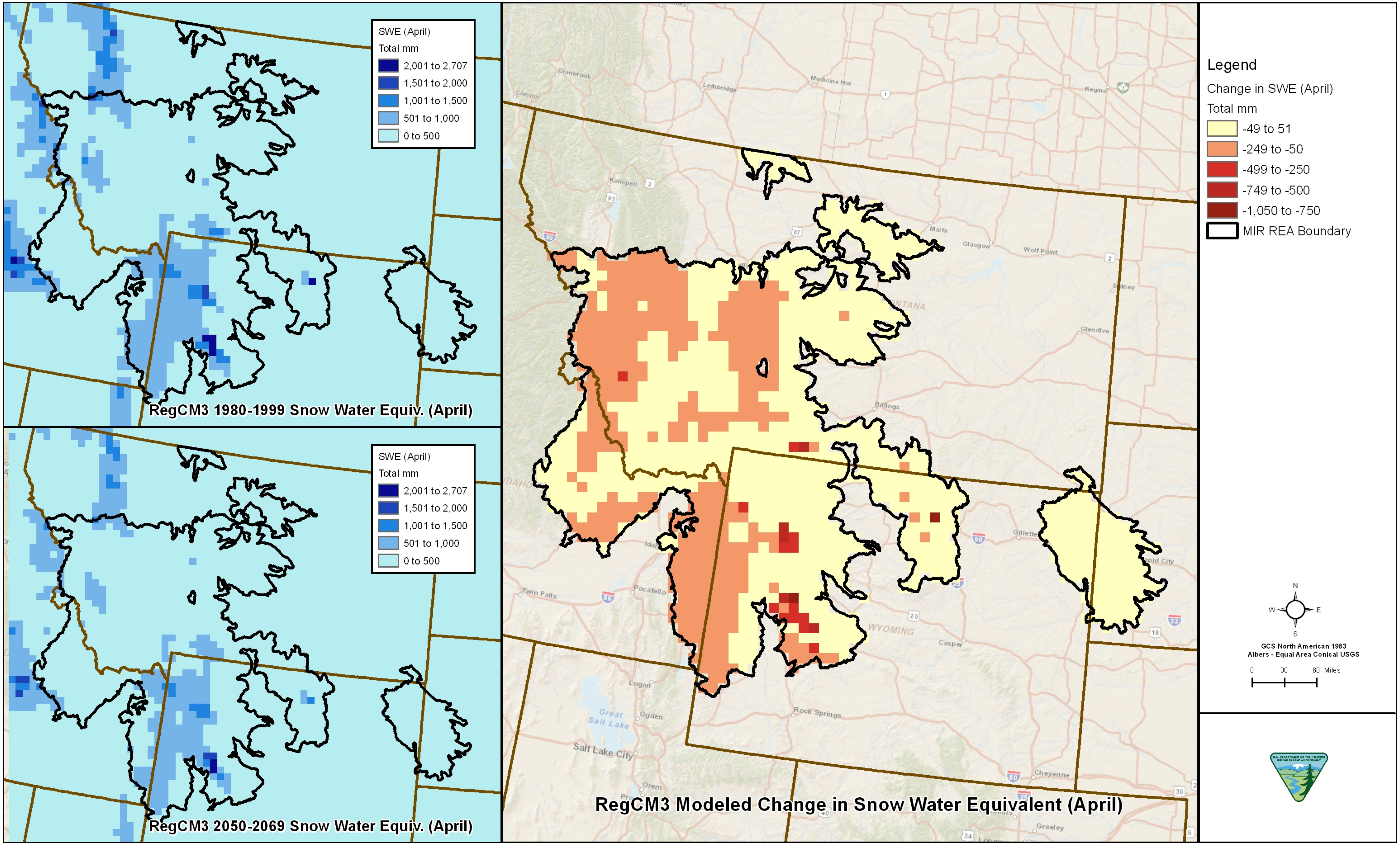

Figure C-5-7. Snow Water Equivalent (April)

