

Acronyms used in this Report

AAFC	Agriculture and Agri-Food Canada
AAMD&C	Alberta Association of Municipal Districts and Counties
ACIS	AgroClimatic Information Service
ADMC	Alberta Drought Management Committee
ADRMP	Agriculture Drought Risk Management Plan
AENV	Alberta Environment
ARD	Alberta Agriculture and Rural Development
AFSC	Agriculture Financial Services Corporation
BMP	Beneficial Management Practices
CAIS	Canadian Agricultural Income Stabilization program
DAG	Drought Advisory Group
EFP	Environmental Farm Plan
GDP	Gross Domestic Product
GIS	Geographic Information System
NRT	near real time
RTW	Ropin' the Web

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Executive Summary

Although drought can begin slowly and subtly, experience has proven it can have as significant an impact as other, more dramatic disasters. In the past, crisis management led to reactive measures and emergency responses that were costly and often provided only short-term solutions. In contrast, the 2010 Agriculture Drought Risk Management Plan (ADRMP) focuses on planning and preparedness measures; a risk management approach. Risk management not only reduces the impact of drought on producers in the short and long term, it is also more fiscally responsible and a better fit under global trade rules that can penalize agriculture programs. Many of the strategies and actions presented to reduce the effects of drought may also be used to mitigate the effects of extreme weather events.

ADRMP 2010 continues to provide a framework for a coordinated, pro-active approach to reduce the short- and long-term effects of drought and of climate change on Alberta farmers and ranchers. It will guide government agencies in assisting producers to more effectively reduce the impacts of drought before, during and after a drought event, and will help agricultural producers to be more prepared and less vulnerable to drought.

The ADRMP is built upon the province's experiences with drought and government responses, beginning with the mid-1930's *Prairie Farm Rehabilitation Act*.

The Alberta government has a number of strategies and initiatives aimed at climate change, sustainability and land use, which are important to our understanding of and response to drought. Within the partnering

agencies of the ADRMP, strategies and initiatives have continued to grow in sophistication and application. The intent is to continue with the three strategies of preparedness, monitoring and reporting, and response. Throughout the implementation of the ADRMP strategies, awareness of and alignment with the other policy frameworks of government will promote the adaptability of the ADRMP.

Farmers and ranchers manage operations in an increasingly uncertain world. ADRMP reports, maps and interactive web tools help farmers make informed business decisions. Risk management strategies described in this document are available not only for farmers and producers, but also for government. The idea behind this approach to drought and weather extremes is to expect the events and plan around them, rather than regard them as crises requiring ad hoc measures. There is an art and science behind the decisions producers and government make for each short- and long-term situation.



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The 2010 Revised ADRMP

The Government of Alberta released the Agriculture Drought Risk Management Plan (ADRMP) in 2001. Its Drought Action Plan promoted a consolidated and science-based approach to managing the effects of drought in Alberta. Since that time, not only has the science improved, but understandings of climate change, the limitations of our water resource, changing agricultural practice, and our learnings from the ADRMP have prompted the reissuing of the plan.

This revised version is in alignment with the many other government action plans (described under the Policy Considerations heading) that are being developed and implemented to address environmental, economic and social sustainability.

The 2010 ADRMP key strategies address drought preparedness, monitoring and reporting, and response. The management plan acknowledges that drought is a recurring phenomenon in Alberta. ADRMP 2010 is government's management plan for working together with producers to plan for, mitigate the effects of, and adapt to drought on agricultural industries.

This plan's foundation is built from understandings and responses to drought that have been recorded since the mid-1930s. A brief history of government's partnership with producers since that time highlights the evolution of government response, from using ad hoc programs to today's reliance on risk management. Current risk management approaches will continue to shape our management of drought in the coming years.

Continued improvement of the 2010 ADRMP is intended through annual review.



Agricultural Drought Program History in Alberta

Although southern Alberta is more likely to be affected by drought, other areas of the province experience drought as well. The two most significant droughts occurred from 1929 to 1937 (the Dirty Thirties), and from 1983 to 1988. Scientists say the 1980's drought was more severe than the Dirty Thirties, but the impacts were less due to improved soil conservation methods, better economic times and government assistance programs in place. The current ADRMP formalizes the efforts to continue to improve drought preparedness and response. Other droughts have occurred since the 1980s, including droughts in southern and northeastern Alberta in the 1990s, across the entire province in 2001 and 2002, in the Peace Region in 2008, and in the Central and Northern Regions in 2009.

In the mid-1930s, the *Prairie Farm Rehabilitation Act* was put in place by the federal government to assist in land reclamation, soil conservation and water management strategies. Early programs included construction of water sources, expansion of irrigation districts and shelterbelt plantings. More recently, the Permanent Cover Program was implemented to encourage farmers to seed drought-prone land to forage. On behalf of Canada Revenue Agency, Agriculture and Agri-Food Canada (AAFC) currently administers the federal Tax Deferral Program for farmers who are forced to sell breeding stock due to drought.

The severe drought during the 1980s resulted in an era of ad hoc programs for farmers. Programs put into place in the 1980s, 1990s, and early 2000s covered crop yield loss, livestock feed, water shortages, conservation planning, financial counseling and interest-free loans.

In 1990, the Drought Working Committee, made up of representatives from Agriculture Financial Services Corporation (AFSC) and Alberta Agriculture and Rural Development (ARD), convened. The committee assessed the impact of the multi-year drought in southeastern Alberta and developed the Southeastern Alberta Disaster Assistance Program.

Continuing drought in the mid-1990s prompted requests by industry for an improved safety net package and a long-term plan to deal with drought. As a result, the Drought Working Committee formed the Drought Plan Development Team. The team, called the Alberta Drought Management Committee (ADMC), had representation from ARD, Alberta Environment (ENV) and Agriculture and Agri-Food Canada (AAFC), and Association of Alberta Municipal District and Counties (AAMD&C) and its efforts resulted in this revised ADRMP.

Dry conditions that affected Alberta producers in 2009, and that could threaten production in the 2010 season, have resulted in a shift in the membership and focus of the committee, and the evolution of the ADMC into the Alberta Drought Advisory Group (DAG). Significant changes are the inclusion of industry representation and a revised mandate.

Introduction

Agriculture is usually the first industry to show the effects of drought through low crop yields and dugout levels. Droughts that persist over two or three years begin to deplete groundwater supplies; lower stream, river and lake levels; and reduce runoff in major watersheds. Once major bodies of water are affected, municipalities and other industries such as recreation and tourism, fisheries, and transportation must also deal with the effects of drought.

The variability of climate and weather conditions is a key factor in agricultural production. These conditions change from year-to-year and are projected to change even more in the future than they do currently. Many scientists believe that climate is undergoing significant global change, with increase in both local and regional variability.

