

Adaptation to extreme weather events in agricultural watersheds in five countries

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

Vulnerabilidad y Adaptación a los Extremos
Climáticos en las Américas



Principal Investigators:

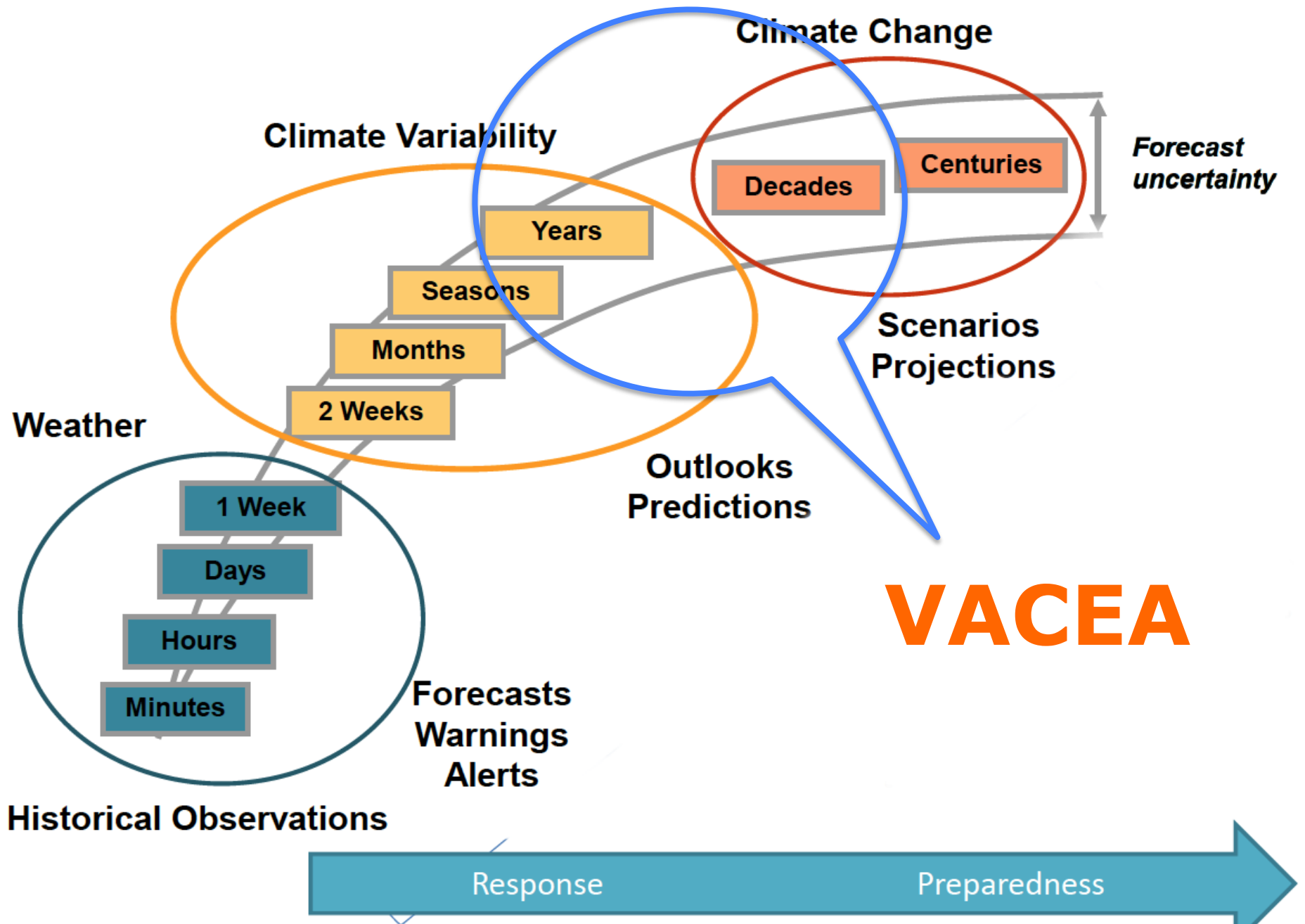
Los investigadores principales

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Dr. Fernando Santibañez, Universidad de Chile, Santiago

