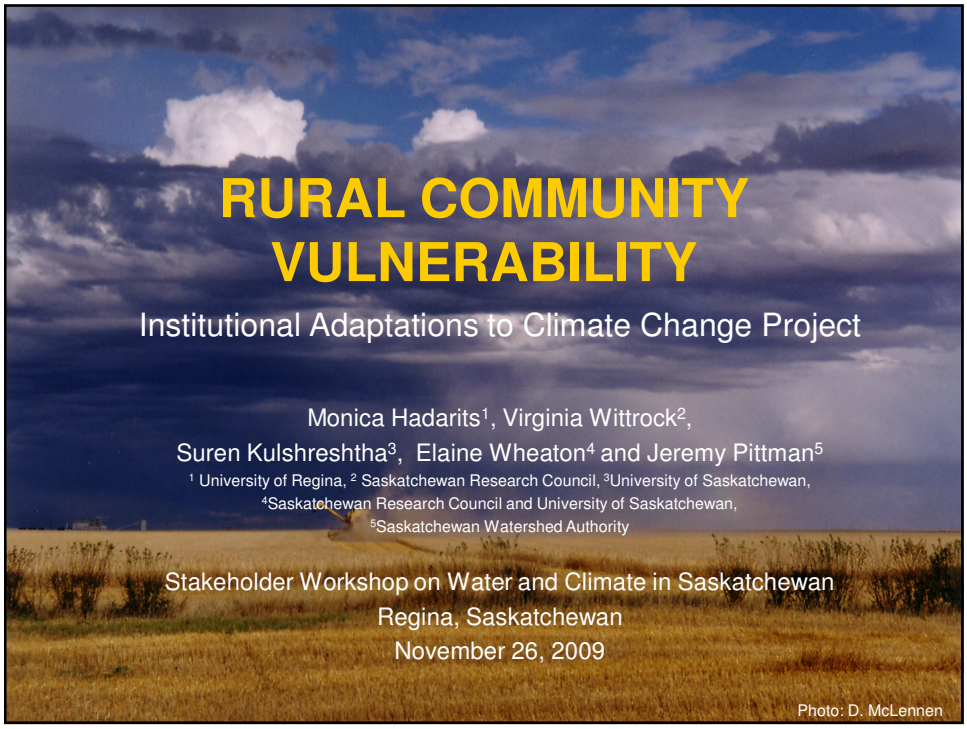


RURAL COMMUNITY VULNERABILITY

Institutional Adaptations to Climate Change Project

Monica Hadarits[1], Virginia Wittrock[2],
Suren Kulshreshtha[3], Elaine Wheaton[4] and Jeremy Pittman[5]
[1] University of Regina, [2] Saskatchewan Research Council, [3]University of Saskatchewan,
[4]Saskatchewan Research Council and University of Saskatchewan,
[5]Saskatchewan Watershed Authority

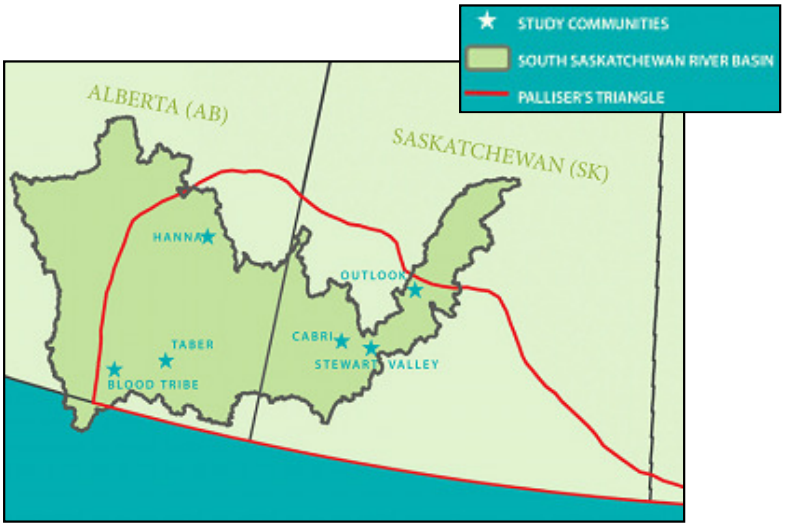
Stakeholder Workshop on Water and Climate in Saskatchewan
Regina, Saskatchewan
November 26, 2009

