



Drought Impacts on Canadian Rural Communities: Monitoring and Assessment

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Main Messages

- **Rural communities** experience significant **economic, environmental and social pressures** during and after severe droughts
- **Pro-active adaptation** strategies for drought were used, but many are **re-active**. **Enhanced adaptation** is vital to decrease current and future vulnerability
- **Institutions** play a major role in determining **adaption and vulnerability**

Outline

- Objectives and methodology
- Community descriptions
- Vulnerability assessment- main exposures, sensitivities, adaptation strategies and examples

Photo Sources: E. Wheaton 2005 (L&R)
D. Corkal 2007 (middle)



Objectives

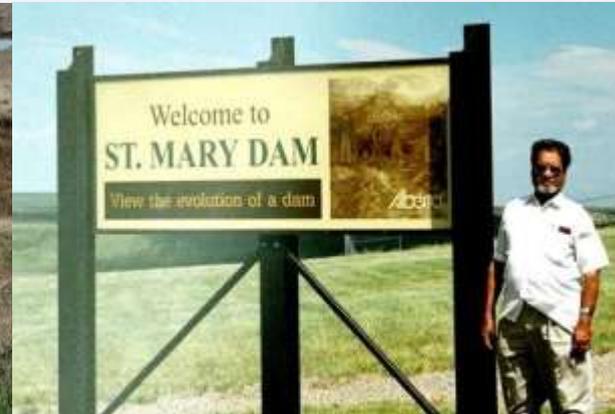
- To examine bio-physical, economic and social **vulnerabilities** of rural communities to droughts
- To determine **adaptation measures** undertaken by communities to deal with water scarcity
- To assess the technical and social **adaptive capacities** of communities in the South Saskatchewan River Basin, Canada



Institutional Adaptation
to Climate Change:
5 year SSHRC funded,
interdisciplinary team
of 35 researchers and
many students from 5
Canadian Universities
and a Chilean
University, led by
Diaz, Sauchyn and
Gauthier, University
of Regina

Data and Methodology

- Primary data: community and institutional level interviews, workshops, focus groups, environmental records
- Secondary data: enterprise specific and location specific, drought patterns and associated bio-physical and economic impacts
- News media surveys were used for related projects