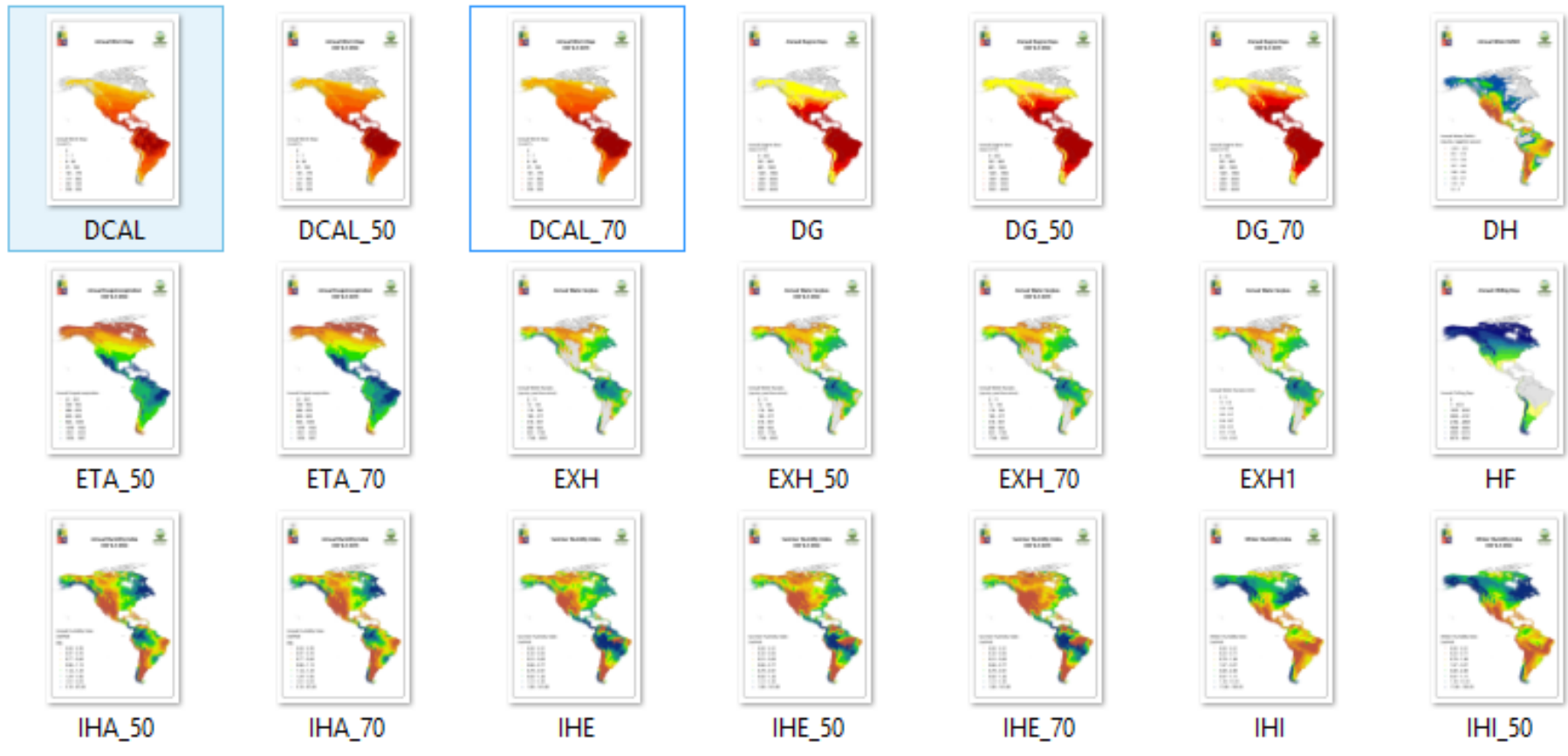


Social Sciences and Humanities
Research Council of Canada

www.parc.ca/vacea/



High-resolution climate change scenarios (Ensemble from three selected models, 2041-2060 and RCP 8.5); VACEA project, AGRIMED, University of Chile

