

Best Management Practices in Water Governance and Climate Adaptations in Saskatchewan, Canada



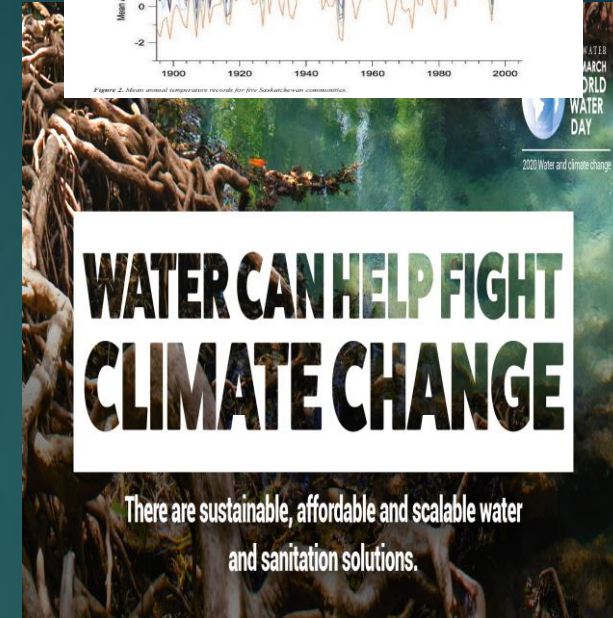
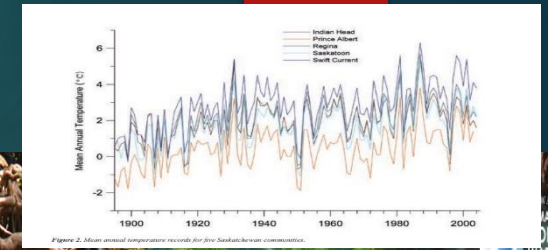
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University of Regina

