Vulnerability and Adaptation to Climate Extremes in the Americas (VACEA)

IRIACC Meeting, IDRC, 13 April 2016

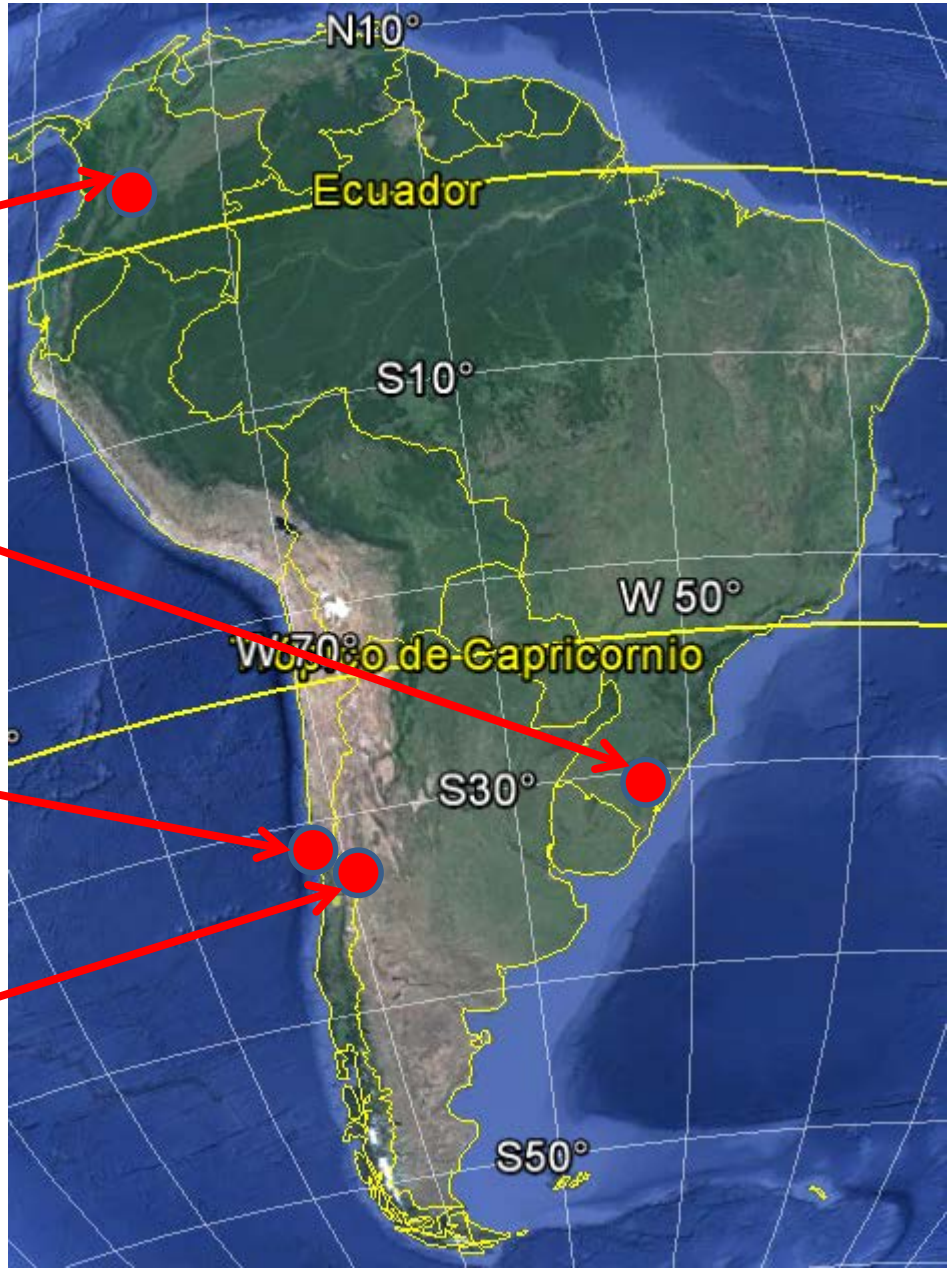
The VACEA pilot areas

COLOMBIA
Manizales-Caldas Region
The Chinchina River Valley

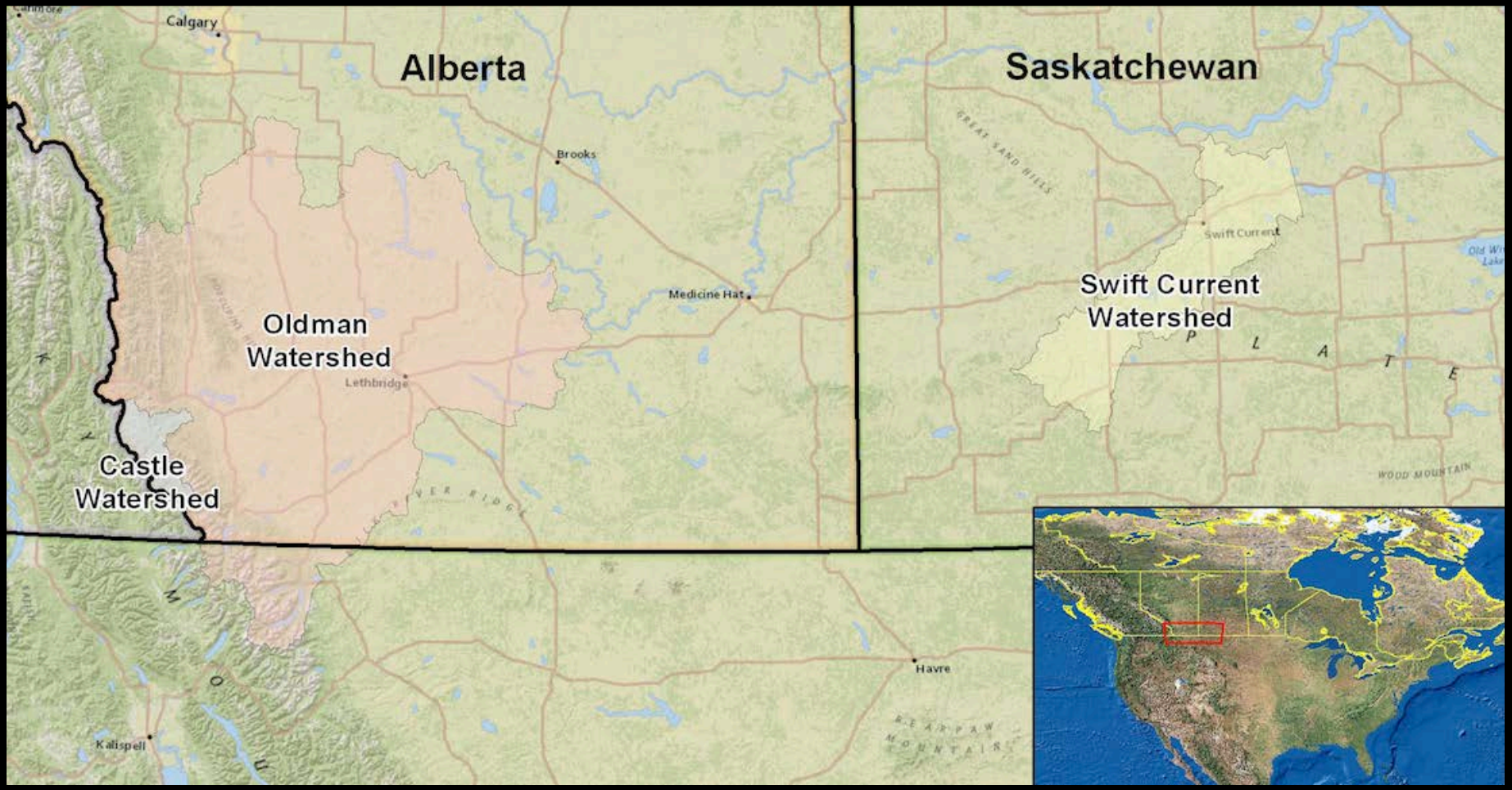
BRASIL
Santa Catarina

CHILE
Choapa Valley

ARGENTINA
Mendoza River Basin



Oldman River and Swift Current Creek Basins: The Drylands of **Canada**



Puerto Varas, Deciembre, 2013

Training and Mentoring

VACEA - Objective

The overall objective is to improve the understanding of the **vulnerability of rural agricultural and indigenous communities** to **shifts in climate variability and to the frequency and intensity of extreme climate events**, and to engage governance institutions in Canada, Argentina, Brazil, Chile and Colombia in enhancing their adaptive capacity to **reduce rural community vulnerability**.

Vulnerability and Adaptation to Climate Extremes in the Americas (VACEA)

Vulnerabilidad y Adaptación a los Extremos Climáticos en las Américas

Principal Investigators:

Los investigadores principales

Dr. Dave Sauchyn, University of Regina, Canada
Dr. Fernando Santibañez, Universidad de Chile, Santiago