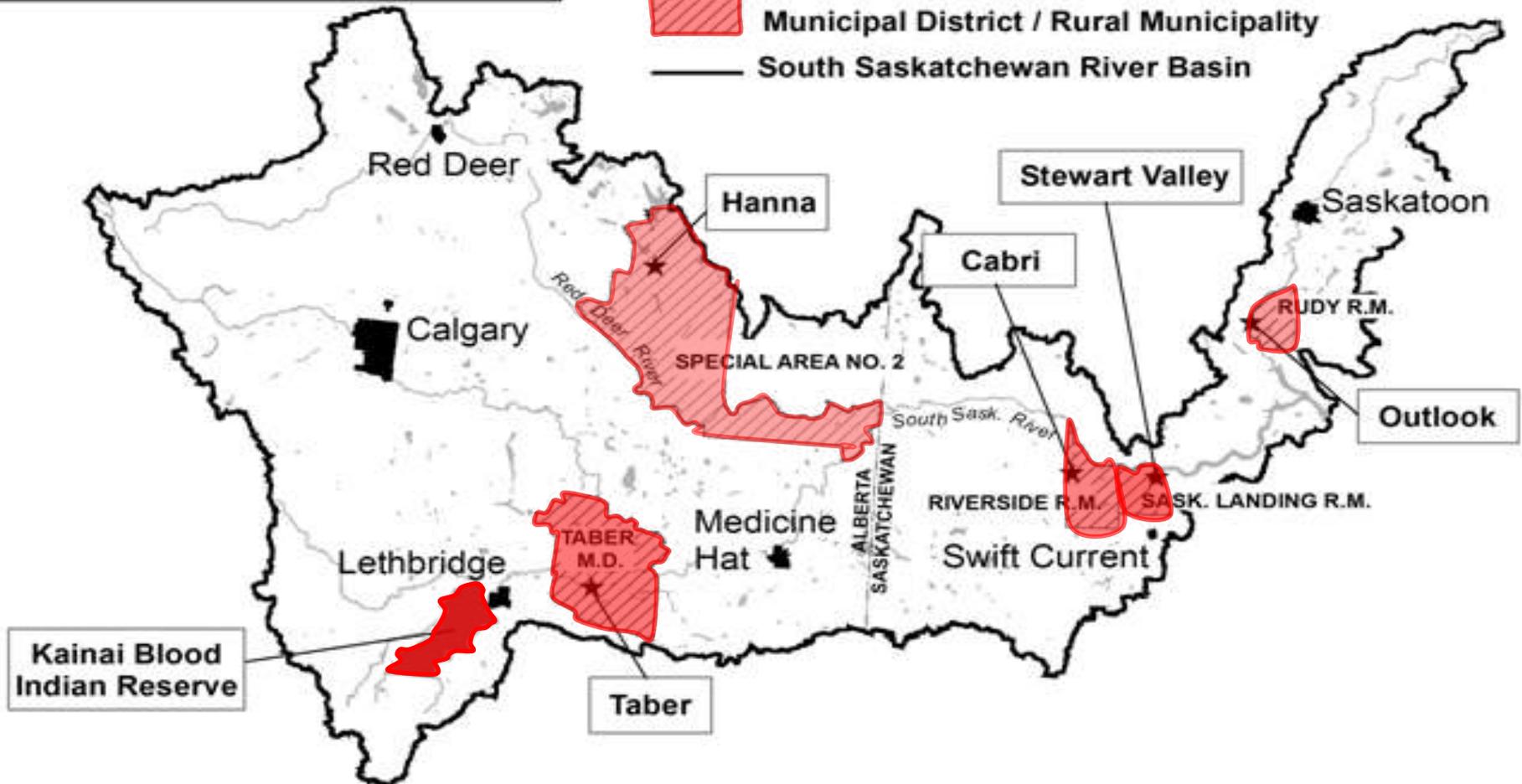


STUDY AREA

Map created by L. Patino November 2008



- ★ Selected Communities
- ▨ Municipal District / Rural Municipality
- South Saskatchewan River Basin



Communities: Background

- All communities are **rural**
- **Agriculture** is the main economic driver for most of the communities. Kainai Nation receives some economic benefit from its agricultural land
- Irrigation is used for **supplementing water requirements** of crops and livestock for some communities (Taber, Outlook, Kainai Nation)
- **Tourism, Oil and Gas** sectors are other economic drivers (e.g., for Cabri, Outlook, Taber)
- Region is subject to many **climatic extremes**