Photo: D. McLennen

Objectives

- Identify the climate and water related stresses rural communities experience (*exposure-sensitivities*)
- Document the strategies rural people use to manage these stresses (*adaptive strategies*)

Study Communities



Map by: J. Pittman

Methods

- Semi-structured interviews
- Focus groups
- Workshops
- Secondary sources

Photo credits : D. Corkal

Exposure-sensitivities

– The amount and timing of precipitation:

- Drought (lack of moisture) (e.g., affect germination and growth, impede grass growth, reduce water availability)
- Excessive precipitation (e.g., reduce quality, delay operations)

Photo credits (L-R): D. McLennen; C.L. Pawluck; L. Westerhoff

Exposure-sensitivities

– Temperature variability:

- Excessive heat (e.g., damage crops/grasses, increase evaporation rates, cause hailstorms, early maturation)
- Quick snow melts with low snow accumulation (e.g., reduce runoff and infiltration, decrease replenishment)

Photo credits (T-B): Tiny Farm Blog; D. Corkal; Brooloo Park

Exposure-sensitivities

- Climatic exposure-sensitivities are compounded by:
  - Economic factors (e.g., international market fluctuations, low commodity prices, high input costs)
  - Institutional factors (e.g., program removal)

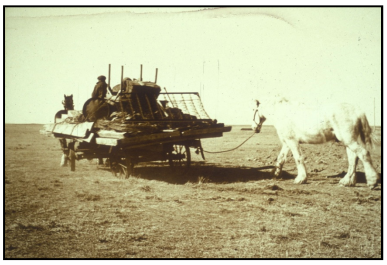


Photo credit: PFRA

Adaptive Strategies

- Producers and rural communities:
  - Crop insurance
  - Water management (e.g., dug outs, irrigation, ration water)
  - Diversify income and operations (e.g., off-farm work, mixed farming)
  - Social capital (e.g., social networks)

Photo credits (L-R): D. Corkal; W. Eastep

Shoal Lake First Nation

- Exposure-sensitivities:
  - Excessive moisture (e.g., soil saturation leads to basement infiltration)

Photo credits: J. Drummond and J. Pittman

Shoal Lake First Nation

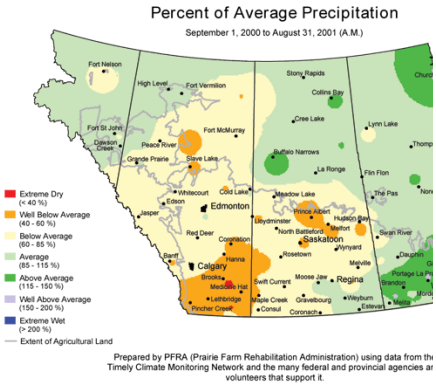
- Adaptive strategies:
  - Band partnered with Dalhousie University (community planning project)
  - Good standing with CMHC = able to obtain loans