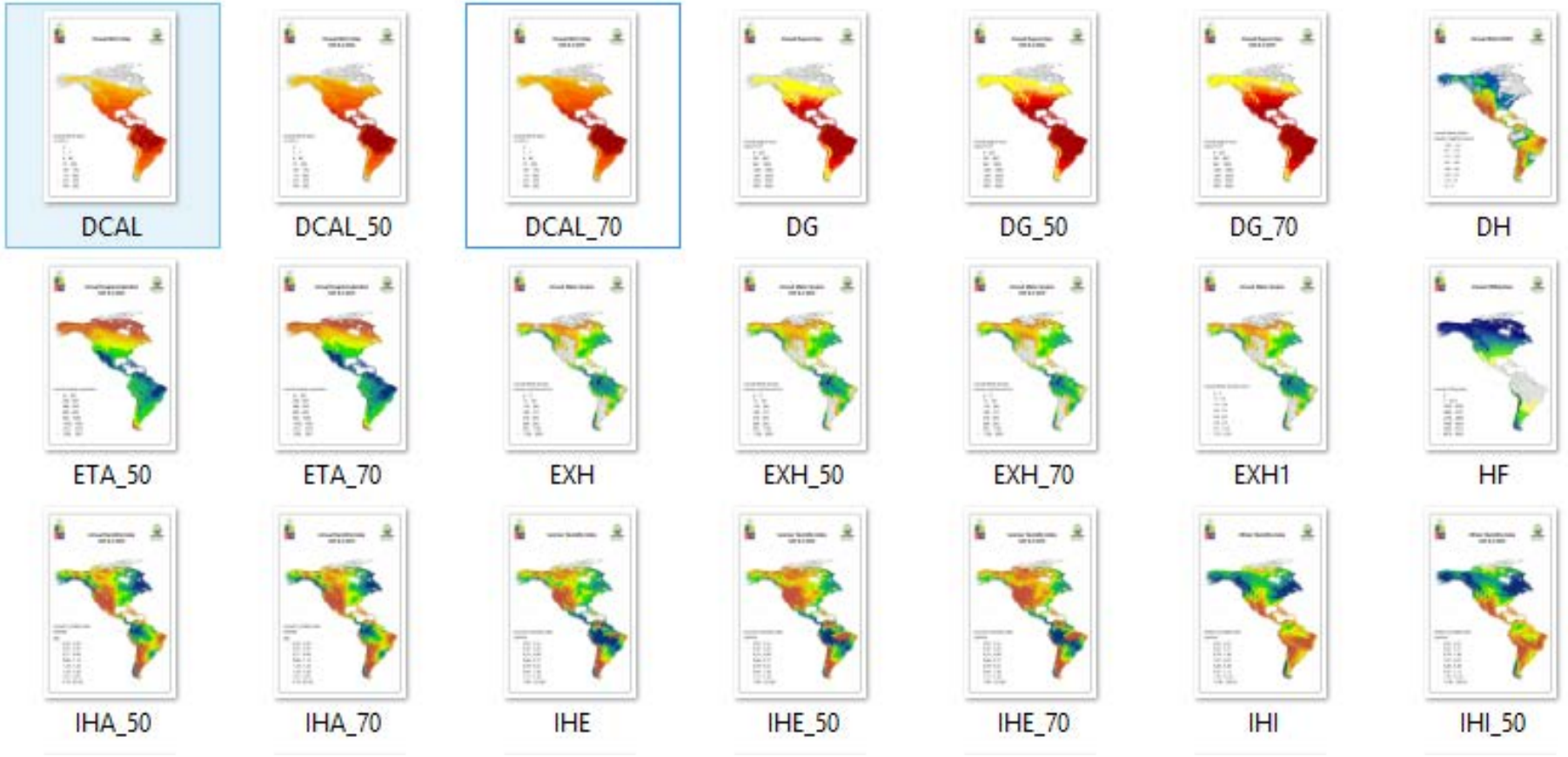
IDRC CRDI

NSERC CRSNG

Social Sciences and Humanities Research Council of Canada

www.parc.ca/vacea/

High-resolution climate change scenarios (Ensemble from three selected models for 2041-70 and RCP 8.5); AGRIMED, University of Chile