Sources of Potable Water Supplies

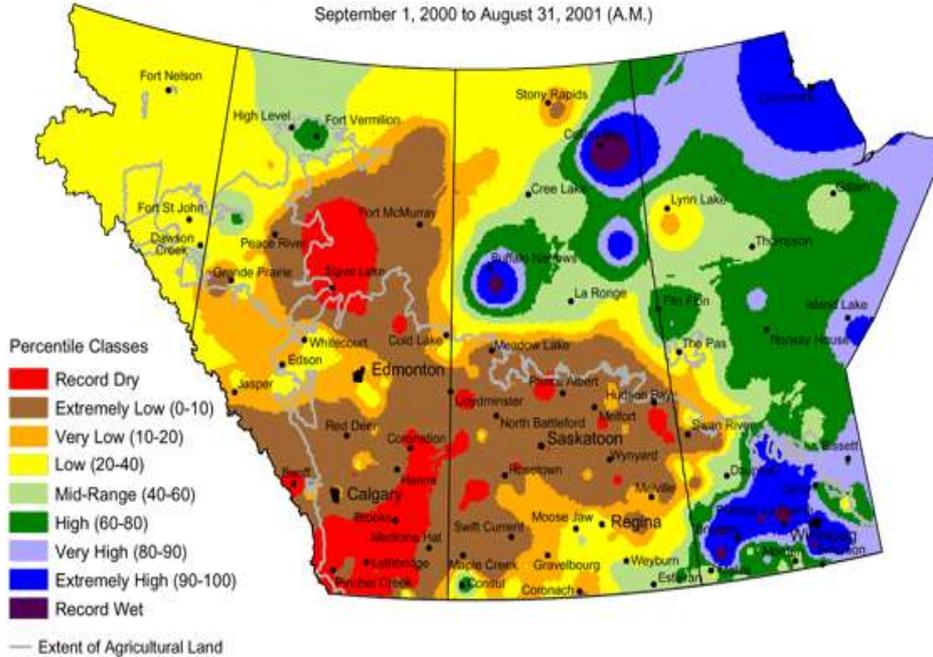
- **Outlook** – South Saskatchewan River
- **Taber** – St. Mary's Reservoir and canal system in the summer; the Chin Reservoir and reservoir south of Barnwell in the winter
- **Hanna** – Red Deer River via a pipeline into a reservoir
- **Kainai Nation** – Groundwater (5 communities) and potable water pipeline from Cardston (one community of Moses Lake)
- **Cabri** – South Saskatchewan River via a pipeline into a reservoir
- **Stewart Valley** - Groundwater

2001-2002 Drought

The Migrating Drought

Current Precipitation Compared to Historical Distribution

September 1, 2000 to August 31, 2001 (A.M.)

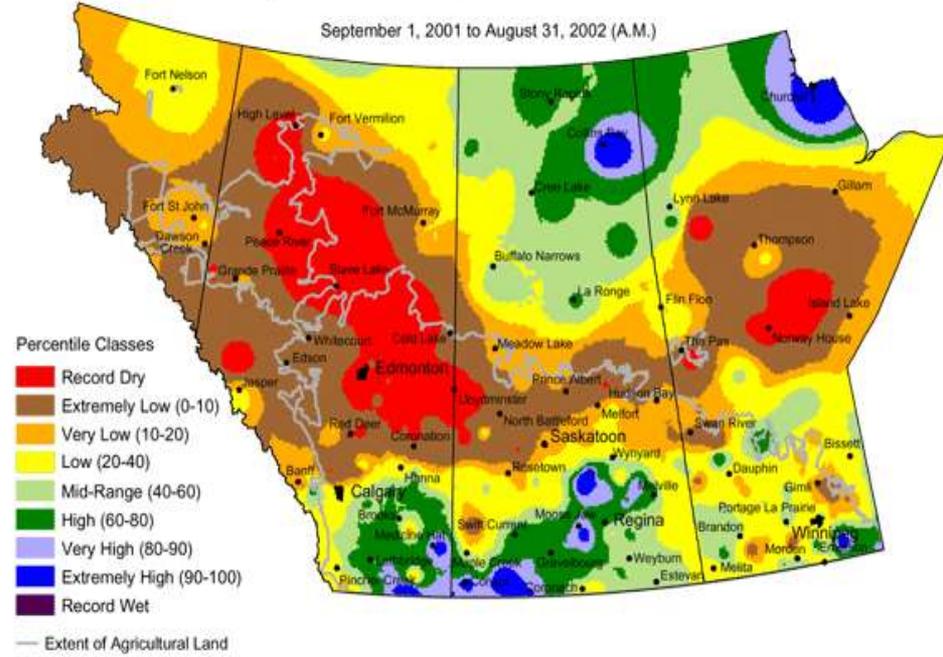


Prepared by PFRA (Prairie Farm Rehabilitation Administration) using data from the Timely Climate Monitoring Network and the many federal and provincial agencies and volunteers that support it.

