

# INSTITUTIONAL ADAPTATION TO CLIMATE CHANGE PROJECT

Stakeholder Workshop on Water and Climate  
in Special Areas (Prairies)

**“As bad as it is, it’s never been better”**

– Focus group participant



*(Source: Johanna Wandel)*

## SUMMARY REPORT

Organized by Special Areas and the Prairie Farm Rehabilitation Administration (PFRA) as a Project Partner with the Universities of Regina, Guelph, British Columbia, Saskatchewan and Athabasca.

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Input for presentation summaries provided by presenters

## BACKGROUND INFORMATION

This report summarizes the presentations and focus group discussions from the Institutional Adaptation to Climate Change (IACC) Stakeholder Workshop on Water and Climate in Special Areas (Prairies) held at the Hanna Community Center in Hanna, Alberta on Monday February 26, 2007. The purposes of this workshop were, first, to disseminate information collected by the project; second to verify the accuracy of the collected information; and third, to collect data for ongoing and future research projects (See the Agenda in Appendix 2).

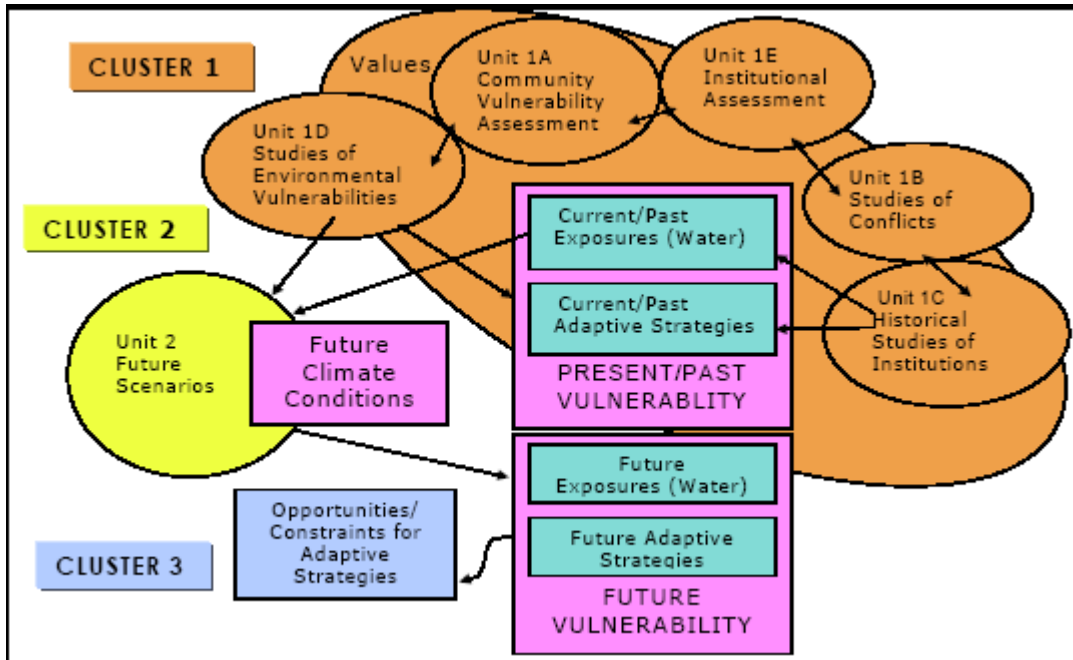
The Institutional Adaptation to Climate Change (IACC) project is funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) and is administered by the Canadian Plains Research Center (CPRC) of the University of Regina. This project requires the integration of multiple disciplines and involves the collaboration of approximately 20 researchers and a large group of research assistants, all with expertise in their respective discipline. The three objectives of this research project are:

1. To identify the current social and physical vulnerabilities of the rural communities related to water resource scarcity in the two basins;
2. To examine the effects of climate change risks on these vulnerabilities;
3. To assess the technical and social adaptive capacities of the regional institutions to address the vulnerabilities of rural communities to current water scarcity and climate change risks.

The IACC project seeks to understand the adaptive capacities of rural communities and rural households and the roles played by governance institutions in the development of those capacities. In order to achieve this goal a comparative study between two river basins—the South Saskatchewan River Basin in Canada and the Elqui River Basin in Northern Chile—is being undertaken. The two regions differ in how they are vulnerable to climate change, primarily due to varying social, economic, political and environmental circumstances. However, there are also important similarities: both are situated in dry climate regions adjacent to a major mountain system, which provides the basins' supply of water from snow and glacier-melt, and are characterized by the predominance of agricultural industry.

The conceptual model—Figure 1—is the structural framework around which the Institutional Adaptation to Climate Change project's clusters are organized. Presentations from, *units 1A, 1C and 1D* (Cluster 1) were given at this workshop. Dave Sauchyn's presentation delved into *future climate conditions* (Cluster 2). The workshop's focus group discussions dealt with *past/present and future vulnerabilities* providing insights for the institutional assessment (unit 1E). The IACC project adopts a vulnerability assessment approach, where the vulnerability of a system is treated as a function of both its exposure and its adaptive strategies. *Current/past exposures* refer to past or present conditions that affect a particular system. In addition, the nature and specific characteristics of the system are taken into account. *Current adaptive strategies* refer to

the ways in which the system has adapted or is adapting to the identified exposures. *Future exposure* refers to the future potential changes in current/past exposures as well as new exposures that may arise under climate change. *Future adaptive strategies* refer to the ways in which the system can adapt to and plan for these future changes. Forces that influence the ability of the system to adapt create *opportunities/constraints for adaptive strategies*.



**Figure 1:** The organization of the Institutional Adaptation to Climate Change clusters.

For the purposes of this workshop, exposures and adaptive strategies were focused on climate-related water problems, such as drought. This report is divided into two sections: summary of presentations and focus group findings. The ‘Focus Group Findings’ section is divided according to the vulnerability approach (i.e. current and future exposures and current and future adaptive strategies). Opportunities and constraints for adaptive strategies are listed under the ‘Adaptive Capacity’ subsection of this report.

There is significant pressure on Alberta’s water resources, as is documented in the province’s Water For Life strategy. Pressures on the water supply stem primarily from population growth, drought and agricultural and industrial development. Currently, the water supply is fluctuating to the point where its unpredictability is affecting communities and their economies. This unpredictability warrants attention since the well-being of Alberta’s economy and population depends on a healthy and sustainable water supply. The Special Areas were established as a result of the difficulties, primarily drought-related, experienced in the 1930s in south eastern Alberta. The Special Areas were chosen as the area of focus for this workshop because of their unique governance system as well as their susceptibility to drought, both of which are characteristics that satisfy the research interests of the IACC project.

A variety of water stakeholders were invited to attend the workshop and participate in the focus groups, including representatives from industry and federal, provincial, regional and municipal governments, environmental groups, as well as farmers, mixed farmers and ranchers. Stakeholders were divided into four focus groups, each with approximately 12 people. The purpose of the focus groups was to initiate discussions among water stakeholders and to provide researchers with a better understanding on the issues stakeholders have with water availability, how these issues are addressed and how these issues can be managed in the future under climate change (Appendix 1 contains the focus group questions). These discussions provide insights into the vulnerabilities and the adaptive capacities of both rural communities and governance institutions, and will set the basis for unit 1E.