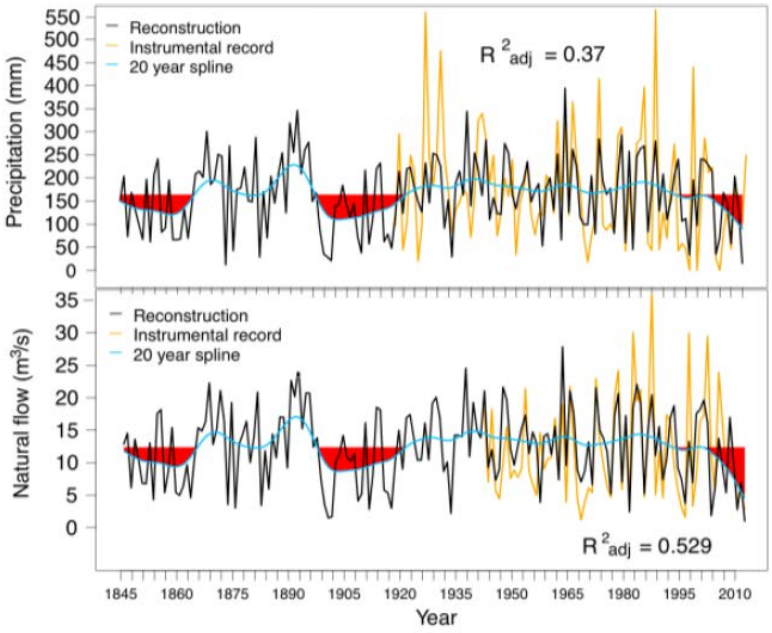


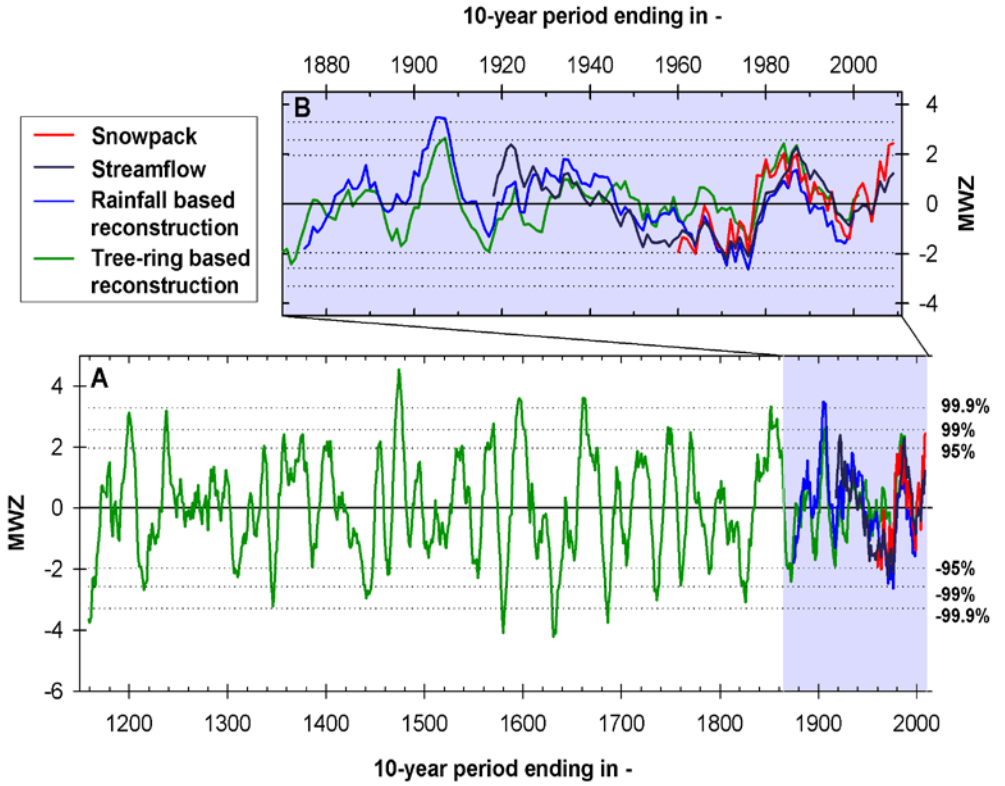
Warm days, degree days, water deficit, potential evapotranspiration, water surplus, chilling