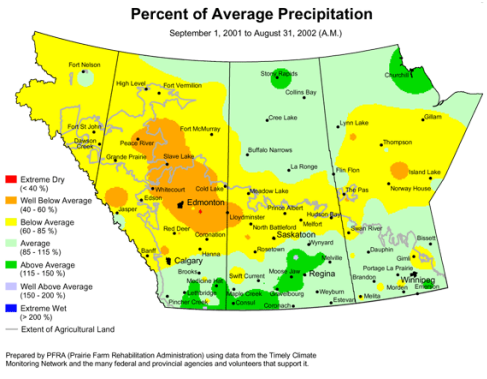
Photo credit: J. Pittman

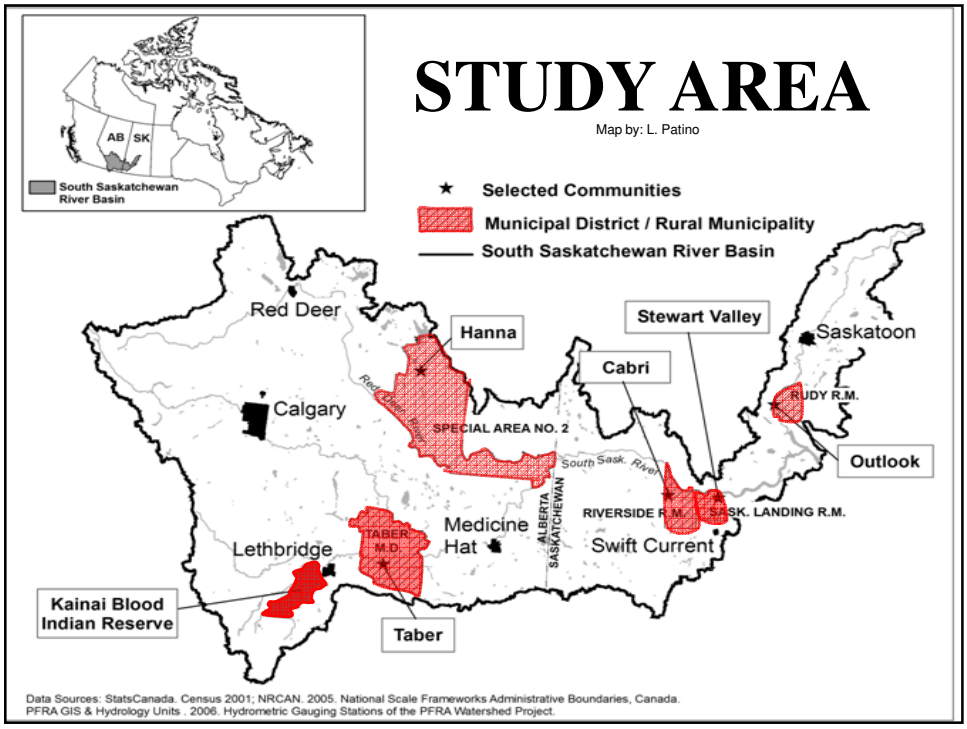
Conclusions

- Rural people and agricultural producers are coping with climate and water stresses, as well as with economic and institutional factors
- Strategies are indicative of capacities to cope with future change