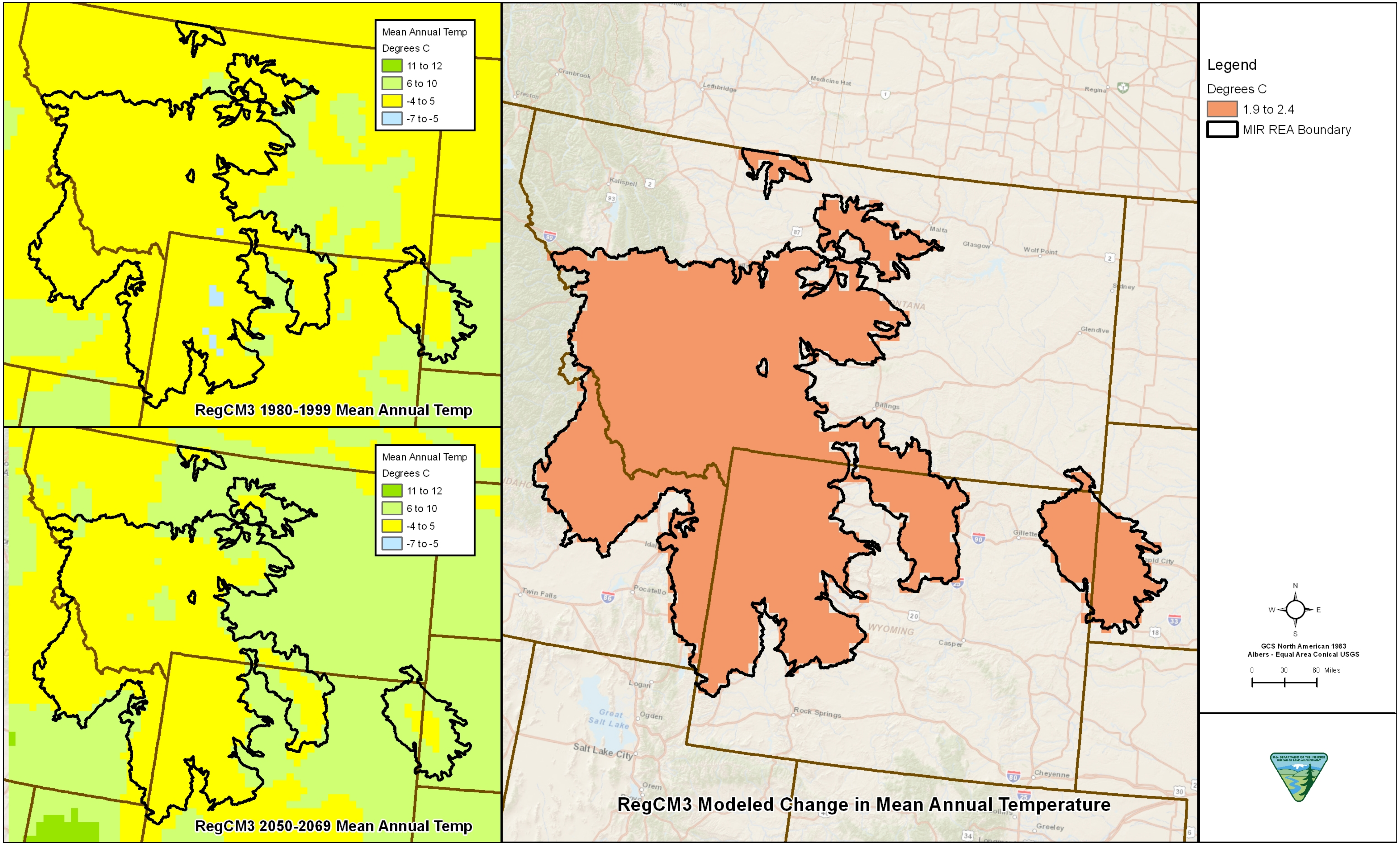

Figure C-5-8. Annual Temperature