Abstract

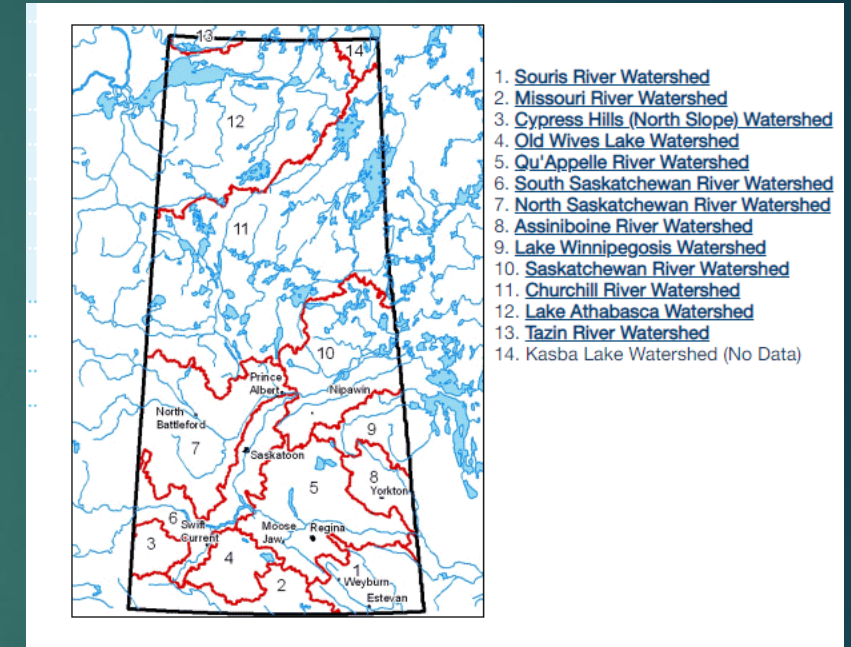
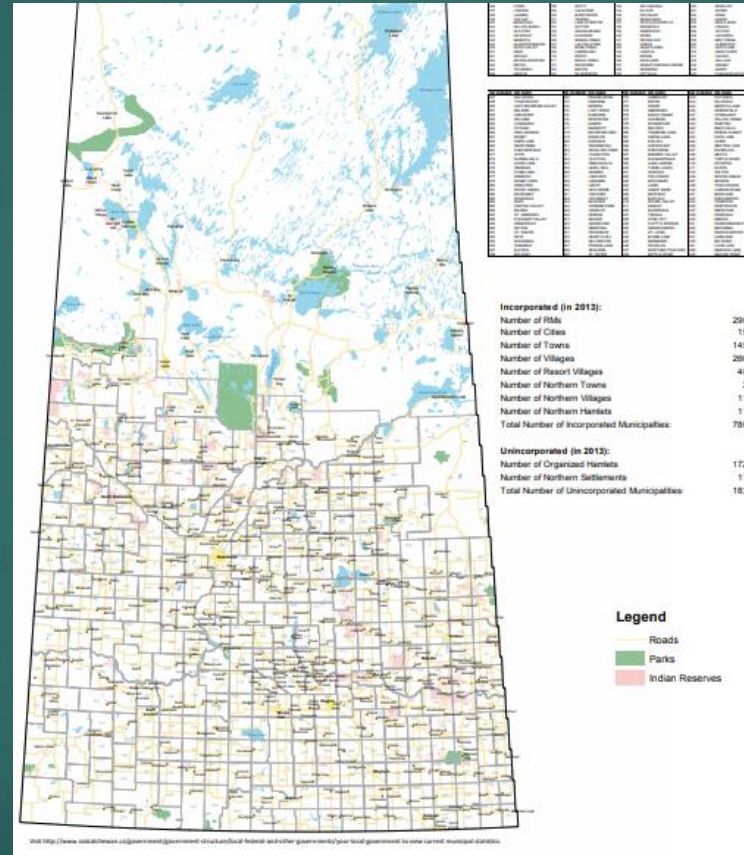
- ▶ Climate change, a problem of global dimensions will increase risks and vulnerability in Saskatchewan, a province highly affected by floods and droughts making adaptation a critical need. The problem of climate change does not only relate to natural conditions whose solutions lie in technical measures but is also a problem of governance. Best Management practices (BMPs) have been used to improve water quality and control water pollution in various sectors since the acceptance of the Clean Water Act 1972. BMPs are similar to nature-based solutions which involve working with and enhancing nature to help address societal challenges.
- ▶ Despite the fact that BMPs have been around for more than 50 years, Canada's water quality is at risk from poorly treated municipal waste, industrial effluent, and fertilizer run-off from agriculture. This is due to the fact that the institutions that have historically supported BMPs are constrained by technocratic ideas relating to BMPs and fail to recognise their governance aspects.
- ▶ This has affected their implementation at the producer level thus affecting water quality. To address the water governance and climate challenges such as flooding many municipalities in Saskatchewan (SK) have developed "best management practices" and nature-based solutions such as drainage ditches, source water protection plans, and constructed wetlands etc through partnerships between governments, watershed management associations, and community groups. Using qualitative research methods such as interviews and document analysis this research not only identifies such nature-based solutions in 14 municipalities in SK but also understands their robustness using adaptive governance theoretical framework and their effect on water quality using data from the Water Security Agency. It creates policy recommendations to mainstream them into climate and related policies at the regional, national and international level. This work is significant as adaptive institutions are much needed in the case of the SK.

Project-Theoretical Perspective

- ▶ **Water-Climate Change Link**-Global climate change will increase variability in water cycle, induce extreme weather events, affect groundwater recharge, create water pollution, affect water availability for sanitation, and increased disease burdens, affecting most the poor and vulnerable (UN Water Development Report, 2020)
- ▶ **Best Management Practice, Water and Climate** -A combination of practices of preventing or reducing the amount of pollution by nonpoint sources to meet water quality goals. Eg- Retention ponds; constructed Wetland; wet Pond; dry Pond; grassed Swale; infiltration trench
- ▶ **BMPs** in terms of water management and climate adaptation.