Adaptation to climate and weather risk is implicit in the ongoing development of the agri-food sector. Agricultural systems have evolved to cope with some variations in climatic conditions, but may be vulnerable to extremes such as high winds, excessive or insufficient precipitation, hail, or extreme temperatures. This updated ADRMP builds upon the original key strategies to better manage the risks of drought and climate change during three defined situations: 1) normal or near normal conditions, 2) exceptional / notable conditions; and 3) extreme conditions.

Each farm needs minimum amounts of rainfall at various times to continue functioning normally. Anything less than the minimum will mean that a change in planning and decision-making is required. The critical amount and timing will depend on stored soil moisture

reserves, the specific crop, pasture or livestock. An action plan can be established that can include response and/or decision times.

In the past, governments have often hesitated to act due to differing opinions on what constitutes a drought. Such hesitation can hinder the mitigation of the impact of drought before it becomes a crisis. For this reason, actions under the ADRMP start long before a severe drought occurs. When drought conditions are indicated by the various monitoring systems, specific actions may be triggered depending on the severity of the conditions.

What Can We Expect in the Future?

Planning for drought is a dynamic process that evolves through trial and error. As we continue to learn about the regional and continental scale of weather and climate dynamics and its effect on the water and energy cycle over the province, the ADRMP will adapt. Planning for drought may be linked to planning for climate change because increased risk of drought for Alberta producers is likely as climate changes.

Drought and climate change are not problems to be solved; rather, they are risks that must be managed.

Background

There is no definitive definition of drought. Research in the early 1980s uncovered more than **150 published definitions of drought**. The definitions reflect differences in regions, needs, and disciplinary approaches.

There is a huge range in the perception of drought. Some people may have a “feeling” that they are in drought after just a few weeks of no rain; whereas, others may consider that there is a drought only if the paddocks are totally denuded of grass. Perception of drought depends on the individual's experiences and the climatic region where they live.

Drought is commonly considered to be a deficiency of moisture when compared to some normal or expected amount over an extended period of time.

Some repercussions of drought include:

- Decreased agricultural production: crops, livestock, range / pasture
- Decreased water supplies: wells, dugouts, streams, lakes, wetlands
- Increased fire
- Increased pests, such as grasshoppers
- Long-lasting effects: soil erosion (wind, water)
- Multi-sector effects resulting in:
 - o Decreased employment
 - o Net farm losses
 - o Decreased GDP

These repercussions may be complicated by overgrazing and tillage practices.

For the purposes of this plan, “Drought” is defined as an extended period of below-normal precipitation resulting in decreased soil and subsoil moisture levels and diminished surface water supplies affecting crop growth, livestock water or irrigation water.

Policy Considerations

Managing Alberta's periodic droughts today involves working within policy directions in support of integrated management systems that sustain the environment while promoting economic growth. Recent related initiatives include the *Land-use Framework*, *Water for Life*; and the *Climate Change Strategy*. The integration of environmental policy will help to ensure Albertans are well-prepared to address the challenges of the future.

These strategies and policies may influence how Alberta producers use land and water resources. This in turn affects drought management decisions. A brief introduction to some of these strategies follows.

[Land Use Framework](#)

The purpose of the Land-use Framework is to manage growth, not stop it, and to sustain our growing economy, while balancing Albertans' social and environmental goals. The framework recognizes that there are more and more people doing more and more activities on the same piece of land.

The Land-Use Framework makes direct reference to drought, saying that the ability of communities to adapt and respond to changing climate and environmental events, such as drought and flood, is a guiding principle for all decision-makers under the Framework.

[Water for Life](#)

Three goals of the provincial water strategy are: safe, secure drinking water supply; healthy aquatic ecosystems; and reliable, quality water supplies for a sustainable economy. Attaining these goals, in part, depends upon Albertans sharing a new perspective that water is a scarce

resource. This is equally true for the success of the ADRMP.

The Water for Life Action Plan, released in November 2009, acts as a road map to achieving the goals and key directions of the strategy for the next ten years. Key actions within the Action Plan that address potential impacts from drought include:

- reviewing and renewing Alberta's current water allocation system;
- addressing the risks of climate change impacts on Alberta's water supply;
- setting water conservation objectives for all major basins; and
- develop and implement water conservation, efficiency and productivity plans for the largest water using sectors in the province and includes agriculture.

[Climate Change Strategy 2008](#)

The Climate Change Strategy 2008 recognizes Alberta as one of the world's largest energy suppliers of oil and gas. The strategy also recognizes the complementary relationship between mitigation and adaptation and the need for coordinated efforts. In that regard, the strategy focuses on three main goals: to implement carbon capture and storage, to "green" energy production, and to conserve and use energy efficiently.

<http://environment.alberta.ca/2430.html>.

Currently work is underway to complete a provincial climate change adaptation strategy in 2010. As part of this undertaking, the Government of Alberta is participating in the Prairie Regional Adaptation Collaborative (PRAC), an inter-provincial (Alberta, Saskatchewan and Manitoba) partnership that focuses on three key themes: Water Resource

Management, Drought and Excessive Moisture Planning and Terrestrial Ecosystems. Works in these interrelated themes will not only support Alberta's Cumulative Effects Management Policy, they will also provide insightful information and knowledge to support Alberta's adaptation strategy, particularly as they relate to current efforts to manage drought risk in the Agriculture sector.

[ARD Water Strategy](#)

The ARD Water Strategy outlines a path forward to continue assisting the agricultural industry to evolve towards a pro-active, drought-prepared industry rather than a reactive drought-responsive industry.

[Prairie Regional Adaptation Collaborative](#)

The Prairie Regional Adaptation Collaborative (PRAC) is supported by Natural Resources Canada (NRCan) to focus on the impacts of climate change and variability of prairie water resources. Although impacts are expected to be similar across Manitoba, Saskatchewan and Alberta, approaches, policy issues and engagement activities will vary from province to province. Alberta's deliverables include:

- Complete revised Agriculture Drought Risk Management Plan;
- Determine involvement of other Government of Alberta departments in a coordinated drought response;
- Share expertise in the development of an agriculture drought risk management plan with PRAC partners, and participate in the inter-provincial forum for data, information, and knowledge sharing.

[Growing Forward](#)

The Government of Alberta operates the [Growing Forward Program](#) through Agriculture and Rural Development. Growing Forward allocates funds for producers and processors to work towards implementing system plans that result in eco-efficiencies, such as energy efficiency; or which are focused on society's demands for safe, humanely produced, environmentally responsible food.