hours, aridity index, humid season-dry season lenght, frost free season, annual rainfall.

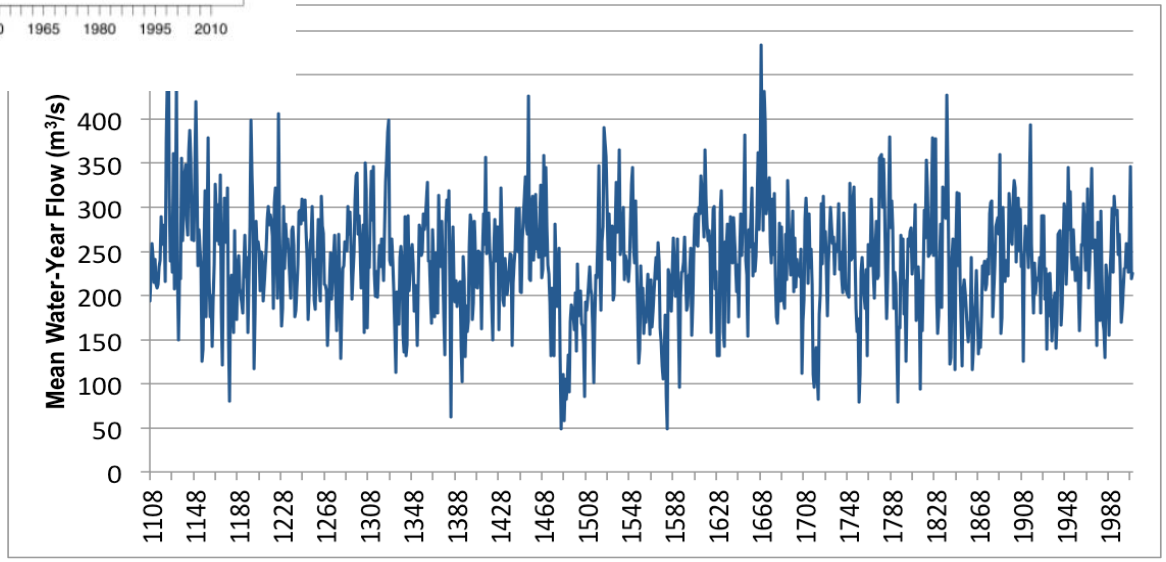
Variabilidad climática en la cuenca del río Chinchiná