Sk-Location, Background, Municipalities and Watersheds



14 watersheds and 7000 municipalities

Theory-Adaptive governance of water and climate change

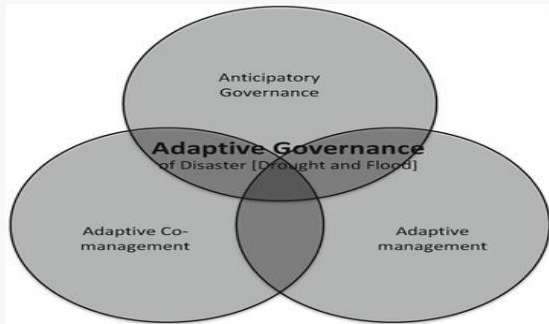
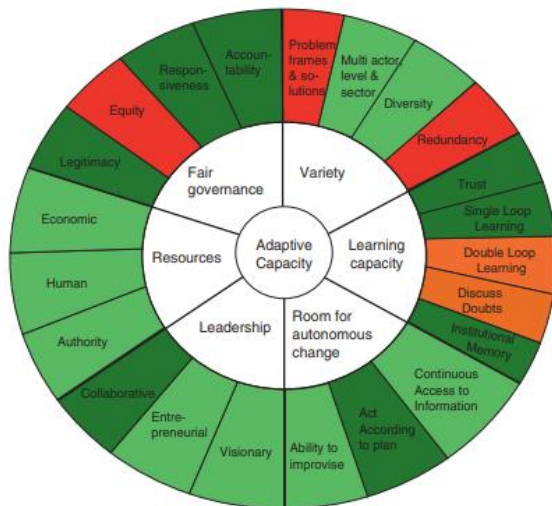


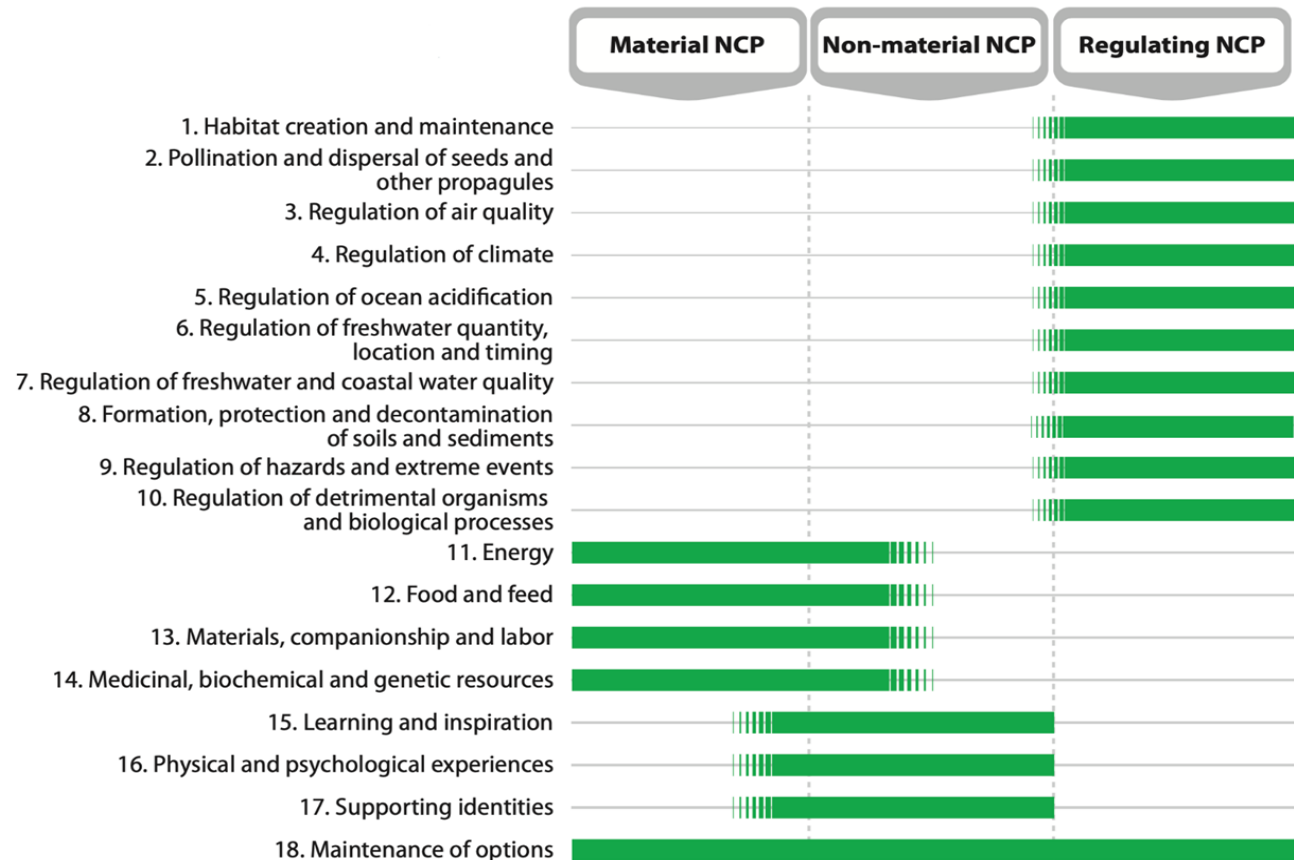
Fig. 2.1
Adaptive governance of disaster: d&f