ARD's Growing Forward Program has three objectives: building a competitive and innovative sector, ensuring the sector contributes to society's priorities and, proactively managing risks; which include outcomes related to drought preparedness and management such as:

- Water Management – to develop and maintain sustainable water supplies;
- Environment – to help protect the resources that support your business.

Agriculture Drought Risk Management Plan

Vision

The ADRMP is a pro-active, effective, and fiscally responsible approach to mitigating the effects of drought on Alberta's agricultural areas.

Goals and Outcomes

The drought management planning and actions of government are:

- communicated to producers,
- coordinated and effective,
- consistent over time, and amongst departments, and
- drought monitoring and reporting is effective and timely, supporting planning and action.

Alberta's agricultural producers have access to, and use the knowledge provided, to manage risk associated with periodic drought; and are therefore more prepared and less vulnerable to drought.

The Drought Advisory Group

In an effort to draw on the best possible external advice for government to address the short and long-term implications of drought, and to oversee the implementation of the ADRMP, the standing multi-stakeholder Alberta Drought Advisory Group (DAG) was formed.

The DAG is co-chaired by ARD and AAAMD&C and reports to the Deputy Minister of ARD. Its membership is comprised from a cross-section of industry stakeholders including; ARD, AAMD&C, AFSC, ENV, AAFC, and the livestock, crop and irrigated crop sectors.

The intention of the DAG is to provide consistent and consolidated advice and recommendations to complement government actions on drought-related issues affecting the agricultural producers in Alberta; as well as advising and providing recommendations to government on long-term strategies for mitigating the effects of drought (and possibly low levels of precipitation and dry soil moisture as a result of climate change).

Working with industry organizations, the DAG will identify how to best assist producers in preparing for and coping with drought, and develop these discoveries into recommendations.

In addition to overseeing the implementation of the ADRMP, the DAG will provide advice on and input during the plan's review and evaluation.

Drought Management Actions

The ADRMP is supported by three approaches to action that are in turn linked to the three levels of moisture condition:

- drought preparedness
- drought monitoring and reporting; and
- drought response.

Drought Preparedness Actions

Drought Preparedness focuses on year-round efforts, especially during non-drought times, to increase the level of readiness of the agricultural community and government to respond to the next drought.

Drought Monitoring and Reporting

Drought Monitoring and Reporting includes ongoing monitoring, evaluation and reporting on soil moisture conditions, precipitation amounts, and temperature regimes in the agricultural areas of Alberta.

Drought Response Actions

Drought Response involves taking appropriate action during and immediately following a drought to reduce drought impacts on producers.

Drought Level or Moisture Condition

The levels of drought (moisture / hydrometeorological conditions) that are addressed in the Drought Action Plan, and that are used throughout the reporting mechanisms of the ADRMP, are threefold:

Normal or Near Normal Conditions

- Precipitation amounts and soil moisture reserves are near normal
- Crops and pastures are not showing moisture stress
- Temperature regime is near normal
- Normal releases from reservoirs

Exceptional / Notable Conditions

- The province or a portion of the province is operating under the potential for drought conditions
- Precipitation amounts and soil moisture reserves are moderately low to very low
- Crops and pastures are beginning to show moisture stress
- Declining stream flows and water shortages beginning to emerge
- Temperature regime may be higher or lower than normal

Extreme Conditions

- The province or a portion of the province is suffering drought; according to the indices
- Precipitation amounts and soil moisture reserves are extremely low
- Crops and pastures are suffering moisture stress with significant yield reductions expected to occur
- Severe water supply deficits (very low stream flows, lake and reservoir levels) and severe water shortages are occurring
- Temperature regime may be extremely high or low

Drought Preparedness Actions

When drought occurs, farm managers are impacted not only by the drought, but by other aspects of the weather, the global economy, and the political will of various leaders responding to the drought conditions. In order to be prepared when drought occurs, farm

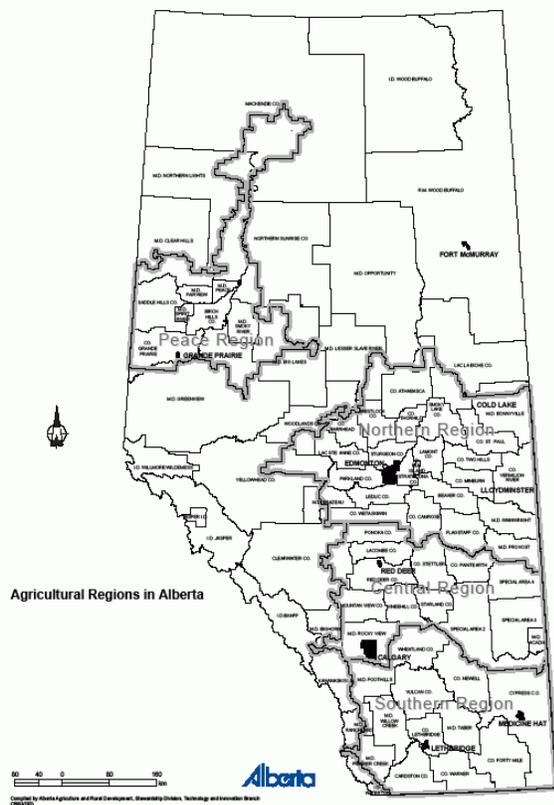
managers make the decision to use, or not to use, a number of drought mitigation tools as best fits their risk management plan. The following describes preparedness actions that may be undertaken.

Action	Agent
Goal: Actions before, during, and after drought are coordinated and effective.	
Participate in AFSC insurance and risk management programs.	Producers
Develop secure water supplies, water storage and distribution facilities to improve water supply security.	Municipalities and individual water users
Improve water conveyance efficiencies: agricultural, municipal and industrial water.	Municipalities and individual water users
Develop and use risk assessments for use in water development planning.	Alberta and federal government agencies
Goal: Producers are able to manage periodic drought; are prepared and less vulnerable to significant drought.	
Provide relevant and accessible drought preparedness and management information through: <u>Ropin' the Web</u> and other websites; newspapers, including AgriNews; television and radio; and seminars and school programs.	Producers Alberta and federal government agencies
Package existing information on drought management and water conservation to target specific agriculture sectors under various drought conditions.	
Promote water conservation to irrigation districts and private irrigators.	
Encourage the development of secure long-term water supplies.	
Form partnerships with the agricultural community, seed plants, and others to promote water conservation and drought management.	
Selection of crop type and varieties, choices in herbicide/pesticide/ fertilizer use, decisions about timing of planting / harvest, infrastructure choices, like type of machinery and buildings.	Agricultural industry organizations and individual producers
Promote the Growing Forward Programs, such as the Growing Forward Water Management Program to Alberta's agricultural producers.	Alberta Government

Goal: Government response to drought is consistent.	
The DAG communicates and coordinates responses, where possible, including timely meetings and correspondence.	Alberta Government
Increase access to available water supplies, upgrade pumping facilities and increase storage capacity.	Municipalities
Ongoing monitoring, evaluation and reporting of precipitation and soil moisture conditions.	Alberta Government

Drought Monitoring and Reporting Actions

This area of focus includes ongoing monitoring, evaluation and reporting on soil moisture conditions, precipitation amounts and patterns, snowfall accumulations and air temperature regimes in the agricultural areas of Alberta.