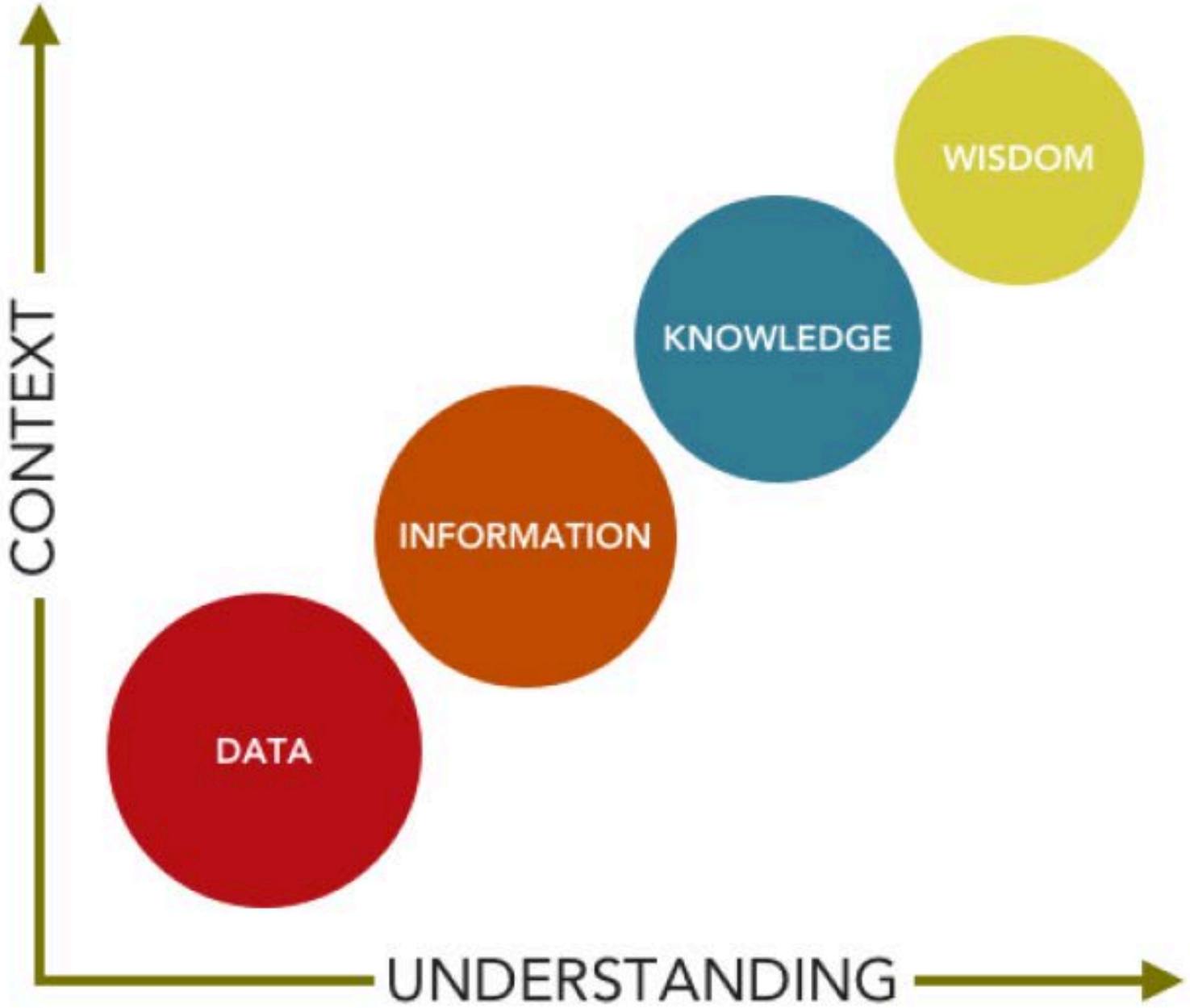
“The farther back you can look, the further forward you are likely to see.”