## **SUMMARY OF PRESENTATIONS**

This section summarizes the presentations delivered at this workshop.

### **Community Vulnerability in Special Areas 2 (Gwen Young, University of Guelph)**

The goal of the IACC project is to assess the current vulnerability of six Canadian and four Chilean case study communities. The selected communities were all rural communities with a history of water stress, a land use and economic base, and a type of reliance on water. For these reasons, Hanna, in Special Areas 2, was chosen as one of the case study communities for this project.

Johanna Wandel and Gwen Young are the two researchers who conducted a vulnerability assessment in Special Areas 2 in November of 2006. The primary focus of the research was to understand the climate and weather conditions that can be problematic for those living in Special Areas 2, to understand the nature of water use and the current management of water and weather related stresses, as well as the ability of Special Areas 2 to cope with more frequent and severe stresses in the future.

Johanna and Gwen found that one of the main concerns for households, primarily those not on the pipeline, is insufficient and low quality potable water. People were very concerned about the security of their well water. They also found that when there is little snow and slow runoff, ranchers have a difficult time filling dugouts, which affects their operation because they rely on water from their dugouts. In addition, low soil/subsoil moisture and low early season moisture present challenges for ranchers, as they translate into poor grass growth. Some adaptation strategies ranchers have employed include constructing more and better dugouts, keeping feed supplies and investing in pasture insurance.

***“Probably our snowmelt is one of the biggest things for stock. If you don’t get some snowmelt in lots of cases you don’t have water, and then you’re pumping water from dams and wells and everything else to get you through the summer”***

***- Focus group participant***

Insufficient precipitation in the spring is a concern for dryland farmers because it results in poor germination and little early growth. Another concern is low precipitation throughout the growing season because it results in lower yields. A few adaptation strategies dryland farmers have employed include changing their crop mix, switching to no or minimum tillage, diversifying their operation, using crop for feed and finding off-farm jobs.

While the ATCO Pipeline is an important institutional adaptation— they provide employment, irrigation and stock water to the community, as well as raw water to the treatment plant— the type of reliance on water determines one’s exposure to dry conditions. The oil and gas industry is a prominent characteristic of the area and most operations would not be viable without the revenues from the oil and gas industry.

### **Future Climate and Weather Conditions in Central Alberta** (Dave Sauchyn, Prairie Adaptation Research Collaborative, University of Regina)

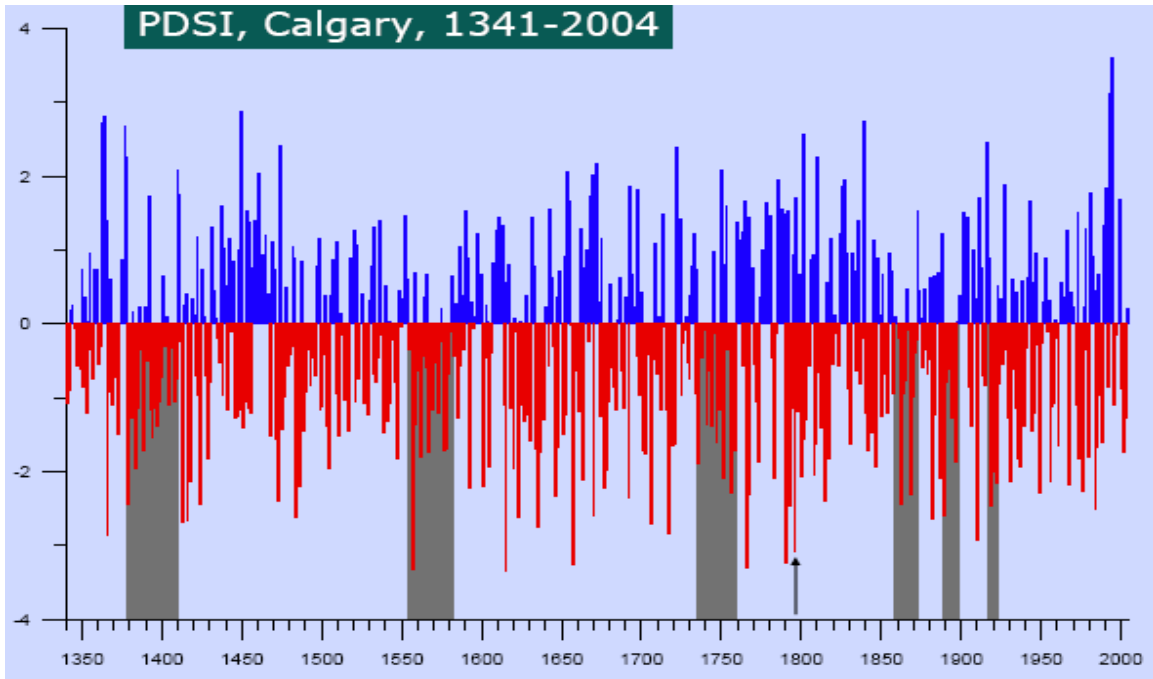
Research conducted by Dave Sauchyn, Jodi Axelson and Suzan Lapp provides insights into Alberta’s future climate and future potential changes in Alberta’s water resources.

Southern Alberta experienced the most severe droughts recorded by humans in the 1920s. Trees, however, provide us with a longer, very accurate record of the past climate. Results from an analysis of tree rings suggest there have been more severe droughts in the past 650 years than those of the 1920s (see Figure 1). The red bars in Figure 1 correspond to droughts in Calgary. The values along the y-axis indicate the severity of the drought. The more negative the value, the drier it was. The blue bars correspond to wet years in Calgary. The greater the value, the wetter it was.