Sept 1, 2000 to Aug 31, 2001

Current Precipitation Compared to Historical Distribution

September 1, 2001 to August 31, 2002 (A.M.)



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Sept 1, 2001 to Aug 31, 2002

Exposures to climate hazards in 2001-2002: more than just drought

– Temperature extremes

- **Late spring/early fall frosts (e.g., spring 2002)**
- **Extreme variability (e.g., spring 2002)**

– Extended drought

- **Wind erosion**
- **Decreased water supply (e.g., Cabri, Taber, Kainai Nation)**
- **Increased grasshopper damage (e.g., Hanna, Cabri, Stewart Valley)**
- **Lower crop and forage production (all study area communities)**

– Excessive moisture

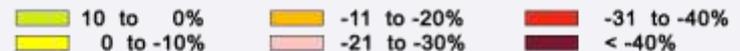
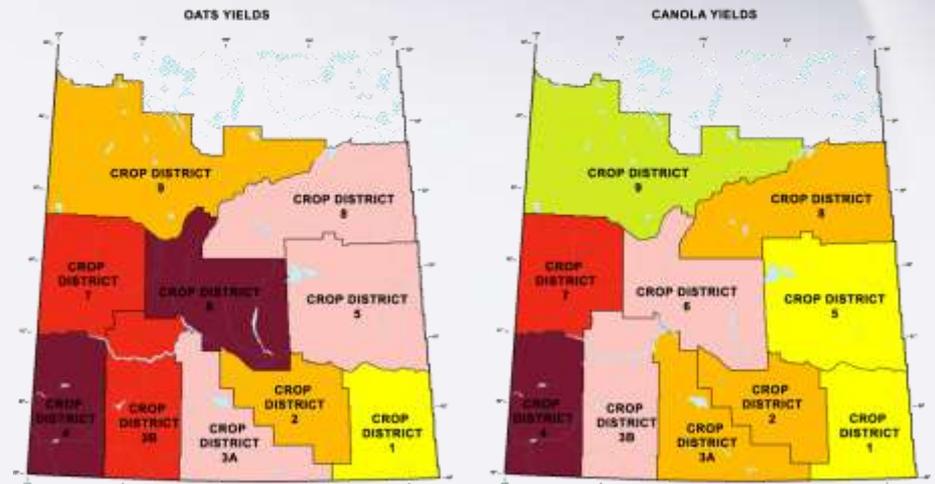
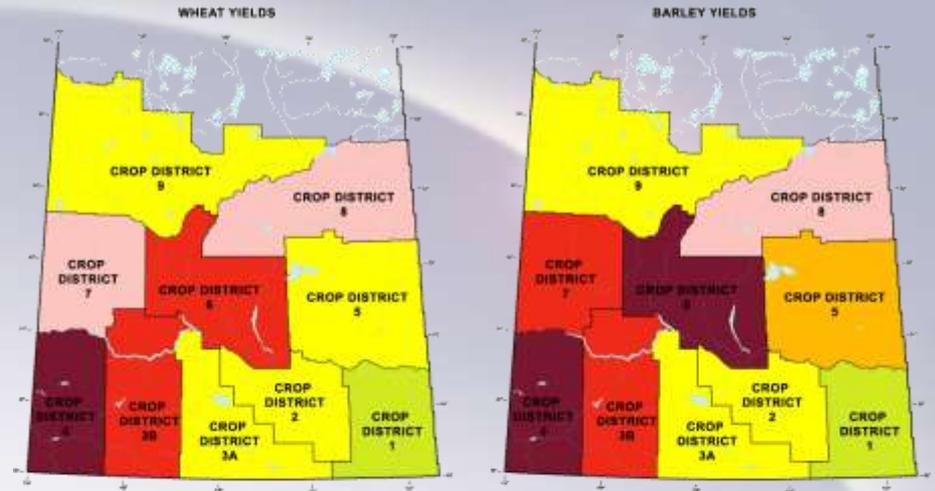
- **Flood damage (e.g., Kainai Nation – spring 2002)**

