Winter 2013

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About VACEA

The overall objective of VACEA 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.

The interdisciplinary research program will have three major themes:

1) Regional Vulnerability Assessment,

2) Climate and Agro-Ecological Variability,

3) Integrative Risk Analysis.

Learn more on the VACEA website: www.parc.ca/vacea

Director's Message

Our previous newsletter was distributed immediately prior to our 2012 annual project meeting in Crowsnest Pass, Alberta, in the upper reaches of the Oldman River basin. The success of this meeting was assured by the support of our external partners, a great venue, a grant from the Social Sciences and Humanities Research Council (SSHRC), the participation of our South American colleagues, and some great weather. The SSHRC Connections grant enabled a two-day workshop on the theme of "Facilitating Knowledge Mobilization at the Science/Policy Interface". The presentations and dialogue, and subsequent discussions, have been the basis for developing a knowledge dissemination strategy for the VACEA project. This is a key strategy that is required early in the life the project to achieve our goal of sharing and implementing the research results before the project is completed in 2016.

Between the Knowledge Mobilization workshop and the project AGM on September 13-14, we had a full day excursion through the upper Oldman River basin. It began with a guided tour of the Head Smashed Buffalo Jump World Heritage Site, where we learned about the long history of adaptation in the basin. We also got a group photo at the spectacular vantage point atop the buffalo jump. The excursion was organized and led by the Southwest Alberta Sustainable Community Initiative based in Pincher Creek. The entire week of project activities was very much enhanced by the participation of representatives from our partnering government agencies and NGOs, including those from Chile, Argentina and Brazil.

Throughout this past fall and early winter, the research team has pursued their research in social and natural science and engineering; preliminary results are beginning to emerge. In 2013, we will begin to share these results and seek feedback from stakeholders in the communities. The VACEA project will be involved in the annual meeting of the Swift Current Creek Watershed Stewards on January 23 and then, later in the winter, we will contribute to a similar meeting hosted by the Oldman Watershed Council. These stakeholder workshops are made possible by the local watershed authorities and our collaboration with colleagues from AAFC.

We look forward to a productive 2013 and working with the communities and our partners, mobilizing results from the VACEA research project, and achieving more resilient and sustainable rural communities.

Dave


Participants of the September 2012 meetings in Crowsnest Pass, Alberta.

Researcher Profile: Stefan Kienzle, PhD

Stefan is a hydrologist and GIS analyst at the Department of Geography, University of Lethbridge, with over 25 years of experience in watershed modelling. Stefan is also Adjunct Professor at the University of Regina (Saskatchewan, Canada) and the University of South Africa (Pretoria, South Africa). He has worked in government research institutes, consulting, and various Universities in Africa, Europe, and Canada. Stefan has been working with, and further developed, the ACRU agro-hydrological modelling system since 1990, and applied the model for watershed impacts analysis in South Africa, New Zealand, the USA and Canada. His current research focus is using the ACRU agro-hydrological modelling system as well as FAO's AquaCrop model to simulate the impacts of climate change on watershed hydrology and crop yields in many watersheds in the Province of Alberta.

In order to enable his work, Stefan is in the process of establishing a digital hydro-climatological Atlas of Alberta with a high spatial resolution. Dr. Kienzle maintains a strong research lab with research assistants and graduate students, and has published widely in international journals, including Journal of Hydrology, Hydrological Processes, Water Resources Management, Climatic Change, and Hydrological Sciences Journal. Stefan is co-author of several chapters in the book "The Canadian Prairies in a Changing Climate" (edited by Sauchyn, Diaz and Kulshreshta), in the book "Sustaining Rocky Mountain Landscapes: Science, Policy and Management of the Crown of the Continent" (edited by Prato and Fagre), as well as the BAHC-IGBP book "Vegetation, Water, Humans and the Climate – A New Perspective on an interactive System".