Monitoring includes routine measurement of meteorological, hydrological and agricultural parameters useful in developing adequate drought indicators. Many of these measurements are collected in near real time and are quality controlled. The quality controlled parameters are used to run weather analysis, soil water balance, and drought indices models that are interpreted to determine the start, intensity, extent, and ending of drought. Some of these parameters are also used to produce weather based insurance products. The weather analysis and drought indices are summarized into regular reports that follow a

consistent reporting format. In addition, ARD's Agro Climatic Information Service (ACIS) web site provides near real time meteorological data from more than 270 meteorological stations across the province, and weekly maps providing up-to-date information between drought reports.

The drought reports use a combination of scientific drought indices to objectively and accurately determine drought severity, extent and duration. Combining indices provides a more accurate assessment of drought severity. The partners will collect, analyze and distribute up-to-date information, publish regular drought reports and frequently update maps and data on the ACIS web site. The combined information will help define development of any extreme conditions in order to guide appropriate and informed responses by government agencies and the agricultural community to existing situations. The drought report (available to the public) includes precipitation received and frequency of occurrence, soil moisture conditions, snow pack conditions, and temperature trends and regimes; and highlights of the drought report are forwarded to the Minister and rural MLAs.

In addition to the drought report, other reports may include the following:

- Regional crop condition reports
- AENV Surface Water Reports
- Interpretation of impact, based on field information from municipality field staff for the affected areas concerning the following resources:
 - surface water, dugout and reservoir supplies
 - feed supply
 - crop and pasture condition

- wildfire risk
- grasshopper levels
- Secondary data sources such as the US Drought Monitor, El Nino progressions and forecast, and conditions in surrounding jurisdictions.

Alberta's weather monitoring capabilities are being continually improved by the expansion of ARD's Near Real Time (NRT) standard weather

station network across the agricultural regions of the province. ARD has also developed a state of the art data quality assurance and quality control program and weather data delivery system.

The following strategies describe actions in support of drought monitoring and reporting.

Action	Agent
Goal: Timely, Accurate Drought Monitoring.	
Maintain and improve ARD's AgMet network and provide quality controlled weather and soil data to users in a form the can be readily used.	ARD
<p>As of January 1, 2010, the following list of weather and soil parameters were being measured at ARD standard weather stations:</p> <ul style="list-style-type: none"> • 118 stations with precipitation, temperature, humidity, and 2m wind-speed • 48 stations have 10m wind direction and speed • 31 stations have soil moisture and temperature (5,20,50 and 100 cm) • 47 stations have solar radiation • 3 stations have snow depth <p>ARD also makes use of data from about 150 hourly NRT reporting stations located inside and outside of the agricultural area, as well as in the neighboring provinces. Data is available in near real time on the ACIS web site.</p> <p>Additionally:</p> <ul style="list-style-type: none"> • AENV operates and maintains approximately 95 permanent near real time Meteorological Stations. • AENV operates and maintains 43 Hydrometric Stations and partners with Environment Canada who operates an additional 400 Hydrometric Sites. • AENV operates 117 snow survey sites with 46 mountain locations and 71 locations in the plains area. • SRD has approximately 180 stations. 	<p>ARD</p> <p>AENV</p> <p>Sustainable Resource Development (SRD)</p>
Goal: Drought Reports for the Agricultural Region of Alberta	
Drought Reports for the Agricultural Region of Alberta describe current soil moisture and precipitation conditions. The reports include maps of recent precipitation patterns, snow pack accumulations, temperature regimes, soil moisture conditions and drought indices that all help to define the severity and	ARD

Action	Agent
<p>extent of drought conditions across the province. Under normal conditions, the reports are produced monthly from May 1 to August 31, with a mid-winter update. As conditions become drier, reports become more frequent and more detailed.</p> <p>Highlights of the drought report and related maps are sent to the Minister of Agriculture and Rural Development and his rural caucus colleagues.</p> <p>Each week, or when conditions change significantly, more than 30 new maps will be published to the ACIS web site allowing users to track conditions between Drought reports. The ACIS on online station viewer allows even finer resolution, allowing users to see what’s happening at any one of more than 270 stations in Alberta with data usually only a few hours old.</p>	
<p>Indices – Maps are created using science-based drought indices to determine the level, extent, and duration of drought. Each index provides an objective, consistent approach to assessing the level of drought. The partners evaluate a variety of indices and then model and upgrade selected indices to suit Alberta's climatic conditions and meet its information needs. Using a combination of indices provides more accurate assessments of the level of drought. See Appendix 3 for more information on drought indices.</p> <p>Severity maps – show the extent and severity of current conditions based on the values of several indices. These maps are produced year round, and are based on state-of-the-art drought science that is supported by a high quality meteorological network.</p>	ARD
<p>Goal: Timely Release of Quality Controlled SSM and Precipitation Data to AFSC</p>	
<p>Provide soil moisture and precipitation data to AFSC to facilitate timely payments under AFSC’s weather based AgriInsurance products. This information is used to make payments that are generated part way through a growing season and shortly after the growing season.</p>	AFSC
<p>Goal: The maps and data are available to help farmers with short and long-term planning and decision-making throughout the year.</p>	
<p><u>AgroClimatic Information Service (ACIS)</u> is an interactive web tool that helps producers, farm consultants, and researchers create maps, obtain historical and near real time weather data, climate summaries and a wide range of maps that depict historical and current precipitation patterns, snow pack accumulations, soil moisture conditions and trends, temperature regimes and drought indices. The weather data and maps help farmers understand their climatic regimes and put current conditions, into perspective, thus helping them with long-term planning and decision-making.</p>	ARD website Ropin’ the Web

Action	Agent
<p>Users can also view and obtain historical and near real time weather data from over 250 meteorological stations. The maps and data help farmers with their long-term planning and decision-making throughout the growing season. Additionally ARD quality controls data for AFSC precipitation-based insurance products.</p> <p>ARD'S current meteorological program, with increased station density and the addition of measurements like solar radiation, together with new data processing systems, have lead to enhanced model accuracy and reporting products and services providing the necessary support for superior drought preparedness and drought response decisions.</p>	
Goal: AFSC Monitoring and Reporting	
<p>AFSC utilizes its network of adjusting and district office staff, and numbers of pre harvest claims to assess drought severity. This information is used to deploy resources to affected areas and determine if there is a need for expedited processes to provide timely service to clients.</p>	AFSC
Goal: Alberta Environment Monitoring and Reporting	
<p>Near real-time reporting of water supply conditions are available to the public through Alberta Environment's website. Reports on Water Supply and Flood Forecasts are provided online. Hydrometric, meteorological, snow conditions, and reservoir and lake level data are continually updated.</p>	Alberta Environment

Drought Response Actions

Possible actions to respond to drought – the Response Toolbox – can be identified to meet local needs, from mitigation during the early stages of drought to financial stabilization during and following more severe drought

conditions. the DAG works with representatives from drought-affected municipalities to identify support options for recommendation to Ministers.