Exposure and Sensitivity Case Study: 2001-2002 Drought







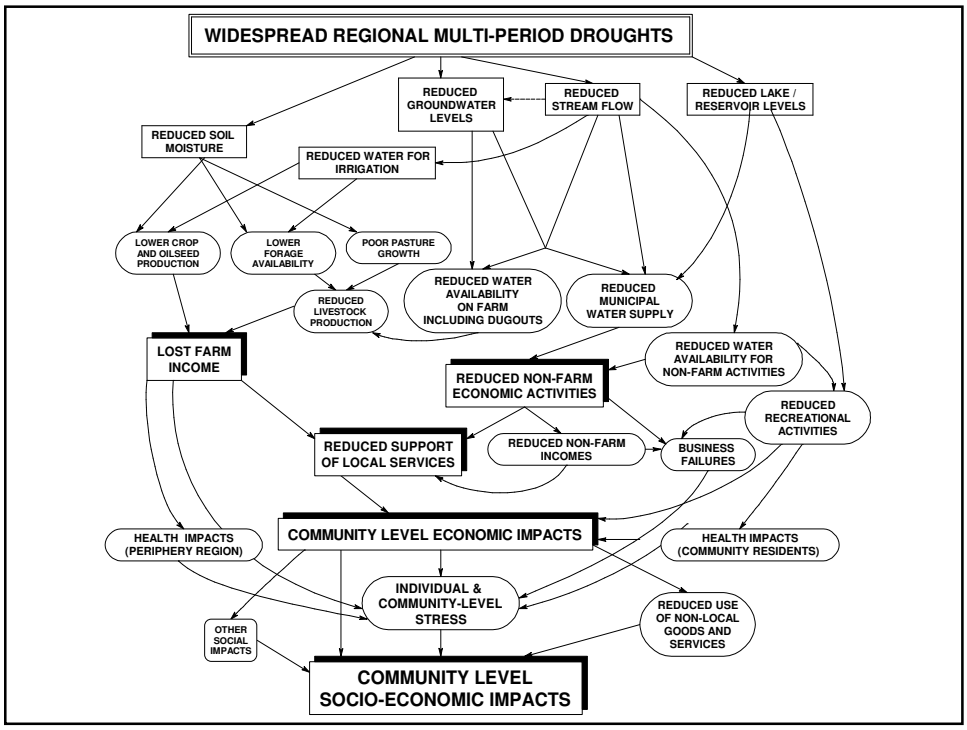
Communities

- All communities are located in **rural** (non-urban or fringe) areas
- **Agriculture** is the main economic driver for most of the communities.
- In some communities (RM of Rudy (Outlook)), and to a much lesser extent (RM of Riverside (Cabri)) irrigation is used for **supplementing water requirements** of crops and livestock
- **Tourism, Oil and Gas** sectors are other economic drivers (e.g., for Cabri, and Outlook).
- Region subject to **climatic extremes**

Potable Water Supplies - Sources

- **Outlook** – South Saskatchewan River
- **Cabri** – South Saskatchewan River via a pipeline
- **Stewart Valley** - Groundwater

Cabri's Saskatchewan's potable water reservoir, fall 2005. Photo: E. Wheaton



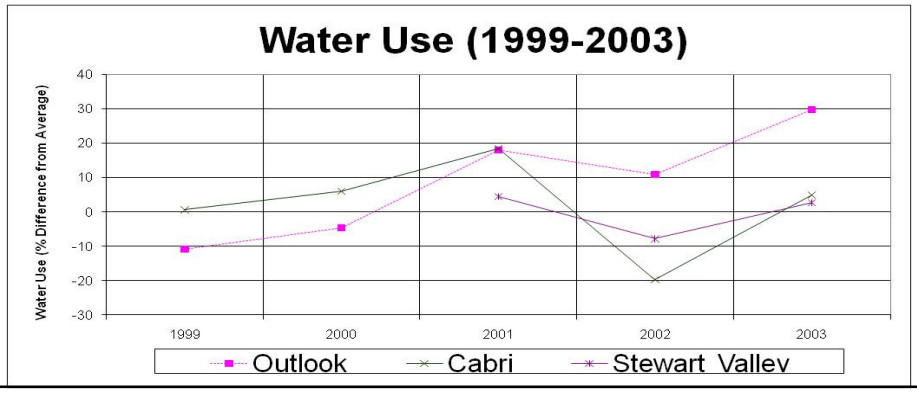
Exposures in 2001/2002

- Climatic Extremes (examples)
  - Temperature extremes
    - Late spring/early fall frosts (e.g., spring 2002)
    - Extreme variability (e.g., spring 2002)
  - Extended drought periods
    - Soil moisture
    - Wind erosion
    - Decreased water supply (e.g., Cabri)
    - Increased grasshopper damage (e.g., Cabri, Stewart Valley)