Sir Winston Churchill








CONTEXT
UNDERSTANDING
DATA
INFORMATION
KNOWLEDGE
WISDOM

Partner	*Contact*
AB Agric & Rural Development	Brent Paterson
AB Environment	Bob Manteaw
AESB / AAFC	Ian D Campbell
Blood Tribe	Elliot Fox
Oldman Watershed Council	Stephanie Palechek
Prairie Provinces Water Board	Mike Renouf
SK Assoc of Watersheds	Deanna Trowsdale-Mutafov
SK Environment	Kim Graybiel
SWA	Wayne Dybvig
Swift Current Creek Watershed Stewards	**Arlene Unvoas**


RUSH LAKE

Swift Current, Saskatchewan

Interviews

Community Vulnerability 100

Governance 70

Exposure	Impacts	Sensitivities	Adaptation
DROUGHT			
Shaunavon and the surrounding area have historically experienced drought as an ongoing stressor.	Ranchers are affected by reduction in hay yields and lack of water for livestock. Crop producers are affected by declining crop yields/quality. Surface water quality is affected by drought conditions.	Some older farmers reflected that the movement away from mixed farms and toward single-commodity farms may cause additional sensitivity, since crop and cattle prices tend to operate conversely.	The area has a history of utilizing adaptive practices to adjust and adapt to dry conditions. Historically, these include: • Rotational grazing • Crop rotation • Contour tillage • Zero-till farming (more recently) • Crop selection

Farming communities are the first source of **information on threats posed by climate change, and adaptations**.

Farmers in the VACEA network actively participating in **adaptation initiatives**.

VACEA team gathering the local perceptions about the effects of **climate change** and best **adaptation strategies**.

SW Saskatchewan September 2015

SW Saskatchewan September 2015

RECOMMENDATIONS

- **Regional proactive planning**, involving multiple agencies and orders of government, because individuals have limited capacity to cope with water scarcity and excess water. **Plan and be prepared** even if the risk seems remote and when time are “good”.
- **Institutional capacity** matters - it is not very practical for local stakeholders to implement their own adaptation practices without a broader information and policy plan for climate change adaptation.
- **Watershed groups** are well positioned to test and implement local adaptations, and to develop preparedness plans. They should be supported and capacity enhanced.
- With the dissolution of government and university extensions programs**, a technical knowledge gap** is a significant problem when implementing new adaptation practices.
- Need for a collaborative **coordinating network** of stakeholders, watershed groups, researchers and all orders of government.
- **A single coordinating agency** to link science to the interests and concerns of local people; delivering technical expertise on climate, water and adaptation practice to local groups and rural communities.

¡No sé qué vamos a hacer con estos climas!

Vulnerabilidad y adaptación a las variaciones climáticas extremas en la cuenca de la quebrada Los Cuervos, afluente del río Chinchiná, Colombia.

Nodes of Vulnerability

Node 1. Climate variability is negatively affecting coffee crops and production, and with very high probability climate change will exacerbate these problems during the 21st century.

Node 2. Precarious Environmental Protection and Management & Practices Affecting Biodiversity

Node 3. Risks owing to intensified extreme hydrometeorological events

Node 4. Reconfiguration of the agricultural and livestock dynamics of the region

Node 5. Public policies that discourage the agricultural sector

A. WHAT PROCESSES ARE DETERMINING AND CAUSING THE CRITICAL NODE?
B. WHAT PROCESSES ARE TRIGGERED AS A CONSEQUENCE OF CRITICAL NODE?
C. WHAT ARE SOME CURRENT ADAPTIVE STRATEGIES DEVELOPED TO FACE THE NODE?
D. HOW WOULD THE VULNERABILITY NODE BE AFFECTED?
E. WHAT ARE FUTURE ADAPTIVE STRATEGIES CAPABLE OF TRANSFORMING?