Action	Agent
Goal: Producers are aware of government response.	
The partner agencies provide information on approved drought programs and government policy to affected producers.	Partner agencies
Municipalities have the responsibility to manage community water supplies and may decide to implement water rationing to extend the duration of available supply.	Municipalities
Goal: Provide information on business risk management programs.	
Federal and provincial business risk management programs are available through AFSC; including AgriInsurance, AgriStability, and AgriRecovery. Programs are managed to respond to exceptional conditions in a timely manner.	Partner agencies AFSC
Goal: Provide information to affected farmers on financial and personal counseling.	
A list of phone numbers for farm crisis lines and financial and debt counseling agencies is available through ARD and Alberta Health, and AAFC.	ARD/AFSC
Goal: Provide access to information on available feed supplies.	
Livestock owners may access the hay listing for available feed.	ARD
Goal: Continue to offer the ARD Water Pumping Program.	
Water Pumping Program is available to producers for replenishing dugout levels.	ARD
Goal: Recommend tax deferral from sale of breeding stock.	
ARD and AAFC monitor hay and pasture yields, and soil moisture and precipitation in drought-affected areas and, if required, DAG will recommend areas to be designated for tax deferral to AAFC.	DAG, ARD and AAFC
Goal: Implement a drought disaster loan program.	
During Extreme Conditions, the DAG works with municipal representatives to determine if a government drought loan program should be recommended for the affected area. This program would loan money to eligible farmers at a reduced interest rate to help them recover after a drought.	DAG and Municipalities

Action	Agent
Goal: Implement other programs as appropriate.	
<p>The DAG will assess and explore a variety of response options and recommend possible responses to the appropriate Ministers. Options in response to drought in the past have included:</p> <ul style="list-style-type: none"> • initial assessment for tax deferral on breeding stock • drought disaster loans • grazing on unallocated public land • grazing/haying Ducks Unlimited acreage • municipal roadside grazing/haying • feed/livestock freight assistance • emergency water hauling • reduced rates for dugout water pumping • grasshopper control options • direct acreage payments 	DAG

Drought Action Plan

Taking all of the strategies and actions described by Drought Preparedness, Drought Monitoring and Reporting, and Drought Response, the Drought Action Plan describes how these strategies can be applied on a scenario basis as described by the three levels:

- Normal or Near Normal Conditions
- Exceptional / Notable Conditions
- Extreme Conditions.

These three levels are determined by the current levels of soil moisture and recent precipitation and temperature trends.

There is no single map, nor any simple and consistent way (using maps alone) to determine Normal or Near Normal Conditions, Exceptional / Notable Conditions, and Extreme Conditions.

In fact, the suite of maps, that we use to determine the current “conditions” with respect to drought varies with time of year and the type of water shortage (acute or chronic) for crop, livestock, farm water supplies, etc.

From a scientific perspective, the maps help describe how the current conditions developed, and the severity and extent of the “condition”. The final assessment of the “Condition” is ultimately a decision driven by many different factors including maps, social, economic and political considerations.

When each of the levels of drought is identified through monitoring, the Drought Action Plan identifies the possible actions of the DAG and partner agencies.

Actions During Normal or Near Normal Conditions

- Normal precipitation / weather patterns / hydrologic conditions

Described by:
 moderately low
 near normal
 moderately high

Frequency of condition occurrence
 drier than this, on average, less than once in 3 years
 on average, this occurs 1 in 3 years
 wetter than this, on average, less than once in 3 years

Reporting Frequency:

May 1 to August 31: monthly, with weekly maps available through ACIS

September 1 to April 30: monthly, with weekly maps available through ACIS

Preparedness Actions	Monitoring/Reporting Actions	Response Actions
<p>Producers have access to technical expertise and financial assistance to assist with switching from drought-prone water supplies to more secure water supplies.</p> <p>Partners provide access to up-to-date information for producers in the agriculture sector on the actions needed to prepare to deal with the variability in soil moisture on an ongoing basis.</p> <p>Producers have tools to evaluate water supplies and water use needs.</p> <p>Producers are encouraged to participate in risk management/insurance programs offered by AFSC.</p> <p>The DAG coordinates an independent evaluation of activities during the previous drought and recommends changes to improve the ADRMP.</p>	<p>Partners monitor and assess drought-related provincial weather data.</p> <p>Partners provide reports to the DAG and stakeholders about current conditions.</p> <p>Maps describing Alberta's weather, climate and related agriculture features can be accessed with AgroClimatic Information Service (ACIS).</p> <p>Drought reports for the agricultural region of Alberta posted on Ropin' the Web, with highlights of the drought report and maps sent to the Minister of Agriculture and Rural Development and his rural caucus colleagues.</p>	<p>Partners work on policy issues as required.</p>

Actions During Exceptional or Notable Conditions

- The province or a portion of the province is operating under the potential for drought conditions.
- Lower than normal precipitation and soil moisture levels.

Described by:

low
 very low
 high
 very high

Frequency of condition occurrence

drier than this, on average, less than once in 6-years
 drier than this, on average, less than once in 12-years
 wetter than this, on average, less than once in 6-years
 wetter than this, on average, less than once in 12-years

Reporting Frequency:

May 1 to August 31: monthly, with weekly maps available through ACIS

September 1 to April 30: monthly, with weekly maps available through ACIS

Preparedness Actions	Monitoring/Reporting Actions	Response Actions
<p>The DAG will advise the Ministers of the partner agencies of the critical soil moisture conditions, and provide reports on preparedness, policies and currently available programs through the report to Ministers of partner agencies.</p> <p>Partners provide preparedness material specific to affected areas (geographic, soil, and climate zones), through a variety of media.</p> <p>ARD will prepare communications for producers, affected municipalities and other stakeholders on the soil moisture conditions.</p> <p>The DAG, with municipal input, will identify possible actions suited to the needs of the</p>	<p>Increased monitoring and reporting described for normal conditions.</p> <p>Partners monitor and assess drought-related weather data from across the province, but with increased focus on the areas facing low moisture conditions.</p> <p>Partners provide reports to the Ministers of the partner agencies, DAG and other stakeholders about current conditions biweekly from May 1 to August 31 and monthly from September 1 to April 30.</p> <p>Drought reports for the agricultural region of Alberta posted on Ropin' the Web, with highlights of the drought report and maps sent to the Minister of Agriculture and Rural</p>	<p>The DAG works with municipal representatives to identify appropriate options for action in the affected areas.</p> <p>Information flow is through, but not limited to, media and internet.</p>