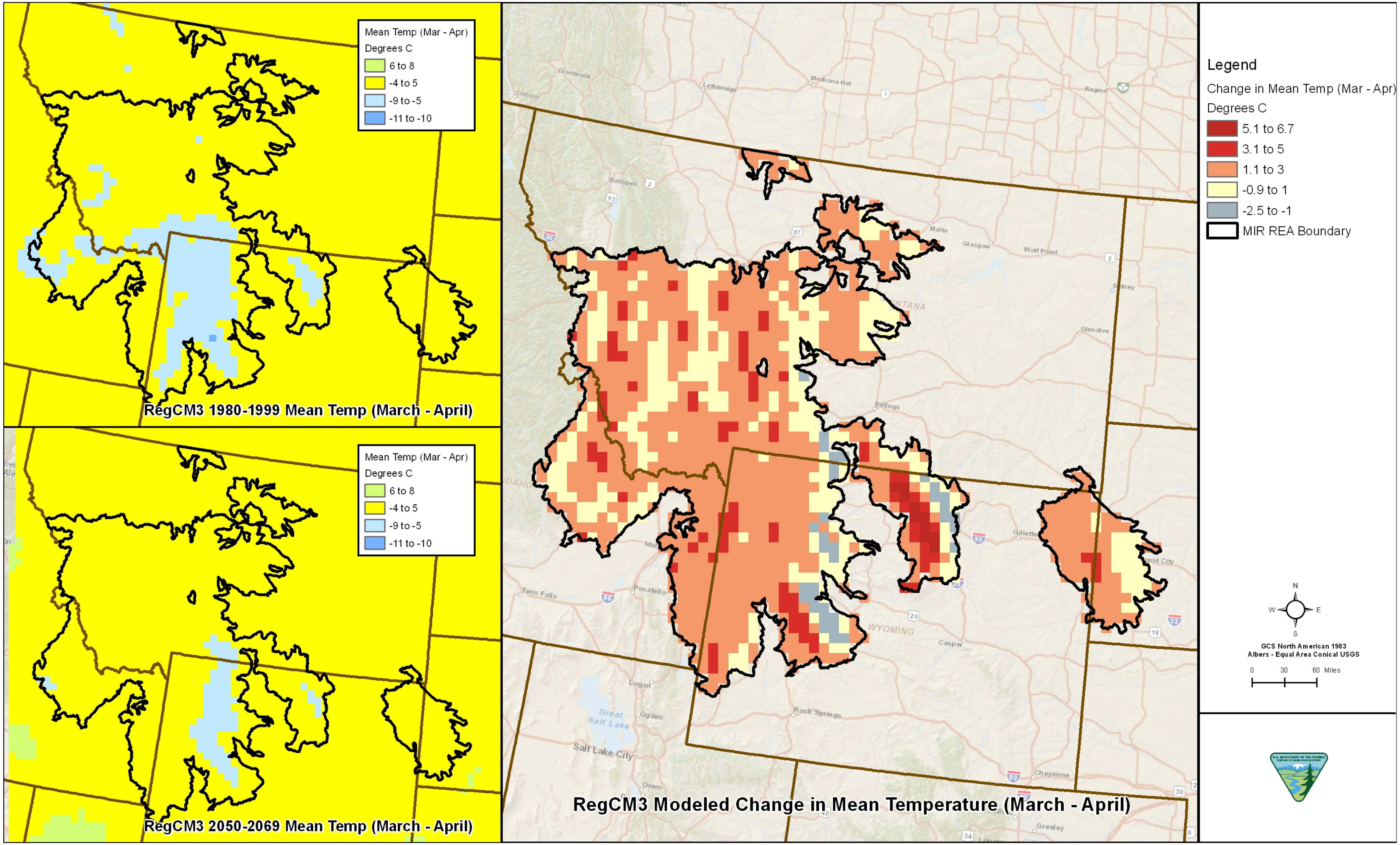

Figure C-5-9. Temperature March and April