Photo: E. Wheaton 2005

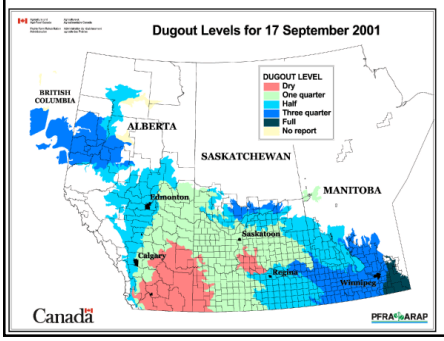
Water Use

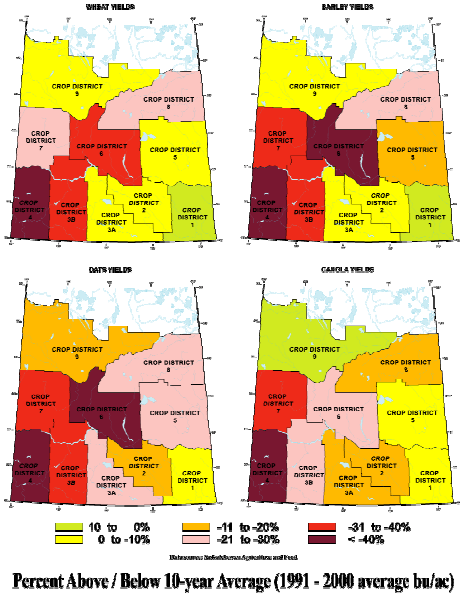
- **Cabri -** Had water shortages in 2000, 2001 and 2002
- **Stewart Valley -** Had adequate water supplies
- **Outlook** – Had adequate water supplies



Drought and Vulnerability

- 2001 and 2002 were extreme drought years and had severe impacts on many sectors





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

Wheaton et al. 2008

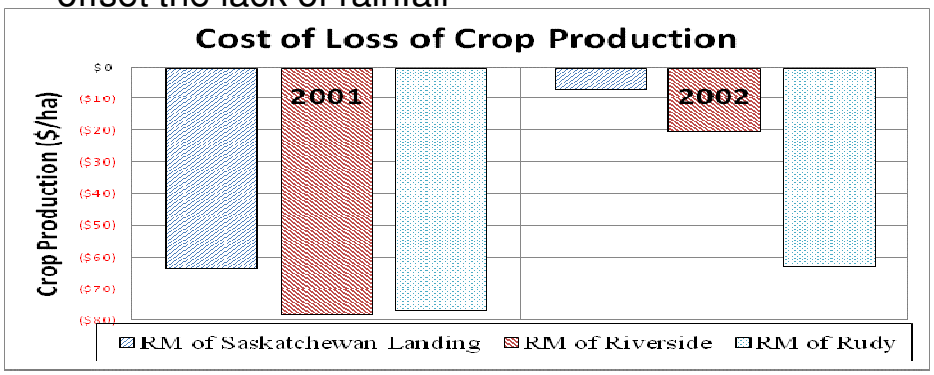
Economic Impacts in 2001/2002 (e.g. from SK communities)

- Lack of employment
- Lower crop and forage production (all study area communities)
- Low crop prices and high input costs
- Demographic inequity (young people move away and not returning)
- In some communities, off-farm income provided some compensating effect to drought impacts
- Decrease in non-agricultural business due to negative impact on agriculture sector
- In some communities, centralization of services in larger centres e.g., Swift Current, Saskatoon