1. Adaptive governance is a range of political, social, economic, and administrative systems that develop, manage and distribute a resource in a manner that promotes resilience.
2. Is composed of adaptive management, adaptive co-management and anticipatory governance
3. Aims to Enhance the Adaptive Capacity of Institutions
4. Six dimensions of adaptive governance -**Variety, learning, room for autonomous change, leadership, resources and fair governance**



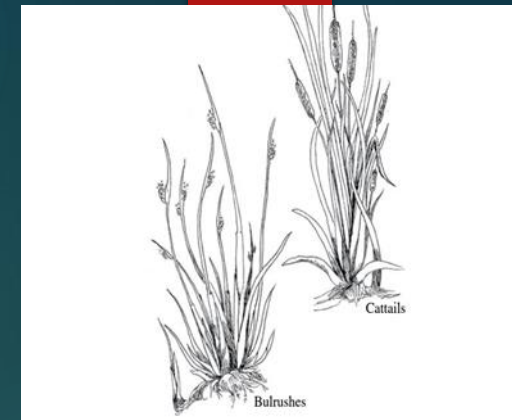
Theorising Nature Based Solutions (Courtesy-Jordan A)

1. Nature's contribution to people is a framework for evaluating the value of nature and natural systems. The framework is an evolution of the Ecosystem Services (ES) framework and was introduced in the Intergovernmental Science- Policy Platform on Biodiversity and Ecosystem Services (IPBES) in 2015.



Case study 1- CW of Avonlea

- ▶ Cattails and Bulrushes in constructed lagoon/wetland planted by communities along with authorities to treat wastewater treatment problems that the village had been experiencing since the 1970's.
- ▶ There is a variety of actors involved in the implementation of the BMP such as Moosejaw River Watershed Scheme, Building Canada Fund, TD Friends of environment, Farm Credit Canada, Consulting firms and the Village of Avonlea.
- ▶ The community was directly involved in the project and local school children participated by planning the vegetation in the constructed wetland.
- ▶ BMP-The constructed wetland is a nature-based solution and thus not only fulfills its intended purpose of water treatment but also contributes to increasing biodiversity (attracting a variety of species such as water fowl), regulating climate with carbon sequestration and providing a space for learning for the community. School students were involved in planting the species for phytoremediation thereby involving/exposing the youth/younger community to alternative technologies and creative solutions.



Case study 2- Mitswasis

- ▶ **Mistawasis**-First Nation able to leverage partnerships with organisations like North Saskatchewan River Basin Council, University of SK and consulting organisations to create and implement Source Water Protection Plan and flood management and climate protection.
- ▶ NBS-The source water protection plan allows us to protect habitats, better water quality and quantity , there is spiritual value attached, there may be regulation of climate.