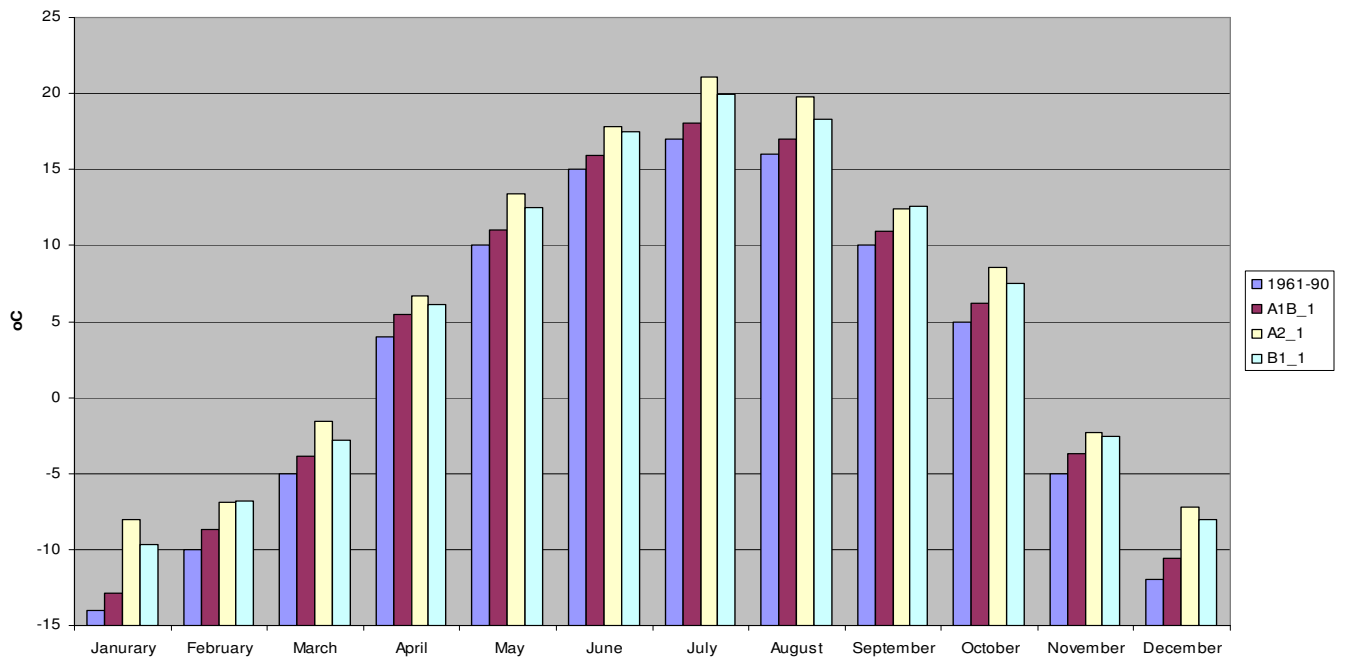
There is consensus among scientists that climate change is a real phenomenon and that the climate is indeed warming. Data from weather stations around the world confirm this. All of Canada is expected to warm in the future, although some places more the others, with the most warming expected in the north and the center of the country. Ideally, scientists could take the historical climate and project the future climate, but human interference with the climate system has rendered this method useless because other factors such as future greenhouse gas emissions now need to be taken into account. Climate models are commonly used to simulate future climatic conditions. These models generate numerous scenarios that make different assumptions about the future.

Both mean monthly temperature and monthly precipitation were generated for Hanna for the year 2050 using the Canadian Global Climate Model (see Figures 2 and 3). The blue bars in Figures 2 and 3 represent the historical average and the other three bars are scenarios of the future climate. Figure 1 shows that the temperature in Hanna will be warmer in the future, particularly in winter. Figure 2 suggests that Hanna will receive more precipitation in the future and that there will be changes in the seasonal distribution

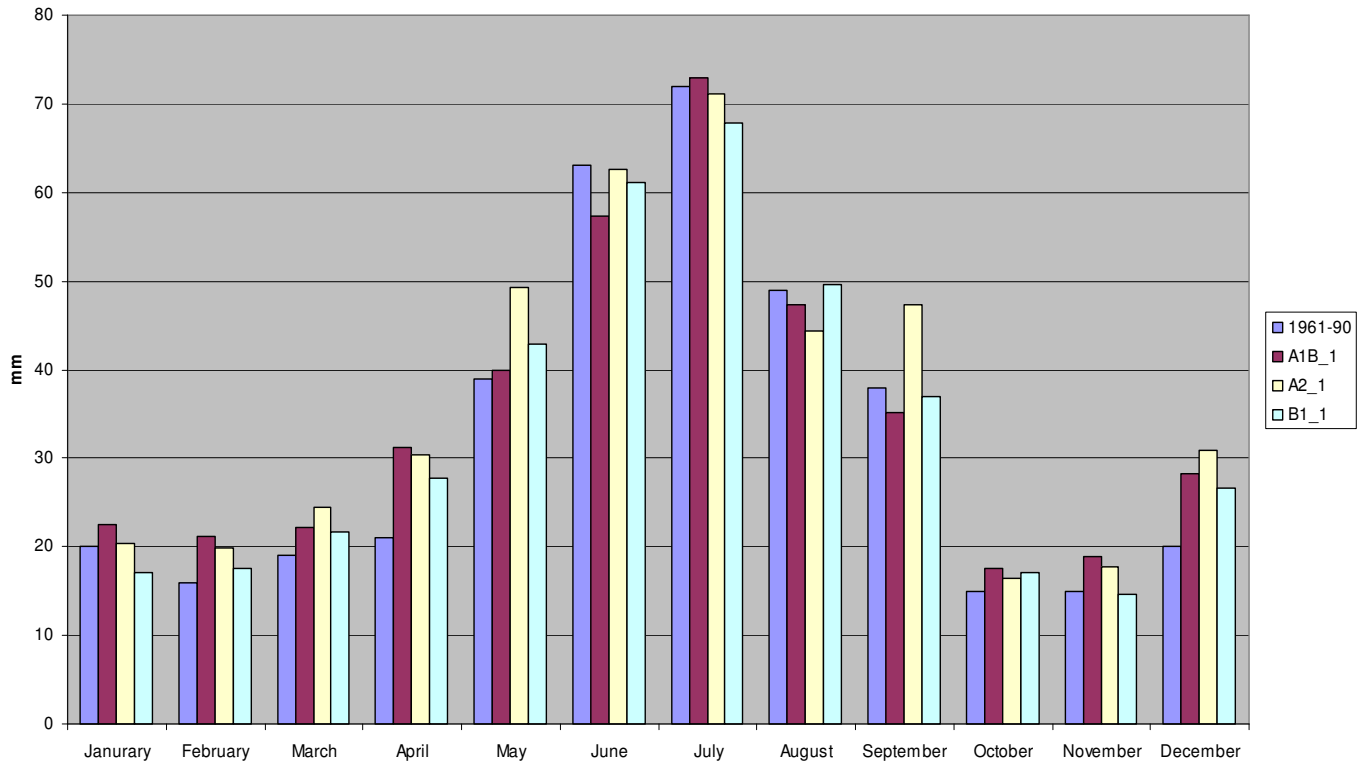
of precipitation; more precipitation is expected in winter, primarily in the form of rainfall due to increasing temperatures, and less in summer.



**Figure 1:** PDSI (Palmer Drought Severity Index), Calgary, 1341-2004



**Figure 2:** Mean temperature for Hanna in 2050, CGCM3



**Figure 3:** Mean precipitation for Hanna in 2050, CGCM3

Although the number of growing degree days is expected to increase significantly in the future (see Figure 4), the air will be warmer as a result of warmer temperatures and it will retain more moisture, meaning there will be less moisture in the soil.

Pietroniro *et al.* 2006 forecast future seasonal flow in the Bow River, the South Saskatchewan River, the Red Deer River and the Oldman River (see Figure 5). Most scenarios indicate there is going to be more water in the rivers in winter and spring and less in summer. Pietroniro *et al.* 2006 also project the annual flow in these rivers (see Figure 6). They conclude that the Bow River should have approximately 10% less water by the middle of this century, the Oldman River 4% less, the South Saskatchewan 8.5% less and the Red Deer River 13% less. There will be less flow in the rivers because there will be less snow in the future. Snow will no longer accumulate in the mountains throughout the winter and melt in spring. Instead, there will be more rain in the winter and it will quickly runoff rather than accumulate.