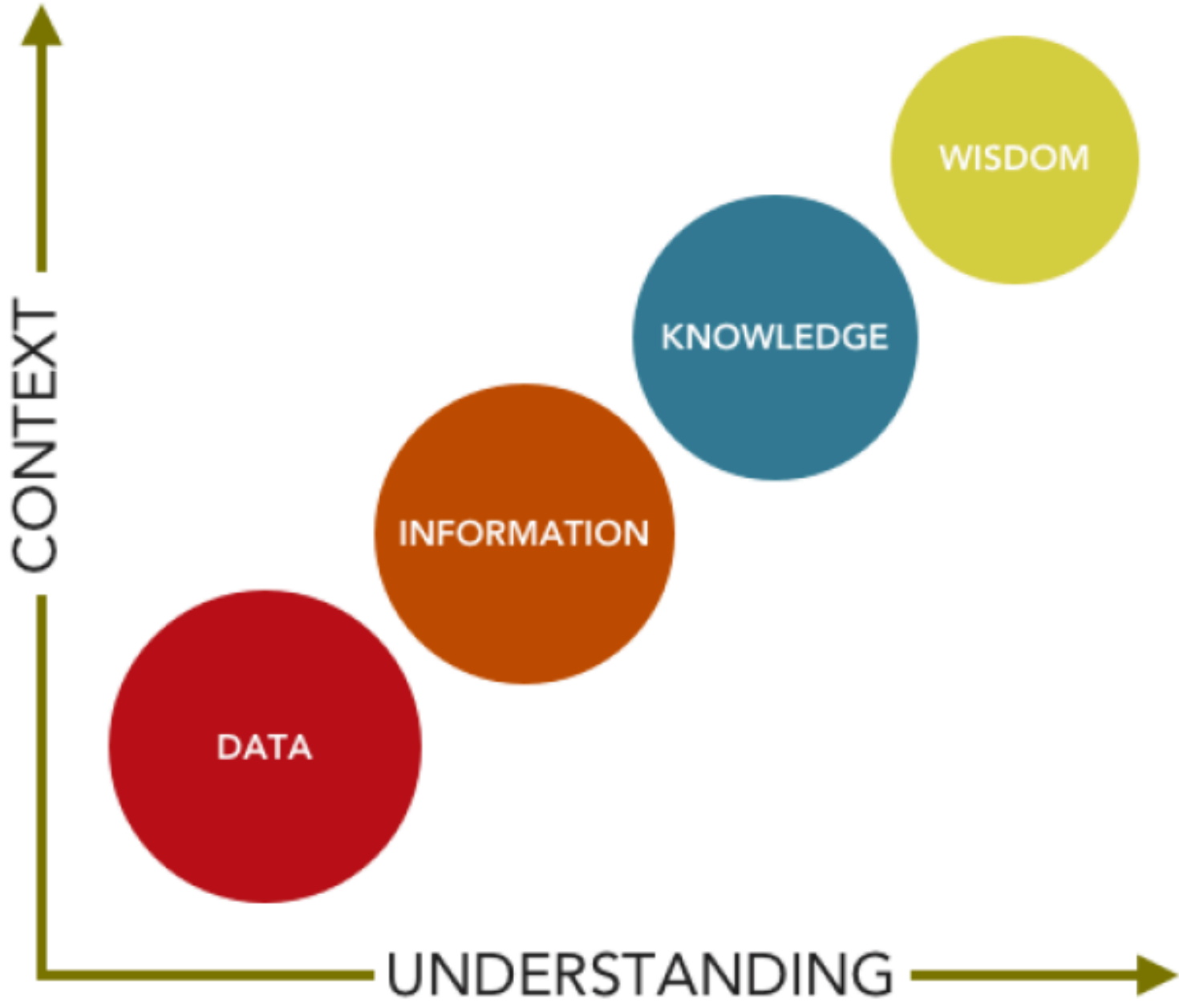


Warm days, degree days, water deficit, potential evapotranspiration, water surplus, chilling hours, aridity index, humid season-dry season length, frost free season, annual rainfall.