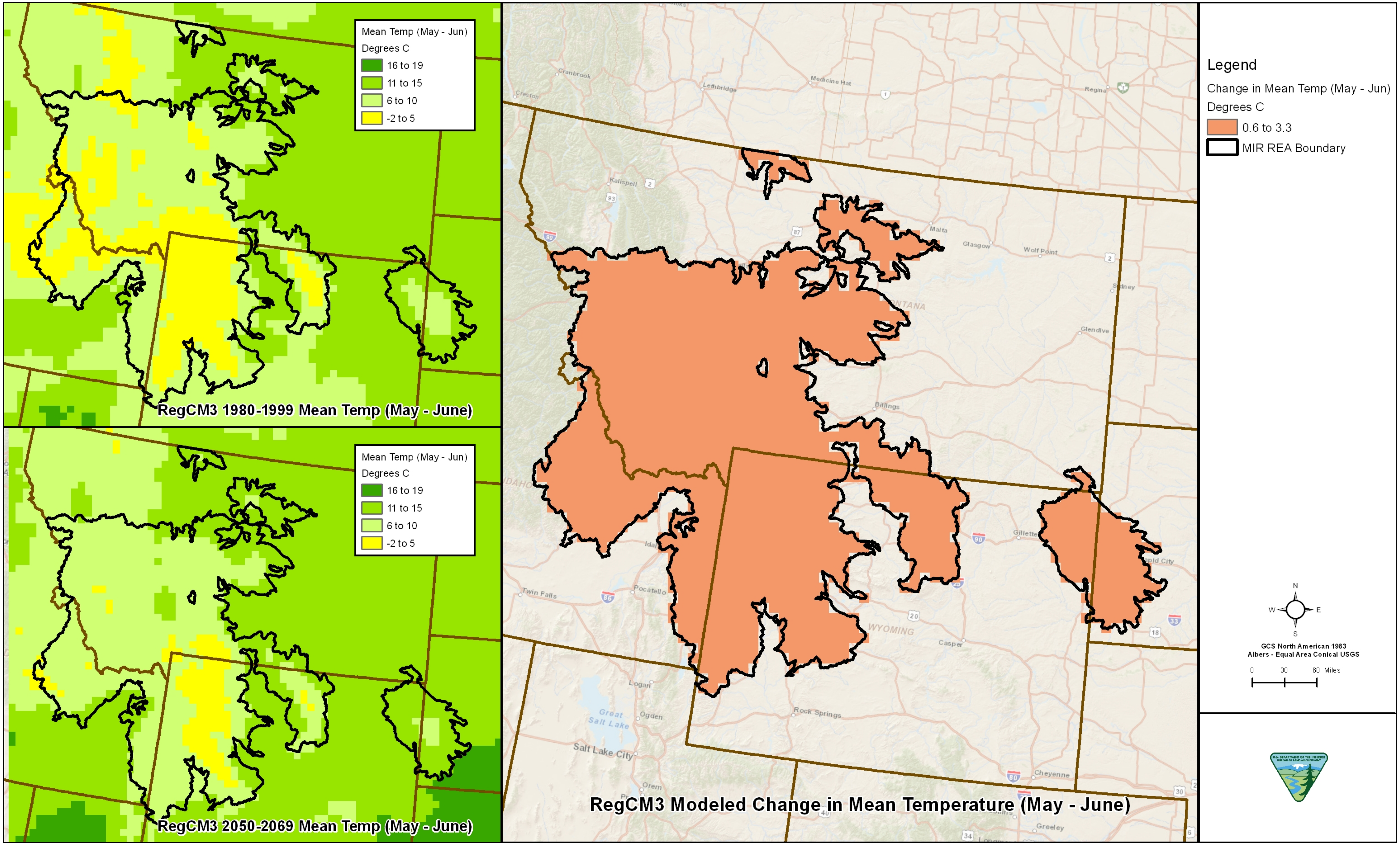

Figure C-5-10. Temperature May and June

