UNIVERSITY OF SASKATCHEWAN

Global Institute for Water Security

www.usask.ca/water

Water Security & Industry Engagement

Prof. Howard Wheater,

Canada Excellence Research Chair and Director, Global Institute for Water Security

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Research Interests: Hydrological processes and modelling, with applications to the management of flood risk, water resources, water quality, wastes and climate change adaptation

Research Vision: *"Sustainable use and protection of water resources, safeguarding access to water functions and services for humans and the environment, and protection against water-related hazards (flood and drought)."*

Global Institute for Water Security - Facts 2011-13

- GIWS was established to provide organizational structure through which the Canada Excellence Research Chair (CERC) in Water Security can realize its stated goals and address broader water security research agenda
- CERC $30 M Federal-Provincial-University partnership over 7 years
- 7 core researchers (including 1 CERC); 48 members (faculty and scientists; 4 CRC and 2 IRC)
- Supported 140 graduate students and 38 post-doctoral fellows
- 7 core faculty secured additional $1.9 M; our members have secured additional $10.5 M
- Published 297 journal articles, 86 conference presentations, delivered 23 invited and 8 key-note lectures

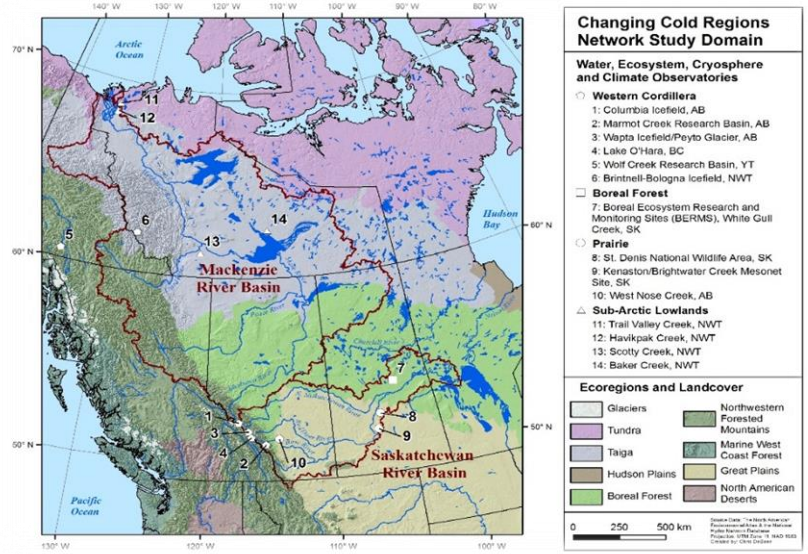
CERC Program

- **CERC Program Themes:** 1) Climate Change & Water Security, 2) Land Water Management & Environmental Change, 3) Sustainable Development of Natural Resources, and 4) Socio-hydrology.

- **Large-scale Observatory:** Saskatchewan River Basin (336,000 km^2) which is located in one of the most extreme and variable climates of the world is now recognized as a Regional Hydro-climate Project (RHP) of the World Climate Research Program's (WCRP) Global Energy and Water Exchanges (GEWEX) project, one of ten in the world and the only one of its kind in North America.

Changing Cold Regions Network (CCRN)

- Howard Wheater is leading the CCRN to understand how warmer climate is likely to impact ecosystem and water resources in Western Canada (Saskatchewan and MacKenzie River Basins)



- CCRN is funded by NSERC through their Climate Change and Atmospheric Research program with a funding of $5M over 5 years
- The network consists of 36 leading researchers from Canada and 15 international scientists.