Impacts on Water Use

- **Cabri** - Had water shortages in 2000, 2001 and 2002
 - Water consumption was highest in 2001 over the 1999 to 2005 period
- **Stewart Valley** - Had adequate water supplies
 - Water consumption was highest in 2003 over the 2001 to 2005 period
- **Outlook** – Had adequate water supplies
 - Water use was above average for 2001 to 2004
- **Taber** – water use was below average for 2001 to 2003
 - Water restrictions were imposed in 2001
- **Hanna** – Had adequate water supplies
 - water use was above average
- **Kainai Nation** – not monitored- data gaps

Drought and Vulnerability

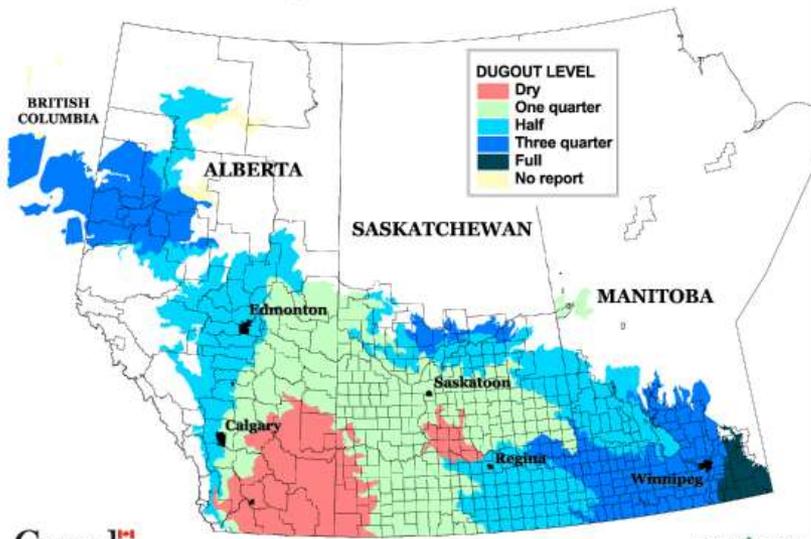
2001 and 2002 drought resulted in severe impacts (e.g. crop and water supplies)



Data source: Saskatchewan Agriculture and Food

Percent Above / Below 10-year Average (1991 - 2000 average bu/ac)