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Swift Current

INTERVIEWS

Community Vulnerability **100**

Governance **70**

Exposure	Impacts	Sensitivities	Adaptation
DROUGHT			
<p>Shaunavon and the surrounding area have historically experienced drought as an ongoing stressor.</p>	<p>Ranchers are affected by reduction in hay yields and lack of water for livestock. Crop producers are affected by declining crop yields/quality.</p> <p>Surface water quality is affected by drought conditions.</p>	<p>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.</p>	<p>The area has a history of utilizing adaptive practices to adjust and adapt to dry conditions. Historically, these include:</p> <ul style="list-style-type: none"> • Rotational grazing • Crop rotation • Contour tillage • Zero-till farming (more recently) • Crop selection

Adaptation: southern Alberta (near Enchant)




“I’ll believe in climate change when we get unexpected weather”
Irrigation District manager

April 21, 2015

August 21, 2015





“There’s an approximate 60-year weather cycle in this country, but 60 years isn’t definite, it could be 70 years and it could be even less, with weather there’s nothing written in stone.”

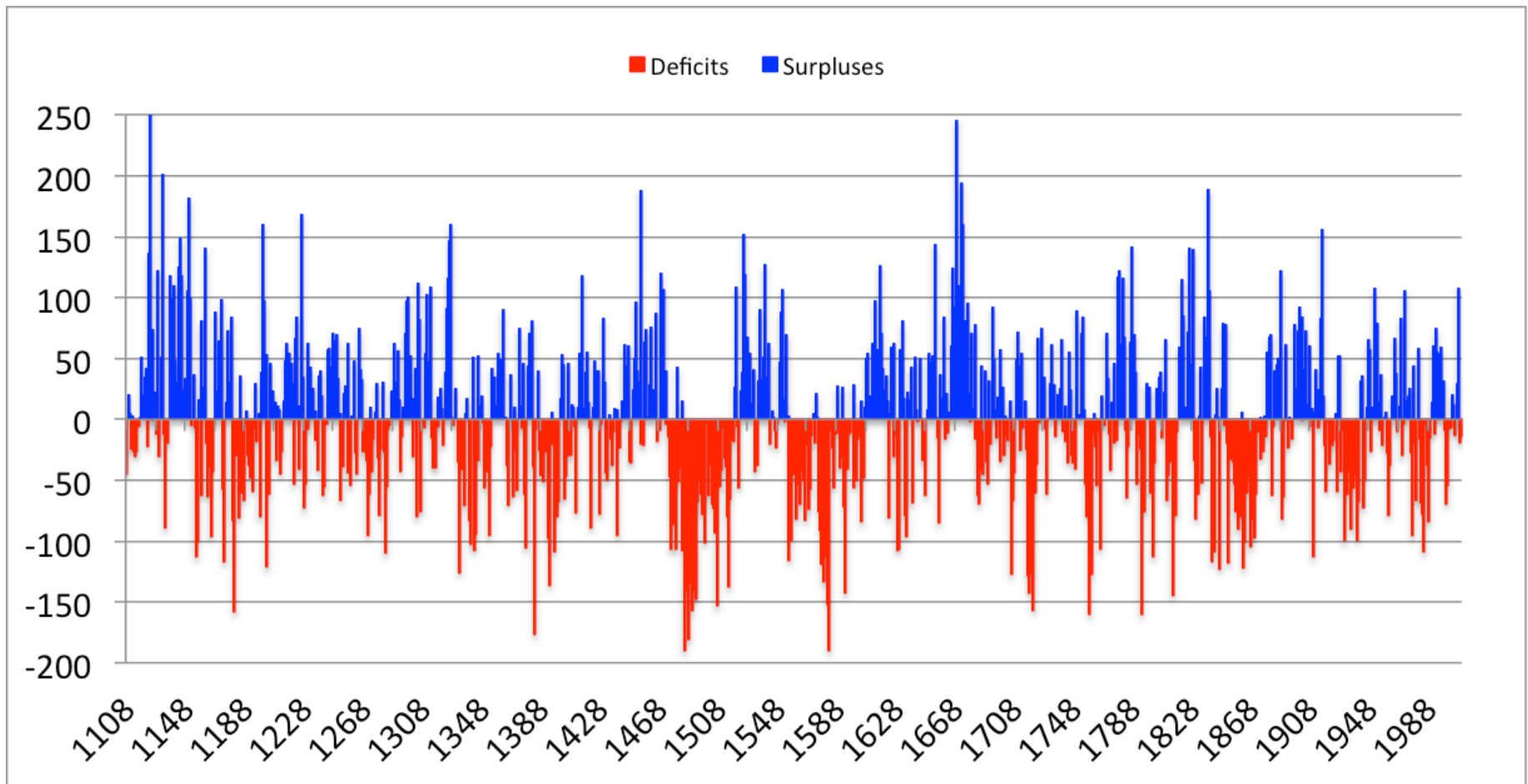
- Reno Welsch, Upper Tennessee Creek, Alberta,
04/09/2012