Research Site: Rocky Mountain Research Basins

- Rocky Mountains are the major source of water in Western Canada and its availability depends on the cold water processes involving snow, glaciers, wetlands and frozen soils that control the storage and delivery of water to river systems

Research Site: Boreal Forest BERMS/BOREAS

- Boreal Forests help us to understand the interactions between climate, hydrology and ecology (forest vegetation), which are important in terms of climate responses, hydrological responses, ecosystem resilience and ecosystem services

Research Site: Saskatchewan River Delta

- Largest in-land delta in North America
- Assessing links between water, animals and people in the Saskatchewan River Delta is set to explore how the current and potential future flow regime of the Saskatchewan River affects the distribution of aquatic habitats (e.g., lakes, wetlands, riparian areas) in the Cumberland marshes

Prairie Research Sites

- The prairies are a hydrologically-complex environment; has limited or no connectivity to the main river system, and is dominated by internal drainage basins and prairie pothole lakes

St. Denis: a cascading system of occasionally interconnected wetlands and pothole lakes of varying salinity

Kenaston: a typical agricultural landscape, home to multi-scale studies of land-atmosphere interactions and remote sensing, with collaboration from the Canadian Space Agency and NASA

Smith Creek: focus of studies on agricultural drainage and its effects on runoff quantity and quality

Swift Current Creek: Effects of low flow effluent dominated system on the dilution of nutrients and pharmaceuticals and personal care products from point and non-point sources resulting in ecological change

Research Site: Oil Sands

- Effective management and environmental protection of watersheds that could significantly change the way water is used and the way land and water are reclaimed in natural resources development operations in Canada and around the world

Research Site: Lake Diefenbaker

- Exploring the effects of agricultural management practices and urban water management on water quality and water movement through a watershed

Algal bloom Sept 24 2011

Socio-hydrology

- Understanding and managing complex human-natural systems

- Group mind-mapping exercise. Stakeholder workshop, Canmore , Alberta, March 2012

New Themes

- Water & Health
- Water and Wastewater Treatment Technologies
  a) Safe and sufficient drinking water is a fundamental human need and a basic human right (United Nations former Secretary-General Kofi Annan on World Water Day, March 22, 2001)
  b) Drinking water is about people and their communities, not only in terms of water quality, quantity, affordability and accessibility, but also their socio-cultural beliefs, practices, behaviours and perceptions.

Water & Wastewater Treatment Tech.

Why do we need this theme?

- UofS Signature area – Water security
- Concentration of expertise and facilities in “Water Treatment Technologies” at UofS
- Opportunity to develop unified front and one-stop-shop
- Demand and expectation from stakeholders (provincial organizations and industry partners)
- Opportunity for scale-up and commercialization
- Opportunity for stakeholders to leverage financial investment with federal agencies

What are the challenges and relevance?

- Research Areas should be of relevance to uofs, province of Saskatchewan and Western Canada
- Five suggested areas are:
  a) Oil & gas sector
  b) Minerals industry
  c) Processed food and beverage industry
  d) Municipalities
  e) Rural water supply and sanitation

Waste-water treatment methods & classifications

- Waste-water treatment methods
  a) Physical unit operations
  b) Chemical unit operations
  c) Biological unit operations
  d) Advanced technologies
- Waste-water treatment classifications
  a) Preliminary treatment
  b) Primary treatment
  c) Secondary treatment
  d) Tertiary/ advanced treatment