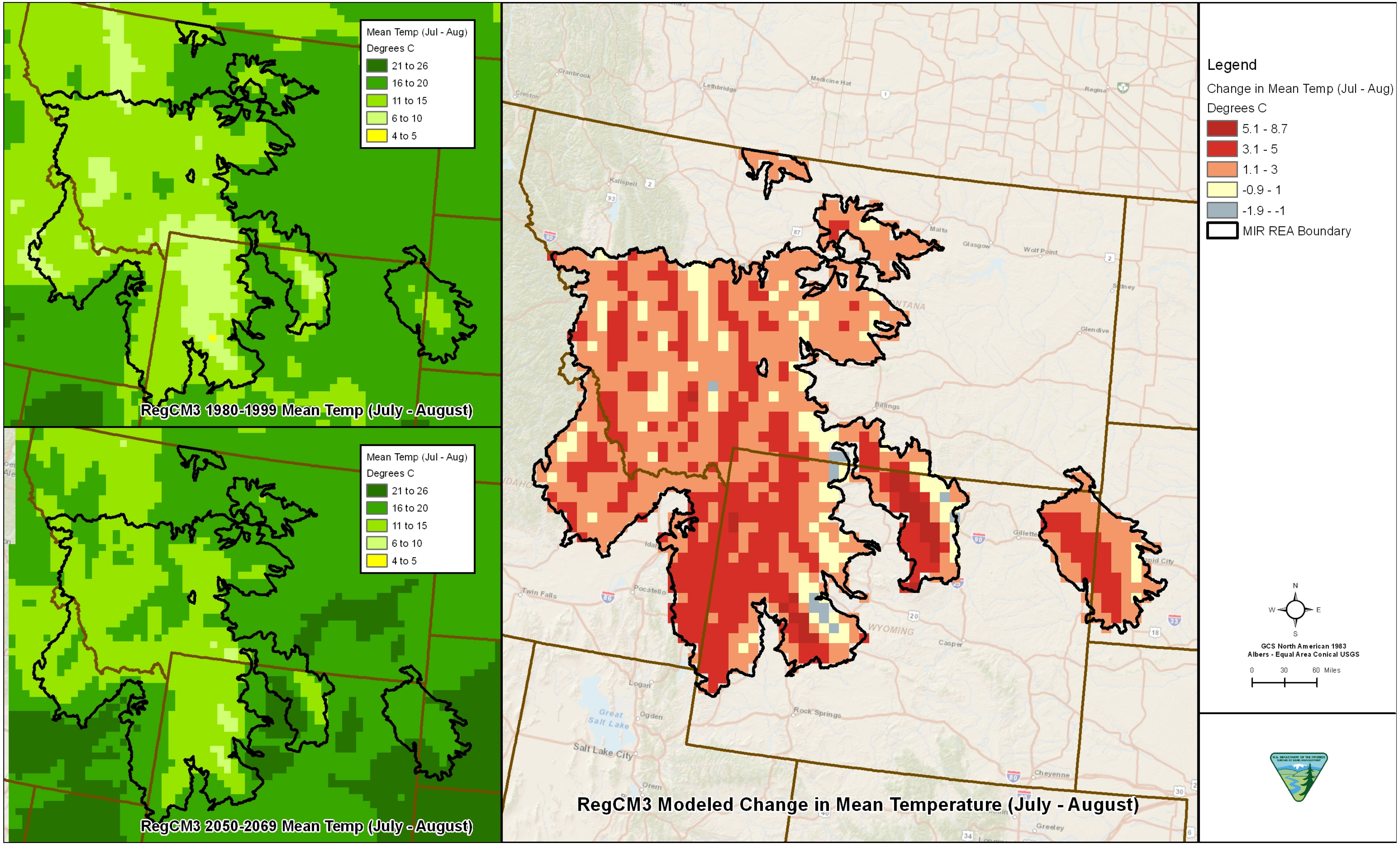

Figure C-5-11. Temperature July and August