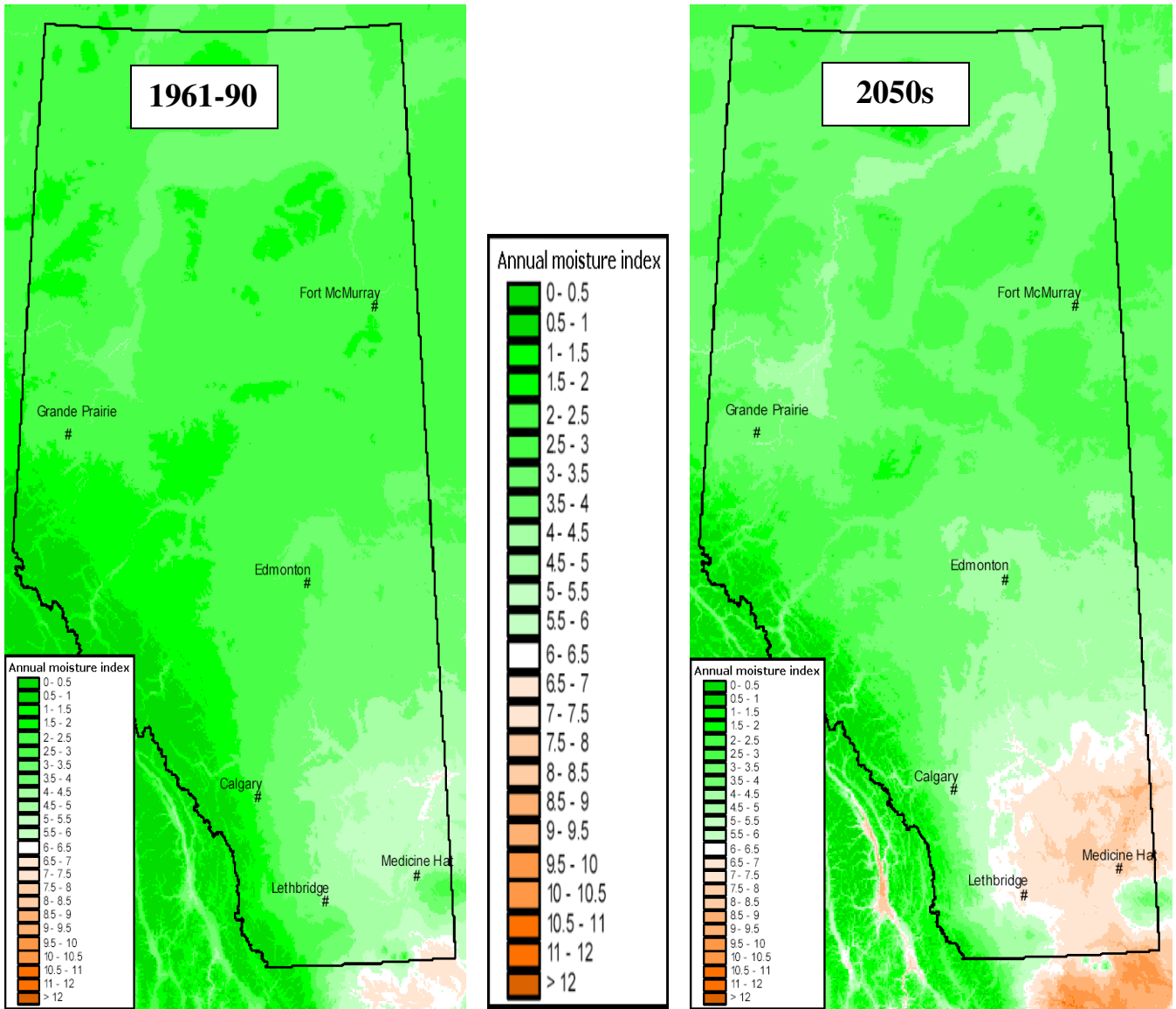


Figure 4: Annual Moisture Index for Alberta (Barrow and Yu, 2005).



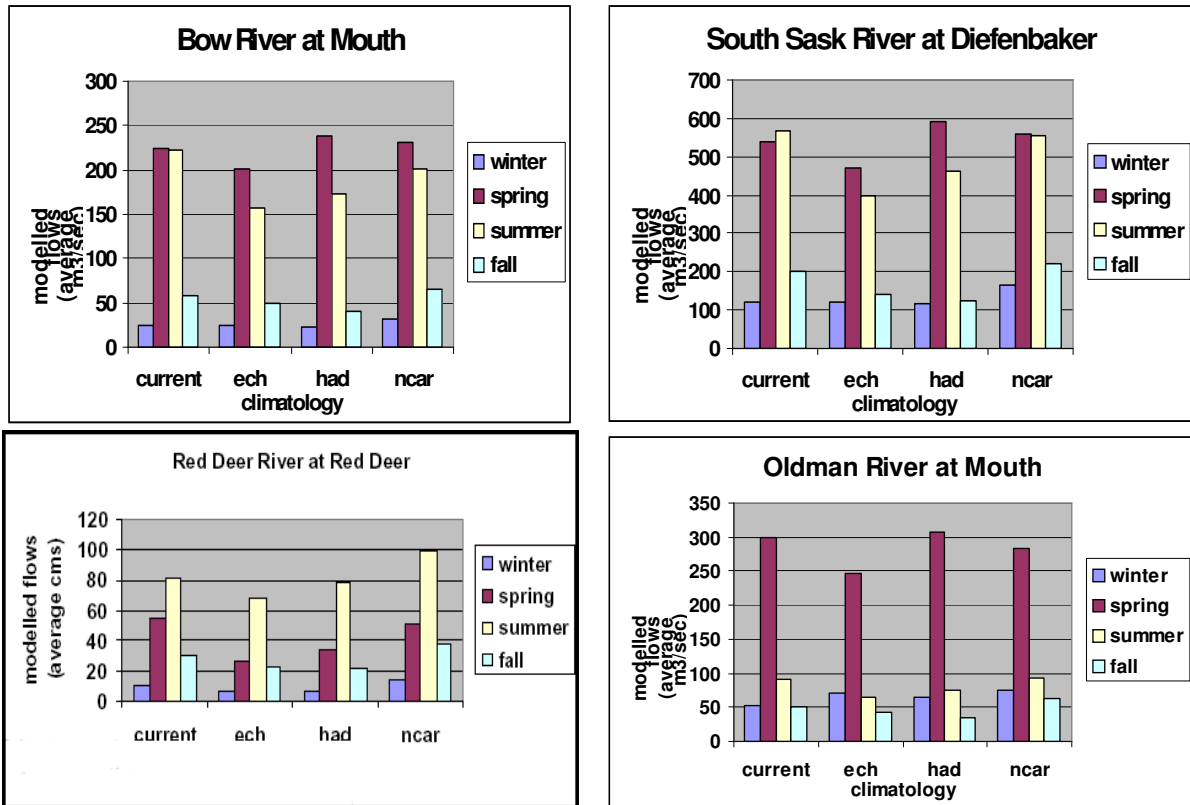


Figure 5: Seasonal flows, SSRB, 2039-2070 (Pietroniro et al., 2006).