Meewasin Northeast Swale Phase 1 Implementation



Case 3-Northeast swale, Saskatoon

Complex legislative and institutional framework created by multiple actors to protect the Swale from urbanization -Swale protection through partnership between Meewasin Valley Authority and City authority with involvement of Swale Watchers that led to development of several plans/ guidelines to govern urban development and protecting the Swale like *Meewasin Northeast Swale Master Plan (2015)*

NBS-

1979 - Meewasin Valley Authority is established: conservation zone for the NE Swale

Northeast Swale Development Timeline

2011 - Swale Watchers advocacy group is formed

1987- University Heights Concept Plan Approved

2012 - The Northeast Swale Development Guidelines updated by Meewasin

1993 - University Heights Suburban Development Area Concept Plan Approved

2013 - University Heights Sector Plan Approved by City of Saskatoon

1999 - Ministry of Highways produces *Needs Report* for perimeter highway

2013 - The Northeast Swale Resource Management Plan

2002 - Northeast Swale Development Guidelines are developed


2015 - The Northeast Swale Master Plan

2010 - Meewasin Valley Authority Assumes active management of NE Swale

2018 - General location study was completed for Saskatoon Freeway: endorsed by the City of Saskatoon and the Rural Municipality of Corman Park.

2011 - Meewasin Ecoblitz

2020 - Freeway Functional Study starts



NBS-The swale is home to more than 200 plant species and 100 plus bird species, along with mammals, amphibians, reptiles and insects. It is safeguarded in the first place because of the freshwater quality and quantity regulatory services it offers. Additionally, the swale filters air of urban pollutants, regulates climate change and improves nutrient cycling and building of soil. It also protects the surrounding areas from hazardous floods and massive scale events.

It holds importance naturally, culturally and historically, as well as economic benefits for education and recreation.