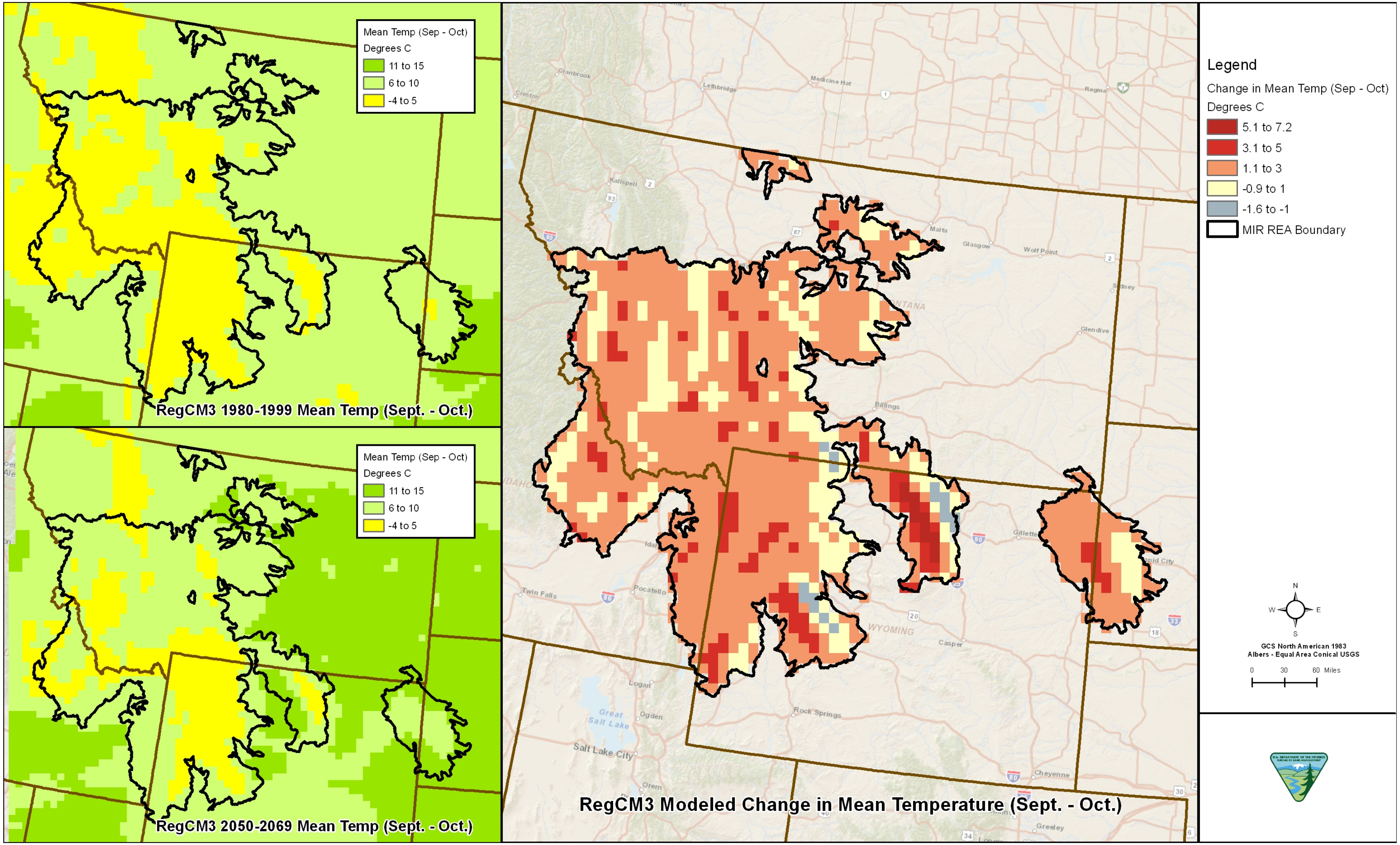

Figure C-5-12. Temperature September to October