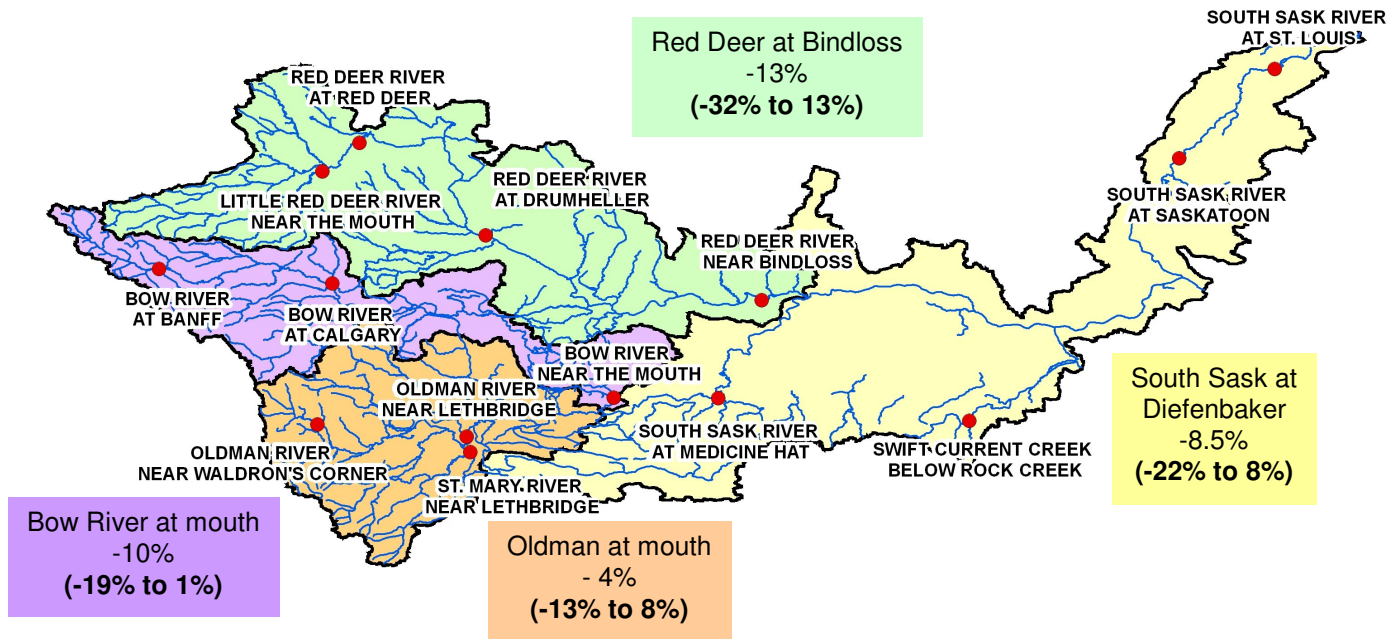


Figure 6: Projected annual flow, 2039-2070 (Pietroniro et al., 2006)

The projections for Alberta's future climate and water resources have both positive and negative implications for its economic, environmental and social processes. People in southern Alberta have been adapting to the climate for decades. However, in the future they will be faced with unprecedented conditions that people will have to cope with and adapt to.

## **Institutional Adaptation to Drought and the Special Areas of Alberta** (Greg Marchildon, University of Regina)

The Special Areas experienced the most prolonged drought during settlement in the 1920s and 30s. The study of past droughts provides some insight into future droughts, making drought prone areas easier to identify. Palliser's Triangle has been identified as an extremely drought prone area. Based on average records, the dry belt of southeast Alberta and southwest Saskatchewan is the most sensitive area within the Palliser's Triangle.

Ranchers were present in the Special Areas in 1900. However, the Special Areas experienced an extremely cold winter in 1906/07, often referred to as "the Killer Winter", which resulted in the deaths of approximately 50% of the cattle in the area. Many ranches went bankrupt and ranchers began to move out. At the same time, first without the consent of the government and a proper system in place, and later, in 1909, with active encouragement from the government, homesteaders began to move in. By 1911 schools were being set up, and by 1914 the municipal and local improvement districts were put in place. Wheat farming was a major economic activity in the area at that time. Good years were followed by bad years until 1917 when there were close to ten bad years in a row and the wheat economy collapsed. The local government was not prepared to handle the collapse. The United Farmers government in Alberta began relocating people and then they decided to slowly dissolve municipal government and set up Special Areas administrative boards. The main purpose of the Special Areas Board was to secure control of the land that was indebted, resettle farmers, and promote transfers to larger-scale, self-sufficient ranching or farm-ranch operations. Government support facilitated the growth of farming operations. The boards were later placed in charge of administering education, hospitals, road construction and road maintenance.

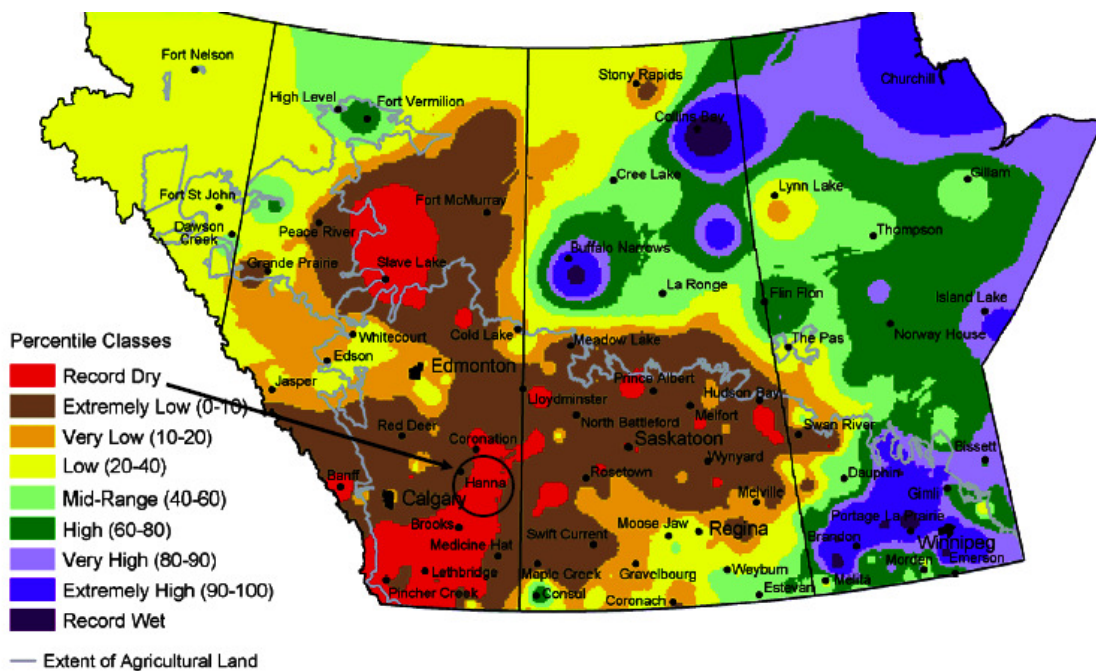
The way in which the Special Areas are run has been questioned many times by the provincial government, since there are no municipal governments. However, the Hanson Commission report of 1960 concluded that the Special Areas Board conducted its business extremely well and should actually be used as a model for other areas.

Although there was both political and economic collapse in the Special Areas in the early 1900s, the size and the expertise within the Special Areas Boards facilitated adaptation to droughts in numerous ways.