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

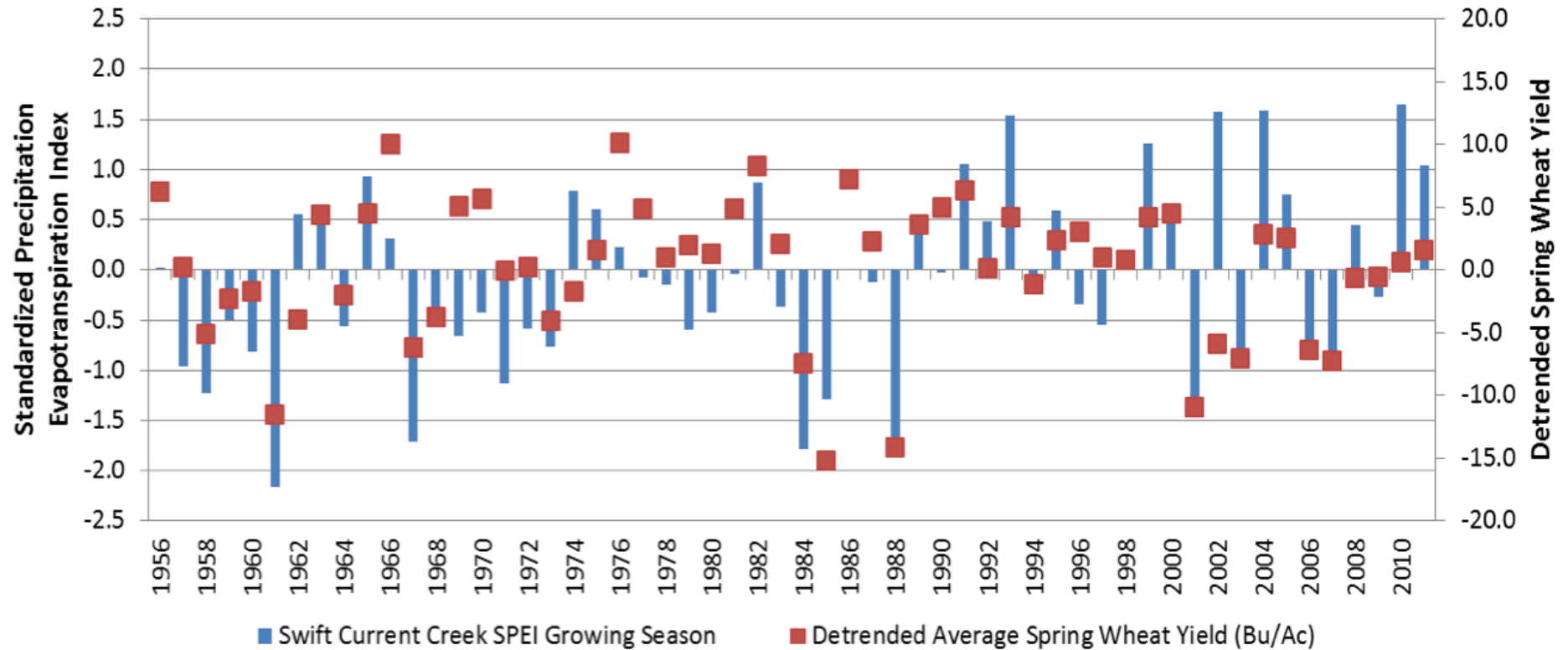
- Sir Winston Churchill

South Saskatchewan River Flow (m³/s), 1108-2010



Precipitation/Evaporation (SPEI) and Wheat Yields