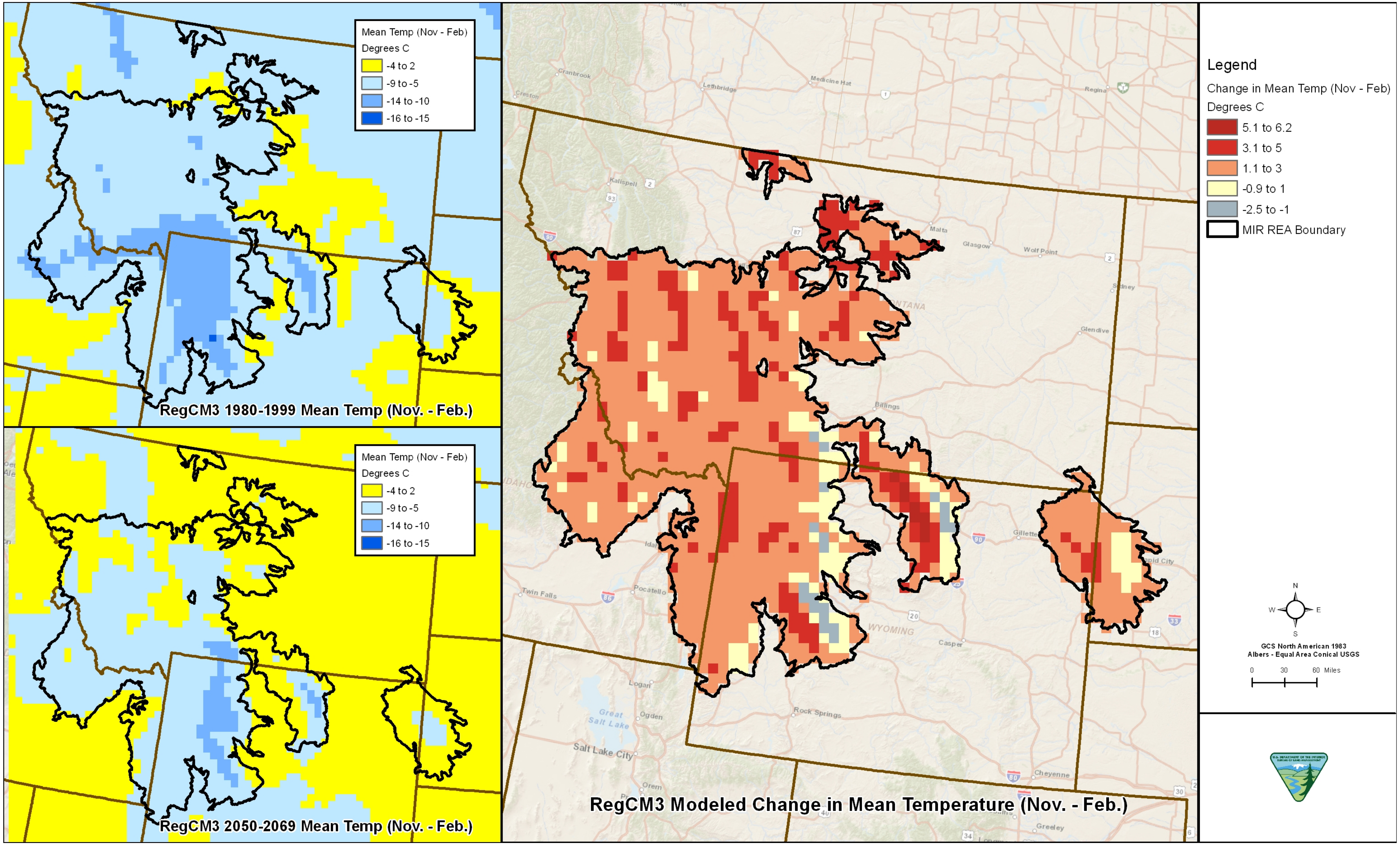

Figure C-5-13. Temperature November to February