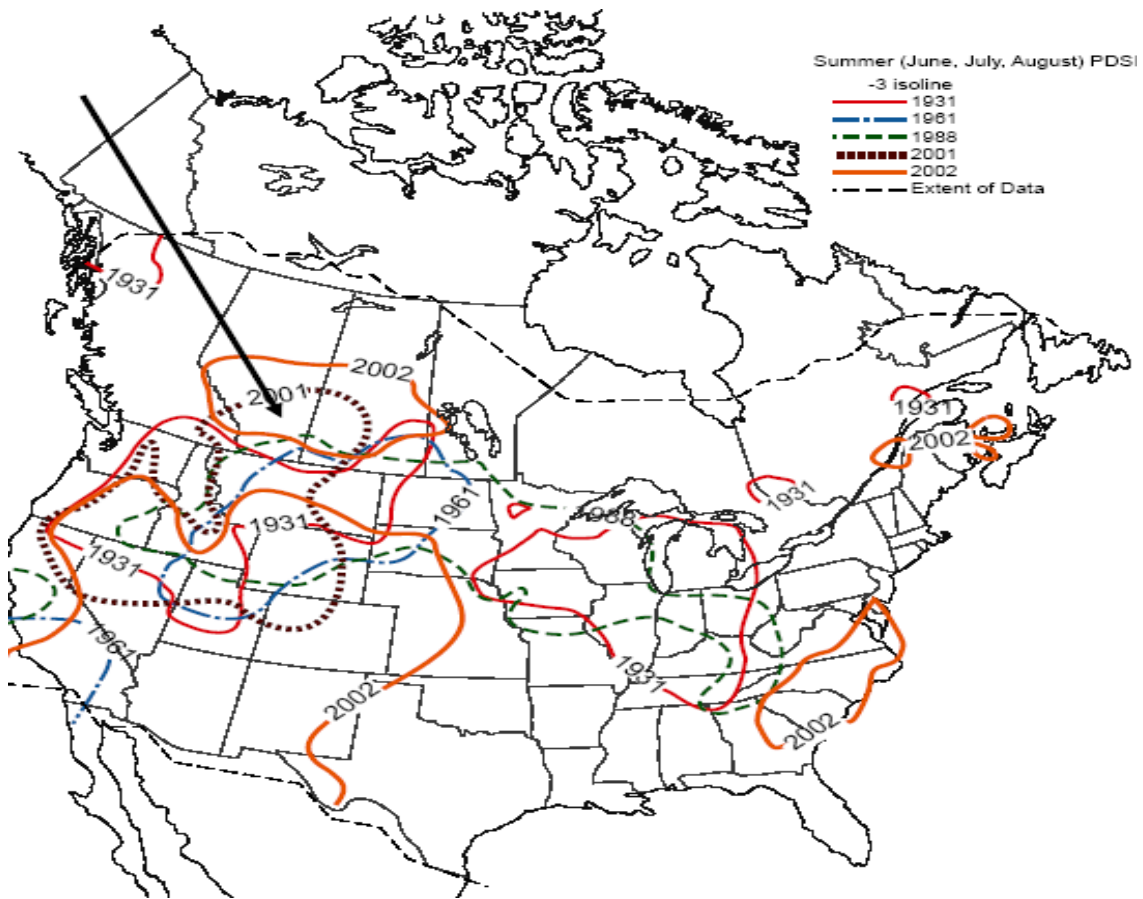
## Impacts and Adaptations: The Case of the 2001-2002 Drought (Virginia Wittrock and Elaine Wheaton, Saskatchewan Research Council)

In 2001 and 2002 the Special Areas experienced severe drought. Figure 6 highlights that, when compared to past droughts, 2001 and 2002 were record dry years in southeastern Alberta. Figure 7 outlines past droughts in Canada and shows that the Special Areas were at the center of the 2001 and 2002 droughts. These droughts had negative implications for communities and the environment. Decreases in stream flow resulted in dry dugouts; water quality was compromised; production losses totalled approximately \$3.6 billion for both years for all of Canada and 41,000 jobs were lost.

Many adaptation strategies were employed both within communities and institutions during the droughts. Feed was purchased, cattle were sold or moved, more drought-tolerant crops were seeded and there was heavier investment in crop insurance. Community members pulled together and helped each other through this difficult time. In addition, PFRA established programs to assist farmers in establishing new dugouts and wells.



*Figure 6: Current precipitation compared to historical distribution [September 1, 2000 to August 31, 2002] (PFRA website, 2001)*



*Figure 7: Past Canadian droughts*

## FOCUS GROUP FINDINGS

The vulnerability approach emphasizes the need to treat vulnerability as a function of the current and future exposure and the current and future adaptive strategies of the system being considered (e.g. agency, community, individual, etc.). The vulnerability approach differs from many other approaches in that the conditions that give rise to vulnerability are identified by the system. That is, the conditions are not assumed by the researchers.

The purpose of the focus groups was to gain a first-hand understanding of the issues stakeholders see with respect to water availability (i.e. current exposures), how these issues are currently being addressed (i.e. current adaptive strategies) and how these issues might be managed under future climate change (i.e. future adaptive strategies). Dave Sauchyn's presentation provided information on future climate and water conditions (i.e. future exposures). A list of questions that effectively captures the information sought in the focus groups was developed by the research team (see Hanna Focus Group Protocol in Appendix 1). The questions were given to each facilitator, whose purpose was to engage participants in discussion and ensure that all questions were addressed.

Workshop organizers realized that there were two general themes that the participating stakeholders could be divided into. The first and second groups were geared toward institutions; the third and fourth toward farmers, ranchers and mixed farmers. Stakeholders were assigned to the focus group that best suited their interests and affiliation.

This section of the report summarizes the discussions from all four focus groups. Commonalities and differences in the discussions within and among the groups were identified and are discussed in this section. The findings are organized according to the vulnerability approach.

## **Current/Past Exposures**

### Biophysical

Droughts have severe implications for southern Alberta, as they affect almost all social, political, economic and environmental processes in southern Alberta because there is less water available to use. In addition, they strongly influence the ways in which water resources are managed. Farmers and ranchers use dugouts as their primary source of water on their operations. Dugouts often have insufficient water in them during droughts, resulting in water shortages. Many people who are dependent on well water for their potable water supply experience water shortages during droughts because their wells dry up.

Flows in the rivers increase significantly during periods of intense and heavy rainfall. Many communities have experienced flooding during these periods because the river channel cannot contain all the precipitation.

Evaporation losses in dams and reservoirs significantly reduce the amount of water available to the population of Alberta.

### Livelihoods/Occupation

***“Well farming’s really a lifestyle, it’s not a job you want for money.”  
- Focus group participant***

***“Like I don’t farm because it’s a lifestyle, I farm to give me a lifestyle.”  
-Focus group participant***

Pests (e.g. grasshoppers) and diseases (e.g. fusarium) reduce the profitability of agricultural operations. Grasshoppers, in particular, have been exceptionally problematic in southern Alberta in the past.

Over allocation and full allocation of water rights in rivers limits the expansion of agricultural operations and the development of other industries. Irrigators have run out of water in past droughts.

DUCKS Unlimited dams have dried up natural water sources in many areas. Farmers and ranchers cannot rely on the water sources they relied on previously, as a result. The dams are no longer serving the purpose they were intended to serve.

The effects of water stress on agricultural operations are extensive. Ranchers have a difficult time filling their dugout when there is little snow and slow runoff. Poor grass growth results from low soil/subsoil moisture, resulting in feed shortages. Insufficient precipitation in spring is problematic for dryland farmers, as it results in poor germination and little early growth, while low precipitation throughout the growing season results in lower yields. See Gwen Young's presentation summary in this report and the presentation slides on the website for further details.