Dugout Levels for 17 September 2001



Canada

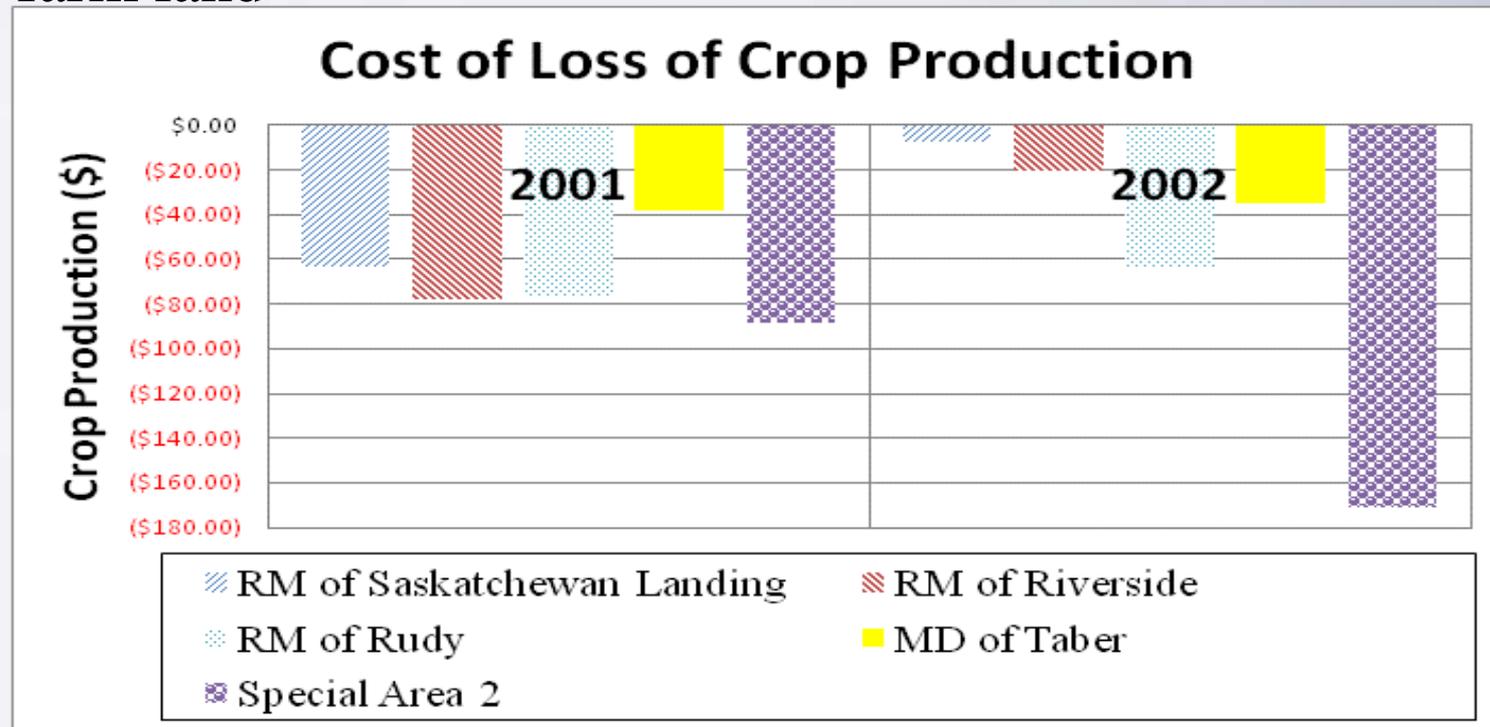
PFRA ARAP

Economic Impacts in 2001-2002 (community examples)

- **Lack of employment**
- **Low crop prices and high input costs**
- **Demographic inequity (young people move away and not returning)**
- **Off-farm income provided compensated drought effects, somewhat**
- **Decreased non-agricultural business due to negative impacts on agriculture sector**
- **Centralization of services in larger communities**