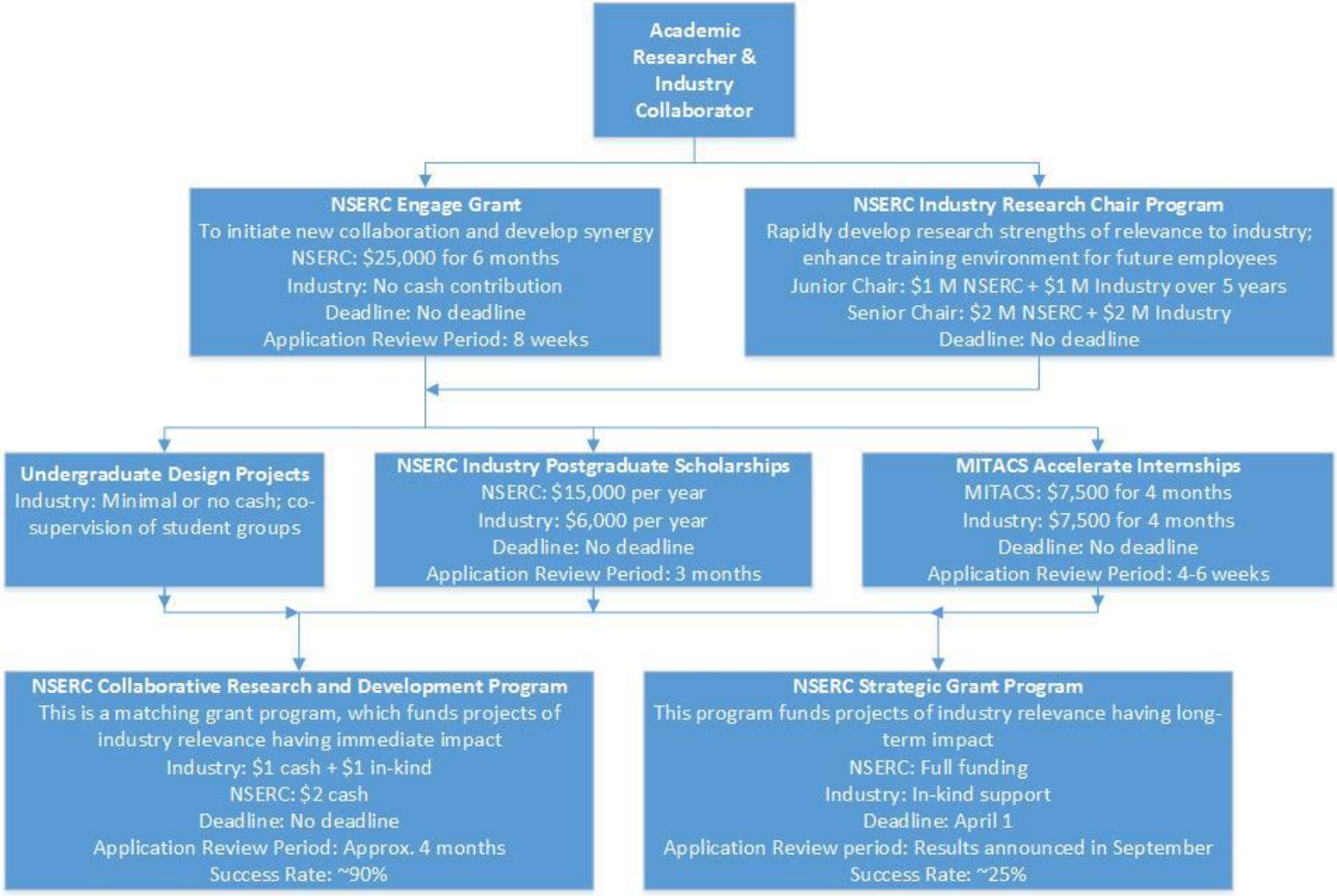
What expertise do we have at uofs?

- UofS has expertise in all waste-water treatment methods as indicated earlier
- UofS Has world-class research facilities and infrastructure
- GIWS can provide administrative structure and facilitate theme coordination
- GIWS can provide prominence to this theme and advertise among its international partners

Next steps……

- Define the scope of this theme
- Identify sub-themes
- Working groups
- Form consortia including: waste-water industry, water security agency, municipalities in Saskatchewan
- Develop concept note
- Web presence and coordination of activities
- Secure funding for theme members

Industry Engagement



Benefits to Industry

- Working on an industry-defined research problem
- Leverage industry funding for research & development work through federal funding opportunities
- Industry involvement with graduate advisory committees to provide direct input to outcomes of research projects
- Capstone Design Projects for senior undergraduate students
- Train highly qualified personnel of relevance to industry
- Scientific Research and Experimental Development (SR&ED) tax incentive program

Quality and quantity of available water is of concern for human consumption - United Nations Millennium Development Goals (MDG) for improvement in access to safe water (UN-MDG, 2005)

It influences health, education, gender issues and the economy (WHO/UNICEF, 2010).