Fluctuations in the market directly affect farmers and ranchers. They have no control over the prices they receive for their products. The prices they do get are not enough to remain viable.

Some of the programs in place to mitigate the effects of droughts and other climate-related stresses actually limit what farmers and ranchers can do to respond to these stresses. For example, when farmers purchase crop insurance they are told what they can and cannot do with their crops, subsequently limiting the management strategies they can employ.

### Social

***“You know, people drive along, they see fields and they forget that that field is that loaf of bread. They forget that what we do is their food source.”  
- Focus group participant***

The oil and gas industry is a substantial part of Alberta's economy and is a prominent characteristic of Alberta's landscape. Many stakeholders feel the oil and gas industry is given preferential treatment by government. Decisions seem to be made in the best interest of the industry rather than that of the public. People feel helpless against the industry and feel their voices are not being heard. Rural communities feel disregarded by the government in that they are the last to be considered in any policy, plan, program, etc.

A topic that came up in all the focus groups was the urban-rural disconnect. Rural dwellers feel that urban dwellers do not appreciate the activities that occur outside the city because they are so far removed from the rural processes. Urban dwellers feel they are entitled to water resources, partly because they do not experience climate and related stresses as intensely as rural dwellers.

Water resources are often used in an inefficient manner. Wastewater could be utilized by those who need it during periods of water stress.

### Institutional

***“The environmental side is a little bit over done...They want basically nothing to change...And to shut down a project just because I don’t know, one bird has to change its nesting place or that sort of thing is unrealistic...”***

Lack of both funding and human resources hinders the ability of institutions to carry out their tasks effectively and efficiently. It is so difficult to obtain funding, particularly from government, that many programs that have the potential to benefit society are never realized. Various government agencies have made significant cutbacks in personnel (e.g. PFRA) and the effects of these cutbacks are already being felt in the agencies. There are fewer people to both carry out daily tasks and develop/manage new initiatives.

Environmental assessments are required for many projects undertaken in Alberta. These assessments are lengthy, expensive and involve too many departments. The process is too complicated and too expensive for smaller projects. Some projects are not pursued because of this.

Water availability is a serious concern in the province of Alberta. Recent droughts make the issue an even bigger reality. Resource managers are limited as to what they can because the water is just not available.

Institutions do not communicate enough. Often the same study is carried out twice, or information obtained by one institution is not transferred over to another who could also be using it. This lack of communication makes for ineffective resource management.

The information needed to make decisions is not always available; therefore, decisions are often made based on the information that is available and not the information that is needed.

Rules and regulations often contradict each other, making it difficult for stakeholders to make concrete plans.

Stakeholders stressed that the provincial government is “hard to move” and that it takes longer than it should for them to get things done, if things get done at all.

## Future Exposures

### Biophysical

(See Dave Sauchyn's presentation summary for more details)

Projections suggest Alberta will experience an increase in both temperature and precipitation by the year 2050. More precipitation is expected in winter, in the form of rainfall due to rising temperatures, and less in summer. The growing season will be longer as a result of rising temperatures, but, with less rain in summer there will be less available soil moisture. The projected changes in temperature will influence snow accumulation in the mountains, which feed the rivers that communities depend on for their water supply. In the future, snow will accumulate and melt many times throughout the winter, rather than accumulating over the winter and melting in the spring, causing river flows to decrease in spring. In addition, droughts are expected to become more frequent and prolonged.

### Social

***“And I still have a little bit of a hard time sitting there listening to projections from a computer that comes out, models something out, and says well this is how it might be. It's like, will it ever be that way? If we add 10 more billion people on this planet, are we going to heat the planet up by another 30 degrees? Like who knows?”***

***-Focus group participant***

There certainly some skepticism surrounding climate change among stakeholders. Some people did not accept that the climate is changing or that it will affect them in any way. Some stakeholders see climate change as a positive phenomenon and were excited about it.

People are hesitant to make changes within their operation, business, organization, etc. because there is uncertainty surrounding future projections. It would be a waste of time and money to make plans for a future that turns out to be different than expected.

Alberta's growing population will add pressure to an already diminishing resource. Demand will likely increase as the population grows.

Some communities receive water via the pipeline at certain times of the year. So if there is less water available during their time to take water, there will be less water for them to use.

### Livelihoods/Occupation

Much of Alberta's economy is dependent on its water resources; changes to the resource could have severe implications for its economy and its people. People, businesses and industry will have to do more with less water in the future.



## Institutional

Water availability will continue to be a concern in the future, since there Alberta's water resources are expected to decrease substantially by 2050. Conflicts among water users may need to be mediated by institutions.

In order for change to occur, there has to be political will.

## **Current/Past Adaptation Strategies**

### Technology

Many farmers have upgraded farm equipment and started to use the internet for information.

### Agriculture

*“To me it’s a great joy to complete a project to deal with the environment the best you can. You don’t handle it, but you cope with it.”- Focus group participant*

*“Plan for the worst, hope for the best” – Focus group participant*

Many farmers have converted to no-till and minimum till, as both conserve soil moisture. More and larger dugouts have been built on farms to facilitate additional water storage. Pumping water from other sources was a common response to previous water shortages. Crop insurance is collected on some operations to compensate for “bad years”. However, farmers and ranchers should not become dependent on insurance and subsidies to bail them out in tough times. “Marginal crops” are bailed and used as feed because it does not make sense to combine them. There are usually feed shortages during periods of water stress, so ranchers buy feed, which is usually extremely expensive. Ranchers reduced their herd size during previous droughts because smaller herds are easier to manage and maintain. Swath grazing is a management practice employed by ranchers to extend the grazing season and reduce input costs. In addition, farmers and ranchers have sought off-farm jobs and embraced the oil and gas industry to supplement their income.

Government programs proved to be very useful during previous droughts. The provincial government was especially helpful. The federal government took more time to respond but eventually came through with some funding.

### Institutional

The Prairie Farm Rehabilitation Administration (PFRA) has played an important role facilitating adaptation in the communities represented at this workshop. PFRA has provided financial support for projects (e.g. the construction of wells) as well as

information to those who seek it. This government agency has also developed tools to aid farmers in decision making (e.g. climate prediction models, seasonal forecasts)

Programs and policies have been developed by various government agencies to help farmers and ranchers cope with a variety of stressors. Conferences have also been held as a means of relaying new information to the agricultural community.

Pipelines have been constructed to facilitate the transportation of water from one place to the next. Pipelines are more efficient because they do not lose nearly as much water to evaporation as canals do.

Moratoriums have been placed on allocations, since many rivers are over allocated or fully allocated.

## **Future Adaptation Strategies**

### Water use efficiency

***“All you have to do to conserve water is haul!”- Focus group participant***

***“Talking about ethics, everybody agrees on conservation and recycling. Everybody agrees on it, but it’s always better if somebody else does it!”***

***- Focus group participant***

People should be educated on the benefits of water conservation. Conservation needs to be integrated into people’s daily routines and lives. We have to get rid of this mentality that we are entitled to water and that we can use as much of it as we wish. It is a finite resource that is already scarce. Not only do people need to be educated on conservation, but they need to have a better understanding of what the implications of climate change are for Alberta. If they understood the magnitude and urgency of the problem, they might be more willing to change their ways. However, people should not be forced to change their practices because that creates conflict and induces rebellion.