Photo: E. Wheaton 2005

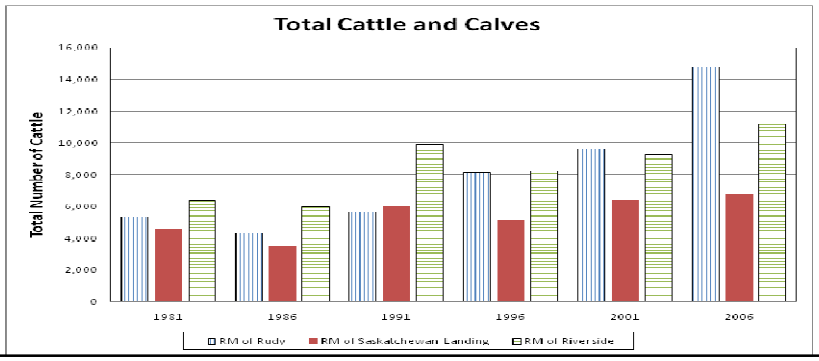
Economic Impacts on Crop Revenue

- Crop revenue was below break even values in 2001 and 2002 in RMs.
- Revenue losses occurred for all areas…RM of Rudy most negatively impacted in 2002 – irrigation couldn't offset the lack of rainfall



Livestock Production

- Prairie wide, herd size declined between 2000 and 2003 indicating higher culling rate than normal.
- The number of cattle marketed increased in 2000 and 2001 compared to the 1996-1999 period.
- Although this has short-term gains it reduces to livestock operations longer-term viability.



Current Adaptive Strategies

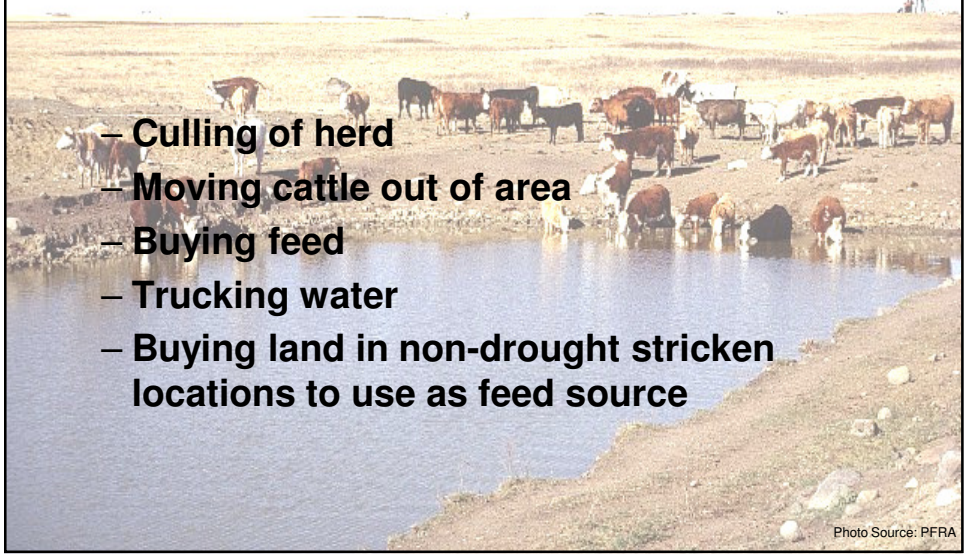
- **Rural communities have learned and need to continue to learn to adapt**
- **External organizations and mechanisms of farm support such as crop and hail insurance – challenges with programs**
- **Changed farming practices e.g., continuous cropping**
- **Diversified income – off-farm (e.g., work on the oil rigs, health care workers, service industry etc)**
- **Social Capital - people work together**

Adaptive Strategies used for Water Mangement

- Water Scarcity (e.g., Cabri)
  - Water restrictions imposed
  - Hauled water from alternative water sources (e.g., Municipal wells)
  - Large water trucks were restricted from using Cabri's potable water
  - Used grey water to water gardens (e.g., laundry water)
  - Upgraded potable water infrastructure
    - Cabri extended pipeline farther into South Saskatchewan River

Photo: E. Wheaton 2005

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

Photo Source: PFRA

Conclusions

- Droughts affected all three regions but Cabri was the most affected. 2002 was less severe than 2001 in all locations.
- **Water –** supply, quality & consumption issues occurred. E.g., Outlook and Stewart Valley had a **more reliable** water supply. Cabri had to further **adapt** to make their water supply more reliable.