Swift Current Creek Watershed, May-June-July, 1956-2012



VACEA: Bonsal, Wheaton, Wittrock

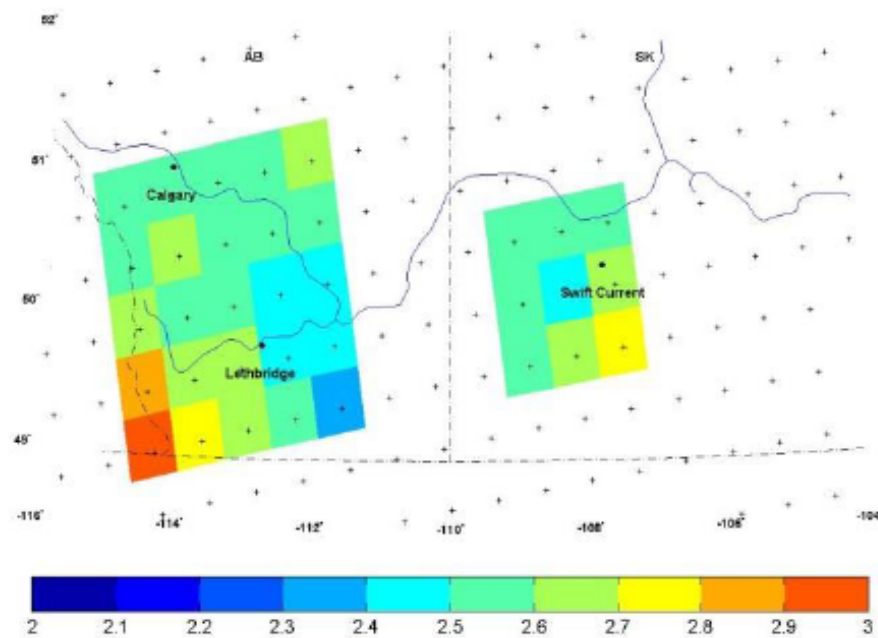
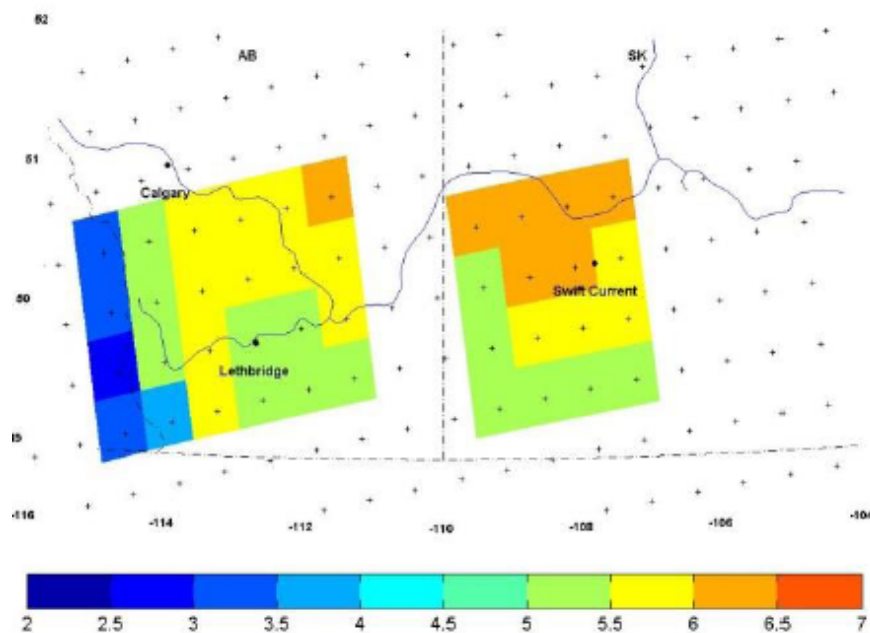
Mean Minimum Temperatures - 2041-70 versus 1971-2000