<p>affected areas.</p> <p>Producers can access information through the internet at Ropin' the Web, by calling the Ag-Info Centre, listening to Call of the Land, and through other media.</p> <p>Producers have access to the ARD Water Pumping Program to top-up dwindling dugouts.</p>	<p>Development and his rural caucus colleagues.</p>	
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Actions During Extreme Conditions

- The province or a portion of the province is suffering drought; according to the indices.
- Severe soil moisture shortages and precipitation deficits.
- Preparedness Actions no longer apply, Reporting and Response Actions are required.

Described by:

Extremely low
Extremely high

Frequency of condition occurrence

drier than this, on average, less than once in 25-years
wetter than this, on average, less than once in 25-years

Reporting Frequency:

May 1 to August 31: monthly, with weekly maps available through ACIS

September 1 to April 30: monthly, with weekly maps available through ACIS

Monitoring/Reporting Actions	Response Actions
<p>Partners monitor and assess drought-related weather data from across the province, adding impact analysis for drought-affected areas and information from field reports.</p> <p>Drought reports for the agricultural region of Alberta posted on Ropin' the Web.</p> <p>Highlights of the drought report and maps are sent to the Minister of Agriculture and Rural Development and rural caucus colleagues.</p>	<p>ARD prepares AgriNews submissions and Call of the Land radio spots to inform the agricultural community of decision-making options during the situation.</p> <p>Provide timely information on risk management programs at extension meetings.</p> <p>Attend industry led meetings to provide risk management information.</p>

<p>Partners provide additional updates to the MLAs, Ministers of the partner agencies, the DAG and other stakeholders about current conditions, weekly from May 1 to August 31, and monthly from September 1 to April 30.</p> <p>Partners prepare communications for producers, affected municipalities and others on the drought situation and drought-related activities.</p> <p>The DAG recommends possible drought response options to the appropriate Minister.</p> <p>Communicate/share current conditions and possible options to the Alberta Association of Municipal Districts and Counties, and to other affected provinces.</p>	<p>Livestock owners can access a hay listing on Ropin the Web for some available feed sources.</p> <p>Municipalities and partner agencies assess available feed and water supplies and make information available to affected producers.</p> <p>Producers have access to information and programs that will help to reduce the impact of extreme conditions.</p> <p>Continue to offer ARD’s water pumping program.</p> <p>AFSC’s claim processes are reviewed and adjusted during drought conditions to provide timely responses to producers without unduly increasing program risk.</p> <p>Provide timely precipitation and soil moisture, as well as anecdotal, information as recommendations to AAFC for municipal designation for the federal tax deferral benefit.</p> <p>Work with partners to explore options such as:</p> <ul style="list-style-type: none"> • access to public pasture • access to Ducks Unlimited acreage • roadside grazing/haying opportunities. <p>Drought related information to include Mental Health Line at 1-877-303-2642.</p>
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Appendix 1: Definitions

ADAPTATION

Adaptation is the adjustment in natural or human systems in response to actual or expected effects of climate change and variability, which moderates harm or exploits beneficial opportunities.

ADAPTIVE CAPACITY

The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences, is adaptive capacity.

AGROCLIMATIC INFORMATION SERVICE

The AgroClimatic Information Service (ACIS) is an interactive tool that can help the DAG, producers, farm consultants, and researchers create maps that help with long-term planning and decision-making throughout the year.

CLIMATE

Climate is the meteorological condition in a given region over a long period of time. It is also defined in statistical terms as the mean and/or variability of relevant variables over a period of time ranging from months to thousands or millions of years.

CLIMATE CHANGE

Climate change refers to a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer.

DISASTER

An event that exceeds the ability of the local community to cope with the harmful effects and requires extraordinary response and recovery

measures is a disaster.

DROUGHT

For the purposes of this plan, “Drought” is defined as an extended period of below-normal precipitation resulting in decreased soil and subsoil moisture levels and diminished surface water supplies affecting crop growth, livestock water and irrigation water.

DROUGHT INDEX

Numerical scales used to describe the severity of drought. Indices combine one or more meteorological or hydrological variables into a single value that can be easily understood and presented in a map or table. The resulting values are typically related to a normal or average condition and describe the current condition, relative to normal or average condition. Indices used by the ADRMP range from simple percentile based indices for precipitation, temperature and snow packs to more complex indices based on soil water modeling exercises such as standardized precipitation index.

NEAR REAL TIME MONITORING STATION

Near-Real-Time (NRT) is a relative term and in the context of the ADRMP and the current weather station technology used in Alberta, it refers to data that is less than 24-hours old. Most of the stations used in ADRMP reporting structure report hourly with observations available on ACIS that are typically no more than 2 hours old.

MITIGATION (CLIMATE CHANGE)

In the context of climate change, mitigation is an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases.

PREPAREDNESS

Preparedness is the state of having been made

ready or prepared for use or action.

VULNERABILITY

Vulnerability to climate change is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.

WEATHER

Weather is the state of the atmosphere at a given time and place with regard to temperature, air pressure, humidity, wind, cloudiness and precipitation. The term “weather” is used mostly for conditions over short periods of time



Appendix 2: Drought Management Actions of Government

A number of government agencies participate in drought management activities either directly or indirectly. This appendix summarizes the current activities of these agencies for reference purposes.

Government of Canada

Agriculture and Agri-Food Canada (AAFC) – Agri-Environmental Services Branch

Part of AAFC's mandate is to develop and promote the conservation and management of water supplies and soil in the agricultural landscapes of Canada through technical and financial assistance. Ongoing activities related to drought management include:

- delivering programs and best management practices related to water conservation and management;
- supporting local watershed planning, including development of geographic information system (GIS) data, products and capabilities;
- maintaining the AAFC Drought Watch website;
- monitoring dugout levels and pasture conditions; and
- providing technical support for determining the eligibility of rural municipalities for tax deferral designation.

Agriculture and Agri-Food Canada (AAFC) – Growing Forward

AAFC's Growing Forward integrates programs and tools to address drought more effectively than in the past. The Business Risk Management suite includes four programs; two of which are delivered by AFSC in Alberta.