Benefits of greens spaces in urban areas (UN Biodiversity) -

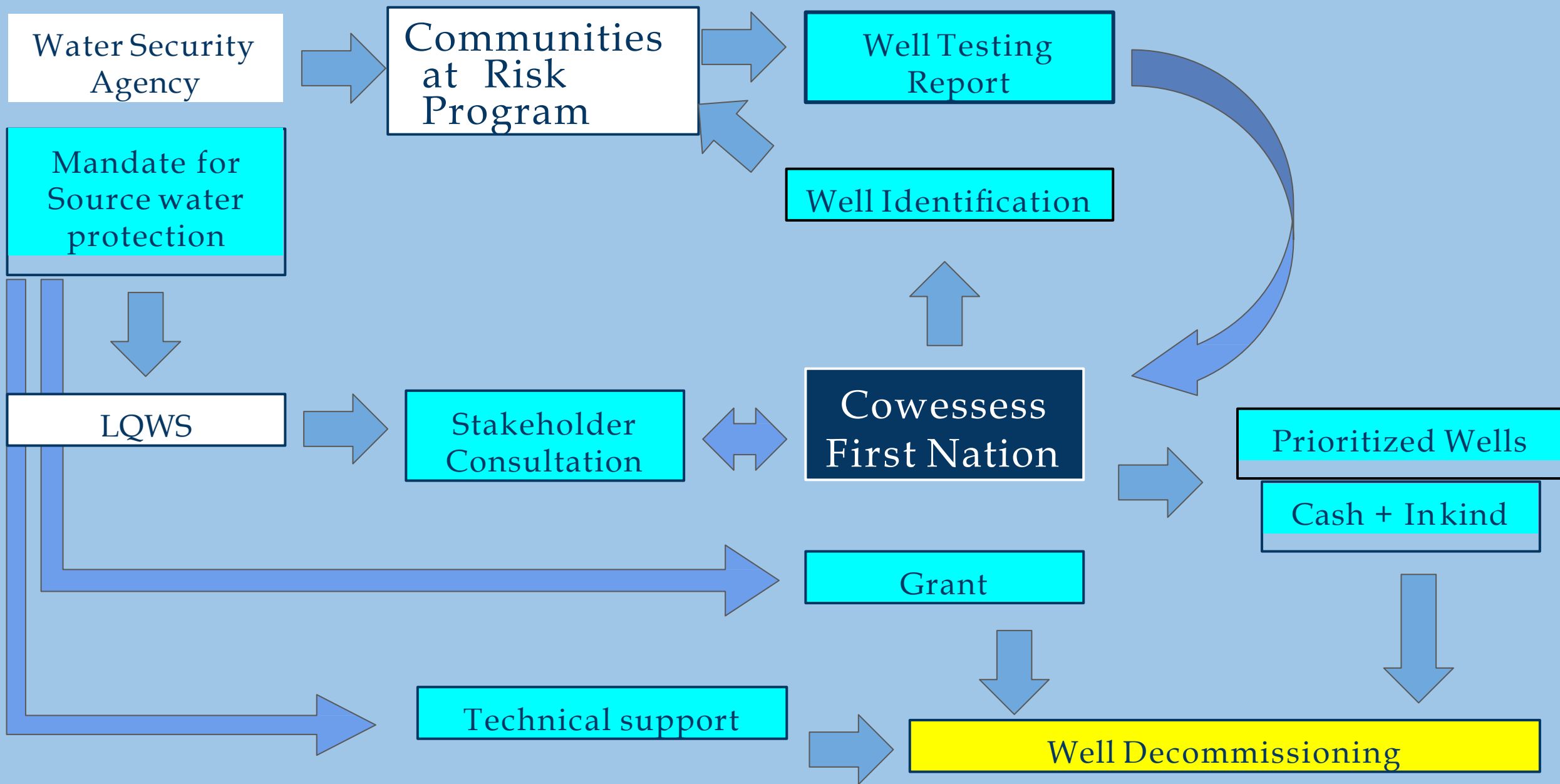
Air cooling

Filtration of urban pollutants

Increase in property values

Increase in urban biodiversity

Improvement of physical and mental health



Case 4- Protecting Source Water on Cowessess First Nation: An Examination of Partnership and Practice