Rural Adaptability to Climate Extremes (RACE) index

Indicator	Purpose	Levels of Analysis			
		Five VACEA Countries	Sub-national Jurisdictions	Watersheds	Study Areas
ENVIRONMENTAL EXPOSURE INDICATORS					
A) Future Climate Variability: 2050s (2041-2070)					
Percentage change in crop yield	Indicates economic vulnerability to future climate conditions	N/A	Coarse crop model analysis	Finer model: 10 km x 10 km	High resolution model: 1 km grid
Water supply: percentage change in mean annual runoff	Indicates future exposure to water shortage or excess	N/A	N/A	Hydrological model ($10km^2$)	Inference from hydrological model
Drought: SPEI – monthly, 3 and 6 month and annual	Indicates future exposure to drought	N/A	N/A	Projections form climate models	Downscaled projections
B) Baseline Climate Variability: 1971-2000					
Extreme high and low streamflows: 100 year return period of high and low flow	Indicates past frequency of extreme events	N/A	N/A	Network of stream gauge records	Individual stream gauge records
Length of Growing Season: # of days between the first 5 consecutive days with a mean daily temperature > 5C and first consecutive days < 5C	Indicates past growing season conditions (determinant of current adaptive practices)	N/A	N/A	Network of weather station records	Individual weather station records
Biomass: percentage change in kg/hectare	Indicates economic vulnerability and/or adaptation	N/A	N/A	Crop yield statistics and remote sensing of productivity	Available by interpolation from watershed scale

Rural Adaptability to Climate Extremes (RACE) index

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SENSITIVITY (HUMAN/SOCIAL SYSTEMS) INDICATORS					
Relative level of income	Lower incomes can indicate vulnerability to a climate extreme.	Gross domestic income (GDI) or product (GDP) per capita,	Average regional income compared to national average	N/A	Information from participants or municipal data
Land tenure pattern: area owned vs. rented	Insecure land tenure indicates economic sensitivity to climate extremes.	N/A	National or regional government statistics	Not available	From participants or municipality level.
Access to Agricultural Water (based on agricultural context)		N/A	N/A	Access to regional reservoir systems (canals, dykes, pipelines)	Access to irrigation/drainage and/or producers' own validation of sufficiency of agricultural water.
ADAPTIVE CAPACITY INDICATORS					
Membership in agricultural organization or other network	Indicates social capital.	N/A	N/A	N/A	Information from participant surveys
Infrastructure for resilience to climate-induced water stress	Indicates the existence of infrastructure to adapt to climate extremes.	N/A	N/A	Municipal data on capacity and quality of infrastructure (range of	On-farm technology identified from participant surveys
Level of education	Indicator of human capital.	Could use UNDP educational index.	Census data.	N/A	Available from participant surveys.

VACEA – Insights and Observations: Advances in Natural and Social Science

Advances in **climate change science**:
•downscaling of climate model projections
•better understanding of regional climate variability, including a the paleoclimatic context
•teleconnections among regional climates related to O-A oscillations

Advances in **community-based social research**:
•common methodology for governance and community vulnerability assessments
•developing vulnerability indicators of sensitivity and adaptive capacity
•barriers to adaptation from top down (governance) and bottom up (community) perspectives
•interaction among multiple determinants of community vulnerability

VACEA – Insights and Observations – Partnerships and Logistics

Informing Policy:
e.g., in Chile, the National Commission on Irrigation (CNR) has developed an Internet platform to make VACEA results available to farmers and irrigation projects
e.g., in Brazil:
•VACEA forums to discuss extreme weather events with the watershed committee and an integrative approach to deal with local issues
•consultation with communities to determine flood risk
•an extreme event classification methodology was incorporated in local and regional civil defense policy
Canada: Unfortunate timing of IRIACC research with loss of technical capacity and adaption programming at AAFC (PFRA) and Environment Canada and prairies provinces.

Project management: Transfer of funds and administration directly to South America proved to be problematic with delays of 1-3 years in the signing of sub-agreements.

VACEA – Insights and Observations: Inter-disciplinarity

Natural science in a social context for an understanding of locally-relevant aspects of climate variability and change and scales of analysis.

Studies of exposure to climate hazards and impacts informed the evaluation of sensitivity of social systems and adaptive capacity, placing the climate extreme hydroclimate experienced by the communities in a long-term and natural science context. Extreme dry years are not as uncommon as believed by local actors.

Perceptions of agricultural producers are consistent with the dominance natural variability over long-term trends. They experience weather not climate.

However we still struggle with crossing dispensary divides; should we develop guidelines and sharing practices?