Conclusions Continued

- Crop Production and Financial losses – all RMs suffered crop production and financial losses
- **More cattle** were **sold** in the drought years of 2000 and 2001 but economic impacts could not be assessed.

Conclusions Continued

- The communities experienced **significant** economic and social **pressures** during and after the drought
- Other stressors are **exacerbated** by extreme events such as drought.
- Other **Stressors**: older population, depopulation and centralization of services.

Conclusions Continued

- **Awareness** of climate change exists, but most of the current adaptation strategies are **reactive**, not **pro-active**.
- However, **some** of the adaptation **strategies** are important to decrease vulnerability to future droughts…e.g., potable water pipeline for Cabri.

References and Bibliography

Diaz, P. 2008. "IACC Project Overview" pg 3 in: Anonymous 2008 "Adaptation to Climate Change in the Canadian Plains Symposium" April 22, 2008 Regina, SK. Presented by Saskatchewan Institute of Public Policy AND Institutional Adaptations to Climate Change Project.

Diaz, P. S. Kulshreshtha, B. Matlock, E. Wheaton and V. Wittrock. 2008 Submitted and accepted. Rural Community and Vulnerability to Climate Change: Case Studies of Cabri and Stewart Valley in Southwestern Saskatchewan. Prairie Forum.

Magzul, L. 2005. "Fieldnotes" Community Vulnerability Assessment of the Blood Indian Reserve, Institutional Adaptations to Climate change Project.

Wheaton, E., S. Kulshreshtha, V. Wittrock and G. Koshida. 2008. Dry Times: Hard Lessons from the Canadian Drought of 2001 and 2002. The Canadian Geographer 52(2):241-262.

Wheaton, E., V. Wittrock, G. Koshida. 2009. Confronting Climate Hazards: Implications for Vulnerability. Presentation at "Research for Disaster Reduction from Extremes Workshop (REDE)" May 20-21, 2009. Winnipeg, Manitoba

Wittrock V, Dery D, Kulshreshtha S, Wheaton E (2006) Vulnerability of Prairie Communities' Water Supply During the 2001 & 2002 Droughts: A Case Study of Cabri and Stewart Valley, Saskatchewan. Saskatchewan Research Council (SRC), Saskatoon, Saskatchewan. SRC Publication No. 11899-2E06

Wittrock V, Kulshreshtha S, Wheaton E, Khakapour M (2007) Vulnerability of Prairie Communities During the 2001 and 2002 Droughts: Case Studies of Taber and Hanna, Alberta and Outlook Saskatchewan. Saskatchewan Research Council (SRC), Saskatoon, Saskatchewan. SRC Publication No. 11899-8E07

Wittrock V, Kulshreshtha S, Magzul L, Wheaton E (2008) Adapting to Impacts of Climatic Extremes: Case Study of the Kainai Blood Indian Reserve, Alberta. Saskatchewan Research Council (SRC), Saskatoon, Saskatchewan. SRC Publication No. 11899-6E08

Wittrock, V., S. Kulshreshtha and E. Wheaton. 2009. The First 21st Century Extreme Drought Event and Its Impacts on Canadian Prairie Communities. Presentation at the 43rd Annual National Conference on the Canadian Meteorological and Oceanographic Society May 31 – June 4, 2009 Halifax, Nova Scotia. Saskatchewan Research Council (SRC), Saskatoon, Saskatchewan. SRC Publication No. 11899-1D09

Wittrock, V. 2002. Preliminary Description of the 2001 Drought in Saskatchewan. Saskatchewan Research Council (SRC) Publication No. 11501-1E02.

Wittrock, V. and E. Wheaton. 2007. Towards Understanding the Adaptation Process for Drought in the Canadian Prairie Provinces: The Case of the 2001 to 2002 Drought and Agriculture. Saskatchewan Research Council (SRC) Publication No. 11927-2E07.