Government of Canada

Treaty 4

Health Canada

Indigenous Service Canada

Reporting

Block Funding

Cowessess First Nation
Self-Governance

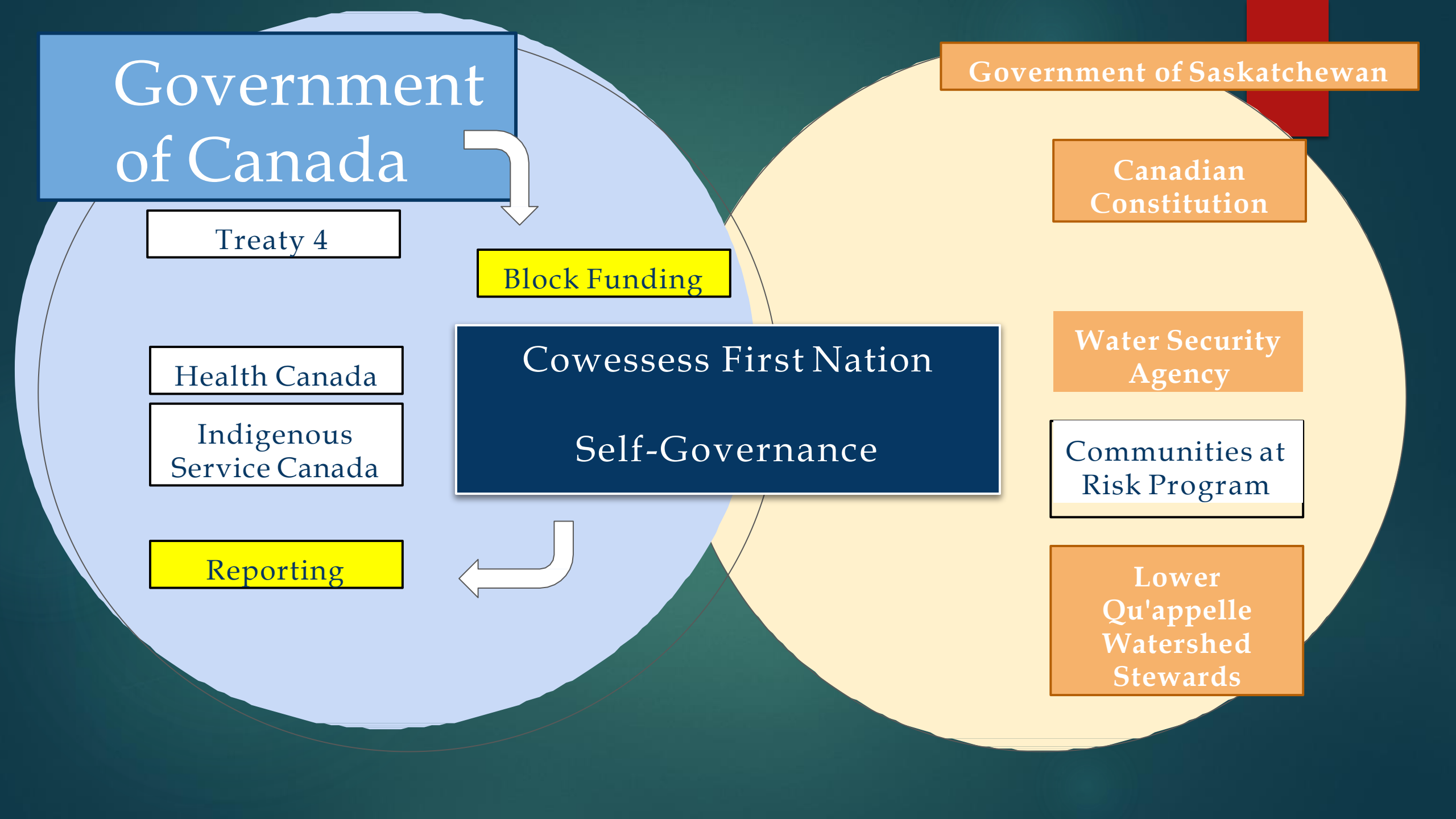
Government of Saskatchewan

Canadian Constitution

Water Security Agency

Communities at Risk Program

Lower Qu'appelle Watershed Stewards



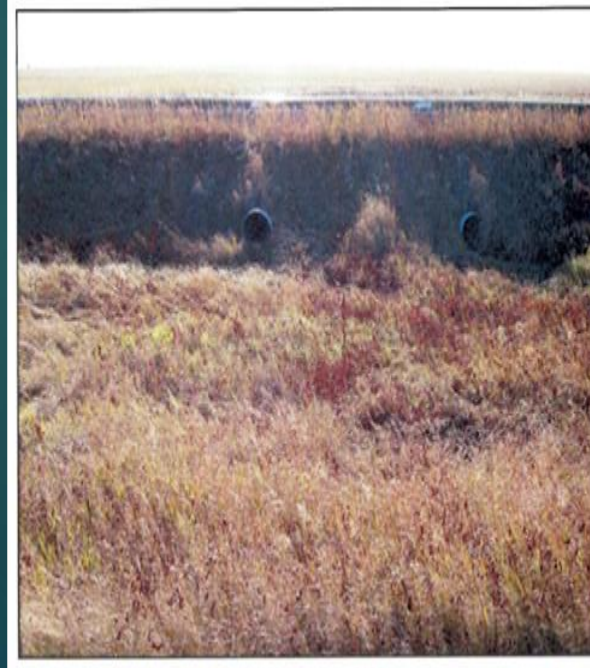
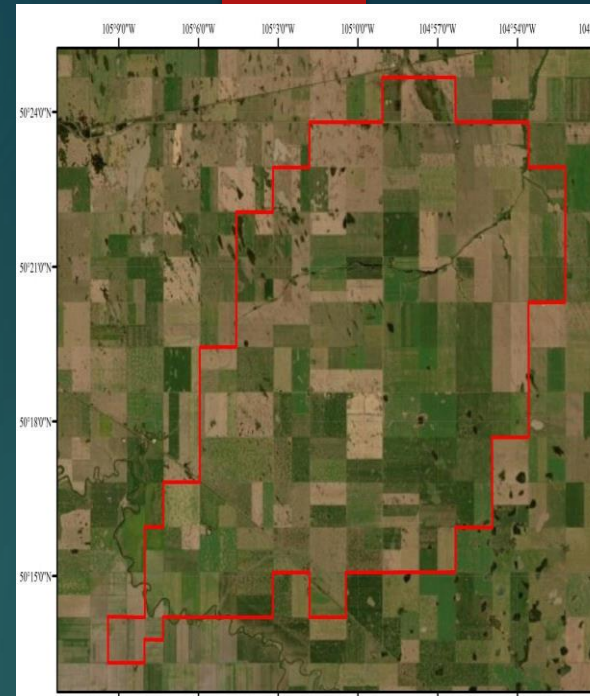
Case 5- Okabena C and D