Student Profile: Bruno Hernani

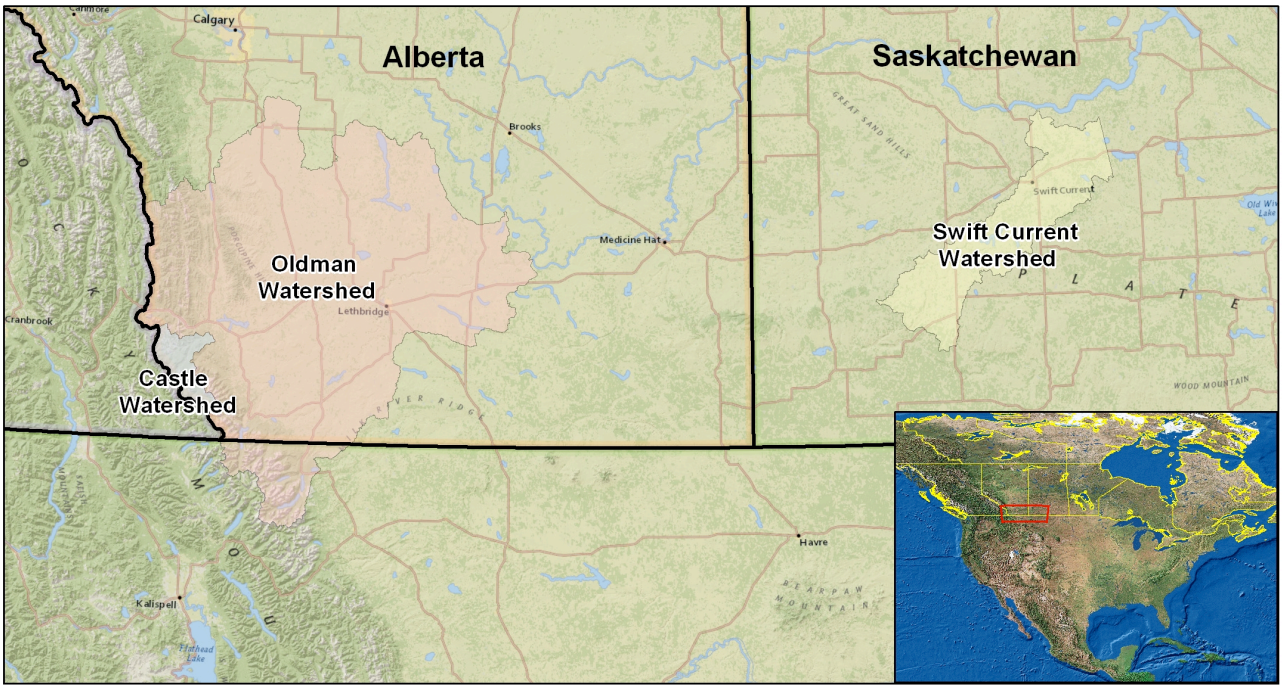
Bruno holds a Bachelor's degree in industrial engineering from University of Lima in Peru and Master's degree in science in environment and management from Royal Roads University in Victoria. He is currently in the last year of his PhD in environmental engineering and sociology through the interdisciplinary program at the University of Regina. His research is focused in the development and implementation of adaptive practices for climate extreme events and also in the integration of engineering and social implications for rural sustainability. During the 2012 fieldwork season of the VACEA project, he visited and interviewed numerous farmers, ranchers and government representatives in South West Saskatchewan and Alberta. The information gathered will be part of his dissertation and will add value to the overall objective of the VACEA project.

Bruno is interested in the international part of the project since he is originally from Peru and has a strong interest in the sustainability of the South American region. Bruno has lived in Regina for the last 5 years where he is involved in several community activities. He enjoys supporting his community in Regina and other communities around the World.