AgriInvest is a savings account for producers, supported by governments, which provides coverage for small income declines and allows for investments that help mitigate risks or improve market income.

AgriRecovery is a framework that will allow governments to respond to disasters by providing rapid assistance, filling gaps not covered in existing programs. www.agr.gc.ca

AgriStability, delivered by AFSC in Alberta, provides support when a producer experiences larger farm margin declines. The program covers declines of more than 15 percent in a producer's average margin from previous years.

AgriInsurance is an existing program, also delivered by AFSC in Alberta, that includes insurance against production losses for specified perils (weather, pests, disease) and is being expanded to include more commodities.

Environment Canada

Environment Canada supports provincial initiatives for managing water supplies and resolving existing and potential problems associated with droughts. To this end, the department will:

- provide raw data from its network of weather monitoring stations;
- encourage water demand management approaches and conservation technology with a view to extending the use of limited supplies;
- undertake, support and promote research into improving understanding of drought;
- encourage the development and dissemination of water conservation technologies and practices to promote the best use of current supplies; and
- encourage an integrated approach to planning and managing the augmentation and allocation of water supplies.

Alberta Agriculture and Rural Development

Growing Forward Program

The Government of Alberta operates the Growing Forward Program through Agriculture and Rural Development. Growing Forward allocates funds for producers and processors to work towards implementing system plans that result in eco-efficiencies, such as energy efficiency; or which are focused on society's demands for safe, humanely produced, environmentally responsible food.

ARD's Growing Forward Program has three key areas: Business Management and Leadership, Business Competitiveness; and Product Differentiation, which include outcomes related to drought preparedness and management such as:

- Water Management – to develop and maintain sustainable water supplies; and
- Environment – to help protect the resources that support your business.

Environmental Stewardship Division (ESD)

ESD advances sustainable agriculture systems for the benefit of the environment, the agriculture industry and Albertans. Sustainable systems are advanced through policy, science, innovation and information systems, and extension. ESD leads the monitoring and much of the reporting actions within the ADRMP and the activities related to drought management, include:

- Operate and maintain a state of the art meteorological network across the agricultural areas of the province;
- Collect and quality control weather data from all available near real time weather stations in the province;
- Maintain and enhance soil moisture, drought indices and weather analysis models;
- Drought reporting (analyzing and interpreting weather and climate conditions; and mapping

drought severity and extent and its impact on crops); and

- Deliver weather data, Ag Climate related products and maps online through the AgroClimatic Information Service (ACIS).

Other ESD activities include the development and promotion of beneficial management practices including delivery of the Stewardship Programs within Growing Forward and the AESA Program (Alberta Environmentally Sustainable Program), as well as climate change mitigation and adaptation strategies.

Irrigation and Farm Water Division (IFWD)

IFWD provides technical water management assistance, including water conservation measures, to agricultural producers.

This division also develops programs, services, information and regulations that lead to the environmentally sustainable expansion of the livestock industry in Alberta. Activities include:

- providing technical water management assistance, including water conservation measures, to agricultural producers;
- quantifying water requirements of irrigated crops in southern Alberta;
- delivering the ARD Water Pumping Program
- providing technical assistance on farm water management;
- assist producers with the development of Long-Term Water Management Plans; and
- delivery of Growing Forward Water Management Program.

Policy, Strategy and Intergovernmental Affairs Division

The division has taken a leadership role in coordinating the DAG activities and policy recommendations. Activities include:

- amending the Agriculture Drought Risk Management Plan;
- managing the Ropin' the Web Internet pages on "Preparing for drought";
- preparing drought report highlights for the Minister of Agriculture and Rural Development and caucus members;
- administering the Growing Forward Water Management Program and Long Term Water Management Planning; and
- coordinating other Growing Forward Programs.

Rural Extension and Industry Development Division

The division has taken a leadership role in coordinating extension and industry development activities including:

- providing drought preparedness and management information through the Ag-Info Centre by telephone, through Ropin' the Web, AgriNews and Call of the Land radio show;
- providing a team of resource agents and specialists in field crops, forages, beef, new ventures, irrigated special crops and business management as a first stop for Ministry and agricultural production and program information;
- operating 13 field office locations across Alberta to provide services to clients;
- presenting relevant information at industry/producer meetings; and
- providing information to municipalities through their agricultural service boards.

Alberta Environment

Alberta Environment is involved in preserving and enhancing Alberta's environment and in the wise management of our natural resources. Activities

include:

- providing Monthly Water Supply Forecasts including Mountain Snow Conditions and Water Supply Outlook;
- providing raw data from its network of weather monitoring stations;
- administering the *Water Act* (e.g., use of water by irrigation districts would be regulated when water supply is low or reservoirs are down);
- issuing weather advisories and warnings; and
- providing water quality protection and enforcement.

AFSC

AFSC and Drought Risk Management

Agriculture Financial Services Corporation (AFSC) is a provincial crown corporation that administers the crop insurance and AgriStability programs in Alberta, as well as providing loans to farmers, agribusiness, and small business. In 2009, AFSC also introduced the Cattle Price Insurance Program (CPIP).

AFSC has provided Alberta farmers with hail insurance for over 70 years, and has grown into a diverse Corporation with several core businesses: crop insurance, farm loans, commercial loans and farm income disaster assistance.

AgriInsurance is a voluntary program that provides protection against yield and quality risk for crop producers.

AFSC notes that even with a variety of programs available, not all losses may be covered; therefore, producers must have their own plans in place to deal with some of their drought-induced income loss. It is to the producer's advantage to plan ahead to reduce risks and thereby decrease losses from drought. Crop producers can protect from significant losses by participating in insurance programs. Livestock producers who grow their own feed can also insure these feed crops.

This agency administers the following programs in partnership with Agriculture and Agri-Food Canada:

- AgriStability is a margin-based program that addresses declines of more than 15 percent in a producer's average margin from past years. AgriStability provides protection for those larger losses that were previously covered under CAIS.
- AgriInsurance includes existing crop insurance, production insurance and other products currently offered and will expand to include other commodities. With the exception of some minor crops, most crops are eligible for insurance including hay and pasture crops
- AgriRecovery - a framework that will allow governments to respond to disasters by providing rapid assistance, filling gaps not covered in existing programs. www.agr.gc.ca

AFSC also offers low-interest loans through the **Disaster Assistance Loan - Crop Loss Option** program. This program assists producers who have suffered an agricultural disaster resulting from severe crop losses over several years.

Alberta Association of Municipal Districts and Counties (AAMD&C)

AAMD&C has representatives on the DAG who:

- provide municipal and regional perspective; and
- provide input to DAG decision making and action plans.

Municipalities – Agricultural Service Boards (ASBs) and Ag Fieldman

Municipalities provide programs for weed, disease and pest control, and soil and water conservation.