Winter

Corrected: HRM3 GFDL $\Delta=5.34^{\circ}\text{C}$

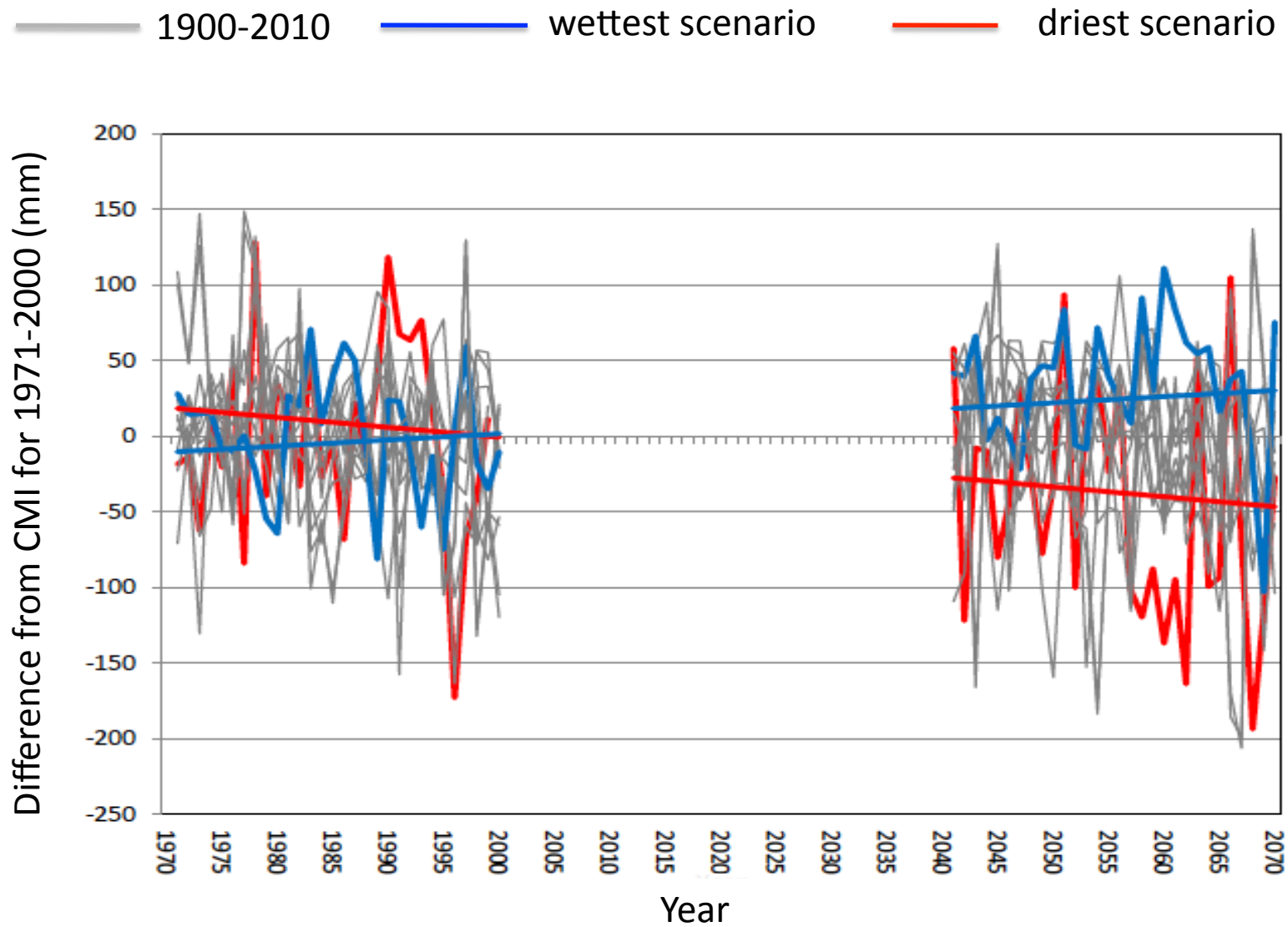
Summer

Corrected: RCM3 CGCM3 $\Delta=2.57^{\circ}\text{C}$



Climate Moisture Index Anomaly

May-June-July, Canadian Prairies



Climate Change Projections and Uncertainty

Natural climate variability **poses inherent limits to climate predictability** ... contributes substantial uncertainty to temperature and precipitation trends over North America, **especially in winter at mid and high latitudes... is unlikely to be reduced** as models improve

Deser et al. (2012)

The **local model spread has not changed much** despite substantial model development and a massive increase in computational capacity. ...[it] is **irreducible** owing to internal variability in the climate
Knutti and Sedláček (2012)

“it will not be possible to provide the information on local changes in extremes ... The **uncertainty** owing to internal variability is dominant and is **essentially irreducible”**

Fischer et al. (2013)

Southwestern Saskatchewan, September 2015

VACEA Project Stakeholder Workshop



Stakeholder 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.