Climate and Hydrology of the Research Basins

By Dr. Stefan Kienzle

One of the key objectives of the VACEA project is to provide new information on the impact of climate change on the availability of water resources in various study watersheds. In Canada, three watersheds are the focus of the impacts assessment (Figure 1): The Oldman River Basin (ORB), the Castle River Watershed (CRW) – a headwater tributary of the ORB – and the Swift Current Creek Watershed (SCCW). The impact of climate change on water resources is simulated using the ACRU agro-hydrological modelling system (ACRU), a distributed physically-based hydrological modelling system. For more information about the ACRU model go to: www.parc.ca/vacea/index.php/acru



Oldman River Basin (ORB)

The ORB has an area of 26,700 km² and is located in the southwest corner of Alberta. Its headwaters are in the forested Rocky Mountains, with mountain peaks reaching over 3000 m in elevation. The ORB also contains foothills and prairie grassland landscapes. The Oldman River flows for 362 km, where it confluences with other rivers to form the greater South Saskatchewan River Basin, and has a mean annual discharge of 105m³/s at its mouth, at an elevation of about 700 m. The large range in elevation and topography result in a substantial variation in climate. Mean annual precipitation ranges from over 2200 mm in the wettest parts of the Rocky Mountains to under 400 mm in the eastern part of the semi-arid prairies. The continental climate results in annual temperature variations ranging from over 30˚C in the summer to -30˚C in the winter. Most of the ORB lies in the rain shadow of the Rocky Mountains, and chinook winds, dry and warm foehn winds, are frequent in the winter. About 40% of precipitation falls as snow. Spring melt in the mountains provides much of the streamflow, which declines during the summer to a low in early fall. Extreme variability in flow through the growing season has resulted in the construction of reservoirs on most major rivers to capture spring run-off and release it throughout the growing season to meet the water demands of a growing population, agriculture, industry, and to augment low river flows in the late summer. The Plains comprise about 80% of the watershed and contain extensive irrigated agriculture. Extreme droughts have occurred in the 1930s, in 1988 to 1989, and in 2001. Flooding in 1995 was caused when heavy rains coincided with spring melt and caused extensive damage in the watershed.

The ORB is sparsely populated with only about 220,000 people, and has a predominantly rural character. The largest city is Lethbridge with a population of 85,000 people. Two First Nations' reserves lie within the watershed, occupying about 1850 km².

On average 30% of the mean annual streamflow is produced on the US portion of the watershed, in Montana. Water demand, mainly from agriculture (87%), has outgrown water supply to such an extent that a moratorium on new water allocations was implemented in 2006. It is expected that climate change will result in a decline in average water supply and increase its variability, particularly the frequency and duration of droughts, resulting in the increased risk that future demands for water will not be met.

The Castle River Watershed (CRW)

The 825km^2 CRW contributes on average about 15% of the streamflow of the ORB. The watershed consists of alpine, sub-alpine, montane, and foothills landscapes located on the eastern slopes of southern Rocky Mountains. The watershed has been identified as a pristine wilderness area and is free of any major industrial or agricultural activity. There is a ski resort located in the Westcastle River valley. The watershed has an elevation range from 1188 to 2677 m and is predominantly covered by broadleaf and coniferous forest (64%), herb and grassland (16%), shrub (11%), and non-vegetated land (9%). The CRW has a continental climate with cold winters and has a mean annual precipitation (1971-2000) of 925 mm. It is important to understand the impacts of climate change on this watershed, as it characterizes future water supply changes for the entire ORB, in particular water availability for irrigated agriculture.

The Swift Current Creek Watershed (SCCW)

The 4,300 km^2 SCCW is located in southwest Saskatchewan, and is part of the South Saskatchewan River Basin. It has an elevation range of 550 to 1150 m, a mean annual precipitation of about 400 mm, and a range in air temperatures from 30 °C in the summer to -30 °C in the winter. Its major land use is agriculture, of which only a small portion is irrigated. The watershed is sparsely populated, with the largest town (Swift Current) having approximately 15,000 residents. Being a prairie watershed, with low precipitation and high evapotranspiration, the mean annual discharge is about 2m^3/s. The dynamics of the impacts of climate change on this watershed are expected to be different from the CRW, and only the set-up of a physically based hydrological model will allow the simulation of the expected impacts on water resources.

Storm brewing in the Swift Current Creek Watershed, Photo courtesy of Bruno Hernani

Get more information about the project on the VACEA website: www.parc.ca/vacea

and stay connected at our new facebook page: www.facebook.com/pages/Vulnerability-and-Adaptation-to-Climate-Extremes-in-the-Americas-VACEA/271211079611742

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