Activities include:

- providing input to the federal and Alberta governments on local conditions and needs;
- conducting pest monitoring programs; and
- working with ARD to provide information to producers for dealing with drought.

Appendix 3: Science Based Drought Indices

Based on scientific reasoning, drought indices help us define the onset, severity and extent of drought across the regions of the province and help to guide the ADRMP strategies.

Drought is a complex phenomenon that is difficult to define and is often politically sensitive. A strict scientific definition of drought remains elusive and is complicated by the fact that droughts (water shortages) are often use-specific, with impacts varying from location to location. For example, following a dry year, low snow pack accumulations and below average spring runoff can have severe and adverse effects on reservoir supplies, lake levels and on farm water supplies, yet crop yields may be adequate if timely rainfall occurs and temperatures remain moderate. Conversely, a period of hot and dry weather in the middle of a “normal period” during the critical stages of crop development may produce acute and severe water stresses resulting in serious yield losses, which can prompt proclamations of drought. Unfortunately no single index has yet been identified that adequately quantifies drought. In fact, most jurisdictions adopt multiple and blended drought indicators and produce maps that attempt to reflect the general severity, extent and location of the drought-stricken areas. ARD has developed and tested several drought indicators and continues to evaluate their effectiveness relative to current and past conditions. This work is ongoing and additional suitable drought indices will continue to be adopted and tested with the cooperation of partners.

Currently, agriculture drought severity maps and interpretations presented in the ADRMP reports are based on a combination of several drought indices. These rely on characterizing

precipitation (snowfall and rain), soil moisture and temperature anomalies. In addition to reporting the current conditions of these elements, ARD uses a percentile index, expressed as a “frequency of occurrence” measure, to rank current conditions against those that have occurred in the past. This allows comparable mapping products across all major elements that are easy to put into context and easy to understand. For example, growing season precipitation percentiles are tracked by ranking the precipitation accumulation during similar periods, dating back from 1961 to present. The current accumulation is compared to the ranked values, yielding the frequency of occurrence. The percentile points are then put into arbitrary, but intuitive classification fields that describe the current state as drier, near to or wetter than the long term normal, together with the frequency of occurrence as listed below.

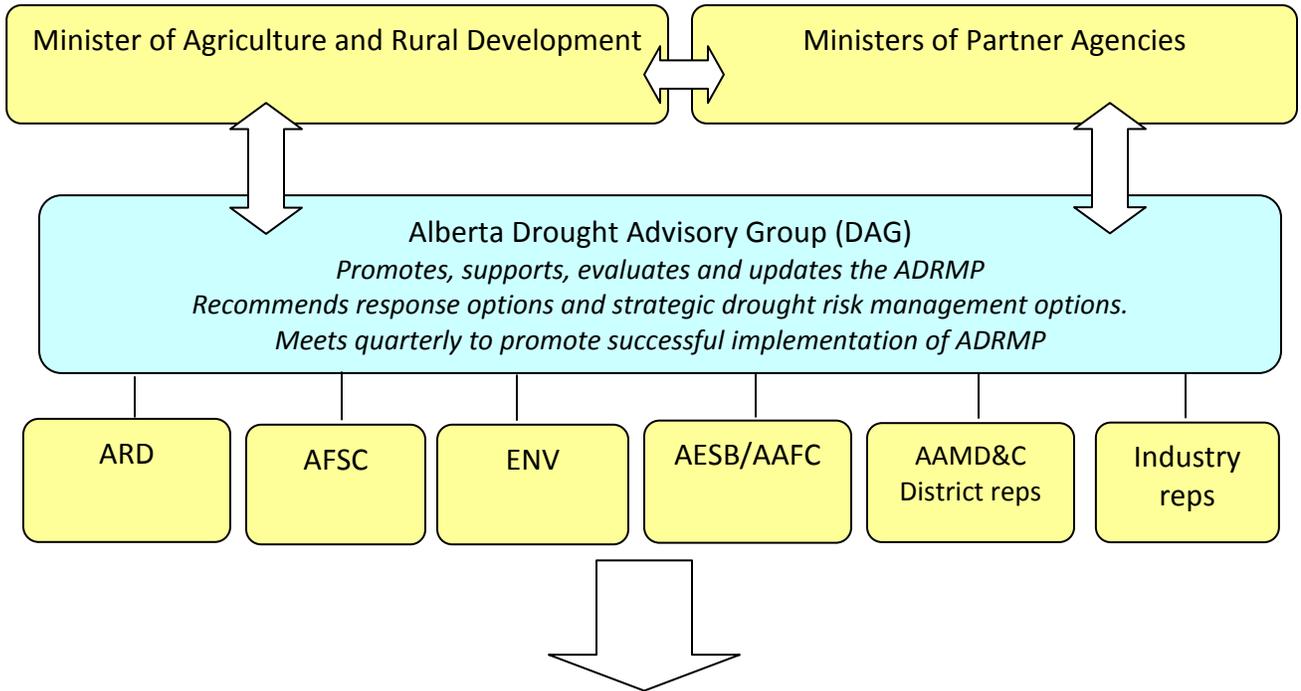
Category	Description
extremely low	drier than this, on average, less than once in 25-years
very low	drier than this, on average, less than once in 12-years
low	drier than this, on average, less than once in 6-years
moderately low	drier than this, on average, less than once in 3-years
near normal	on average,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

Similarly, soil moisture conditions, snow pack accumulations and temperature regimes are classified according to this scheme, with appropriate descriptions following each category.

In collaboration with ADRMP partners, collecting hydrological data (stream flow, reservoirs, lake and ground wells water levels) across the province, ARD's Monitoring and Reporting team will further adopt long-term, hydrological drought indices as well as blended indices to expand, enhance and adapt the current drought risk management program of the province.



Appendix 4: Agriculture Drought Risk Management Plan



ADRMP Vision

The ADRMP is a pro-active, effective, fiscally responsible approach to mitigating the effects of drought on Alberta's agricultural areas.

ADRMP Goals

- Communicate the drought management actions of government to producers
- Actions before, during, and after drought are coordinated and effective.
- Government response to drought is consistent.
- Monitoring data collected supports planning and action, and reporting is timely and effective.
- Alberta's agricultural producers have access to and use the knowledge required to manage periodic drought with its natural variability in soil moisture conditions: and are

Approaches/Action Areas

- Preparedness – year-round efforts, especially during non-drought times, to increase the level of readiness of the agricultural community and government to respond to the next drought.
- Reporting - ongoing monitoring, evaluation and reporting on soil moisture conditions and precipitation amounts in the agricultural areas of Alberta.
- Response – taking appropriate action during and immediately following a drought to reduce drought impacts on producers.