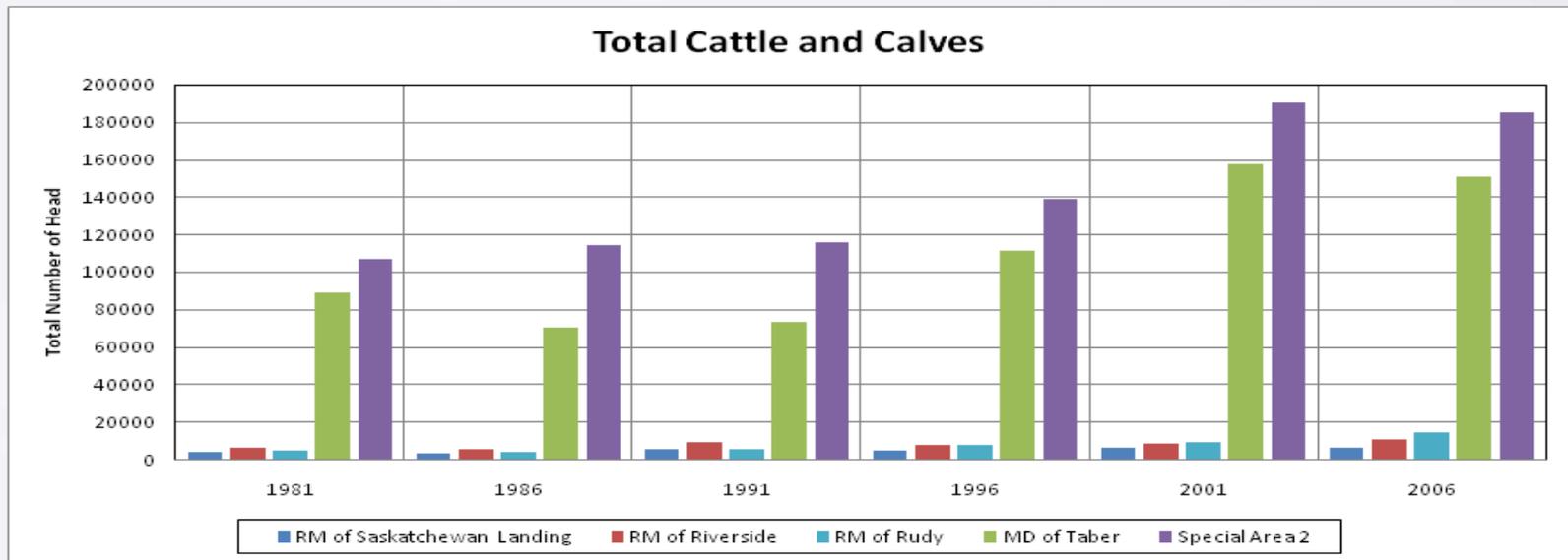
Economic Impacts on Crop Revenue

- Crop revenue was below break even values in 2001 and 2002 in RMs.
- Revenue losses occurred for all five areas...Special Area 2 most negatively impacted
- No data for Kainai Nation due in part to the community cash leasing its farm land



Impacts on Livestock Production

- Herd sizes declined between 2000 and 2003, likely because of the higher culling rates than normal
- Number of cattle marketed increased in 2000 and 2001 compared to the 1996-1999
- Increased sales had short-term gains, but costs livestock operations longer-term viability and growth
- Kainai Nation's cattle numbers are unavailable



Current Adaptive Strategies

- **Rural communities have learned and need to continue to learn to adapt**
- **External organizations and mechanisms of farm support such as crop and hail insurance are useful, but present challenges**
- **Farming practices are changing (e.g., continuous cropping)**
- **Income is diversifying (e.g., work on the oil rigs, health care workers, service industry etc)**
- **Social capital is being used - people working together**

Adaptive Strategies used for Water Management

- Water restrictions were imposed**
- Water was hauled from alternative water sources (e.g., Municipal wells)**
- Large water trucks were restricted from using potable water**
- Grey water was used (e.g. gardens)**
- Water infrastructure was upgraded**

Adaptive Strategies used for Livestock Management

- Culling of herd**
- Moving cattle out of area**
- Buying feed**
- Trucking water**
- Buying land in non-drought stricken locations to use as feed source**
- Leasing land to non-members (Kainai Nation)**
- Using better management practices (e.g., keep livestock from water bodies)**

Conclusions

- The communities experienced **significant** economic, environmental and social **pressures** during and after the drought
- Other stressors are **exacerbated** by extreme events such as drought and vice versa
- **Stressors** included water supply and quality issues, increased water consumption, older populations, depopulation and centralization of services



Conclusions

- **Awareness** of climate change and further water problems exists, but most adaptation strategies are **reactive**, not **pro-active**
- **Some** of the adaptation **strategies** implemented are very valuable for both current and future droughts...e.g., potable water pipelines
- Enhanced impact and adaptation monitoring and assessments are vital



Photo source: E. Wheaton 2005

Questions?



Acknowledgements

- Institutional Adaptation to Climate Change Project (University of Regina)
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Socio-Economic Impacts of the 2001-2002 Drought in Canada

- Total Canadian agricultural production loss was ~\$3.6 billion
- Gross Domestic Product fell ~\$5.8 billion
- Employment losses > 41,000
- Worst year was 2002
- Alberta and Saskatchewan were hit hardest