Water should be reused if at all possible. One focus group proposed the use of water from natural gas production for livestock.

### Water management

A steady source of water will be needed in Alberta. Water storage, both on-stream and off-stream, were discussed thoroughly in all the focus groups at this workshop as a means of securing Alberta’s future water supply. Since there will be more water in winter than there has been in the past, water will need to be captured and stored for future use. The construction of more dams was suggested by many stakeholders. ***“Ironically it’s the hardest thing to do in this day and age is build a reservoir. It takes 15, 20 years to build one now on average, a lot longer to get it on” (Focus group participant)***. Inter-basin transfers were suggested as ways of compensating for diminishing water supplies.

Pipelines are an efficient way of delivering water. Distributing water from existing dams to new areas via new pipelines was also suggested. Rather than constructing a new dam, new pipelines can be built.

### Agriculture

It would be beneficial to farmers and ranchers if they got together more often to share information. One way suggested by a focus group participant is by starting clubs. This would strengthen the social networks within the community and provide a support system for farmers and ranchers as well as a forum for people to exchange ideas.

The adoption, or expansion, of irrigation was also discussed in many of the focus groups. Irrigation systems ensure a good crop even if there is insufficient precipitation.

Additional off-stream and on-stream storage will be needed on agricultural operations to mitigate the effects of droughts and other water stresses.

Farmers will likely be planting different crops in the future (e.g. drought tolerant crops). They will also likely be planting at different times of the year. Farmers and ranchers may also choose to diversify their operations.

### Institutional

***“One of the things I’d like to see change is...that we quit rewarding poor management. We got far too great a history of doing just that, not really advancing. If we’re going to have incentives and rewards, it needs to go to those people who are the leaders, whether it’s land use or water use efficiencies” – Focus group participant***

***“Everybody, everybody has to talk!” – Focus group participant***

Priorities have to be made on water use. The government needs to decide who is entitled to water first. Is it going to be agriculture? Is it cities? Is it oil and gas? These decisions need to be made in order for the resource to be managed effectively and without confusion.

There needs to be more communication, integration and collaboration among institutions, particularly within all levels of government. The resource is mismanaged because there too many people working separately.

Incentives need to be given to those who are making an attempt to better the future of Alberta (e.g. farmers and ranchers maintaining wetlands and conserving water). Some people are, or will, incur significant costs, and they need to be compensated in some way for their efforts and expenses. Tax breaks would alleviate some of the pressure farmers.

Institutions should focus on both short-term and long-term planning, not just short-term. They should be proactive and try to avoid water issues rather than just hoping they can deal with them in the future.

Everyone should have an opportunity to voice their concerns. It is important that concerns are relayed back to higher officials, otherwise nothing will ever change.

The oil and gas industry collects water data as they drill oil and gas wells. This is an important source of information that is not being utilized. The industry should be required to submit these data to the government so that others can use it as well.

Canada should be seeking advice and information from other countries that are experiencing, or are projected to experience, similar conditions. Other countries have invested money in research that might be relevant and applicable in Canada, and they might be willing to share their results.

## **Adaptive Capacity**

Focus group discussions revealed numerous constraints and opportunities that influence stakeholders' ability to adapt to changing climatic conditions. This section summarizes both the constraints and the opportunities identified in the focus groups.

### Insights on constraints

- A lack of both funding and human resources hinders the ability of institutions to satisfy their mandates and to develop new initiatives. Monetary and human resources were identified as being insufficient and the major constraints on the implementation of plans and programs.
- Institutions often hinder adaptation through excessive regulation, limiting the strategies that can be employed.
- Need more information on surface water, ground water, aquifers and the rate at which they are being depleted. The water resource is difficult to manage when there are uncertainties surrounding how much is there and where it is.
- The government needs to stop rewarding poor management. The system seems to be set up in such a way that people can take advantage of the system. It is frustrating when those taking advantage find themselves much better off than those trying to make it on their own.
- More investment in agricultural research would put farmers in a better position to adapt in the future.
- Farmers feel they are not being compensated adequately, that is, they are not paid enough, for their products. They cannot control what they get for their product and this puts them in an extremely vulnerable situation.

### Insights on opportunities

- Higher temperatures will create opportunities for the agricultural industry. Crops that would not have done well under current climatic conditions will succeed in the future (e.g. fruit trees).
- As a result of rising temperatures, farmers will be able to crop earlier and ranchers will expand their grazing season.
- An increase in the number of growing degree days suggests the agricultural industry will be more successful than it currently is.

## **APPENDIX 1**

### **Hanna Focus Group Protocol**

#### **MORNING BREAK OUT SESSION**

Focus: The implications of the Sauchyn presentation for day to day and long-term management/planning in individuals operations/organizations.

What are the implications of these scenarios for you?

- With lower baseflow in the Red Deer River, do you anticipate problems?
- Higher evapotranspiration/less moisture during growing season?
- Warmer winters? Open winters?

At what point would these scenarios become a problem for you? How? What actions would you likely undertake as things get warmer/drier?

What needs to change to put you in a better position of meeting these challenges? What do you need from Special Areas? From the Province? From the Federal Government/PFRA? From other organizations?

Considering past water shortages/poor growing seasons, what did you do and what would you do differently in hindsight? Would what you did in the past work given the scenarios presented today?

#### **AFTERNOON BREAK OUT SESSION**

Focus: Institutions and drought management

What happened during the last drought/how did you handle it/what is different now?

What other factors affected you during those years? (BSE? Changes in transportation subsidies? PFRA programs? Prices?)

What institutions did you contact for help? Why? How was it effective? How could it have been better?

What additional support (in the context of drought and daily operation) is needed from institutions now and in the future?

Given what we know from Dave's presentation, what do you look for from institutions in the future?

## APPENDIX 2

### Agenda

**Stakeholder Workshop on Water and Climate in the Prairies  
Hanna Community Centre  
Monday February 26, 2007**

Organized by Special Areas and PFRA as a Project Partner with the Universities of Regina,  
Guelph, British Columbia, Saskatchewan and Athabasca.

For more information on the research project: "Institutional Adaptation to Climate Change" See:  
<http://www.parc.ca/mcri/index.php> Funded by Social Sciences and Humanities Research Council

**9:00 Welcome and Introductions**

- Darrell Corkal, PFRA
- Polo Diaz, Canadian Plains Research Centre, University of Regina
- Fiona Briody/Ken Forsyth, PFRA

**9:20 Climatic Conditions and Water Management in Special Area 2**

- Johanna Wandel and Gwen Young, University of Guelph

**9:45 Future Climate Conditions in the Prairies**

- Dave Sauchyn, University of Regina

10:30 Coffee Break

**11:00 Breakout Sessions**

- Focus: Climate and water issues, present and future. What does this mean for your operation, livelihood, business, organization?

12:15 Lunch, provided

**1:00 Special Areas during the 1930s: historical perspectives**

- Greg Marchildon, University of Regina

**1:30 Impacts and Adaptation, the Case of the 2001-2003 Drought**

- Virginia Wittrock, Saskatchewan Research Council

**2:00 Breakout Sessions**

- Focus: Institutions and drought management

3:15 Coffee

**3:40 Questions and closing remarks**