The Okabene Conservation and Development District is a Drainage and Erosion Control Project which was initially an environmental sedimentation and water runoff project but eventually grew into creating a conservation and development (C&D) area that allowed producers and governmental agencies to more effectively collaborate in solving the water issue through creation of a big ditch drainage and protect water quality of the nearby river where water is drained of farmers fields.

Tests in 2016 showed a significant reduction in bacteria and sedimentation which improves water quality entering the Moose Jaw River's main channel as the water is travelling more slowly and through a grassed natural waterway.

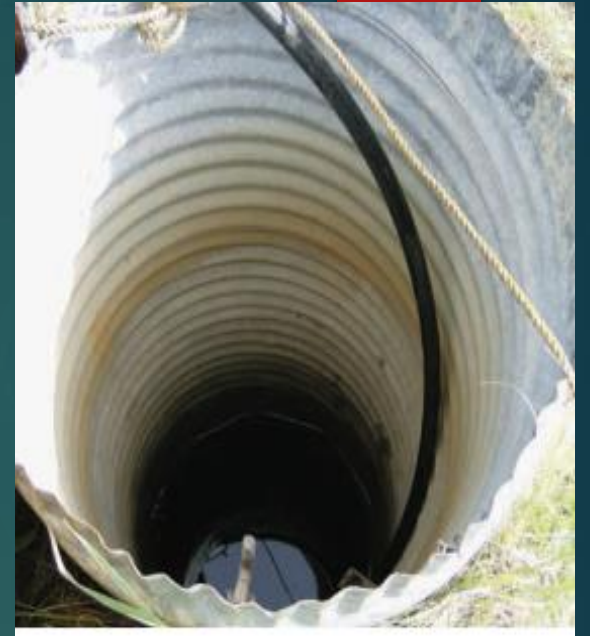
Form of climate change adaptation

NBS-Gray infrastructure was used to manage agricultural and stormwater runoff by way of controlling sedimentation and erosion has multiple benefits including but not limited to reduction in nutrient loading and protection of soils, thereby regulating freshwater quality and quantity. Soil fertility is maintained on a long term basis and associated hazards are also regulated.



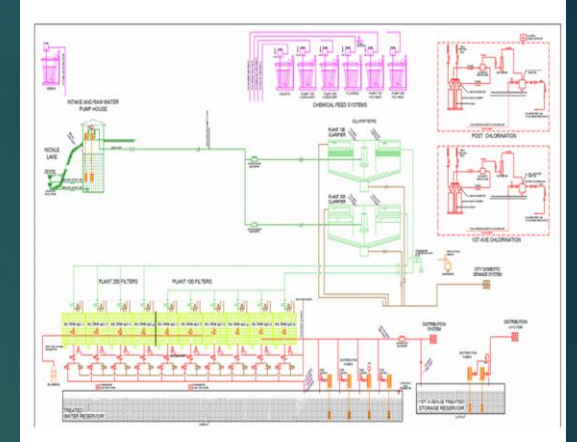
Case 6- RM of Storthoaks

- ▶ Decommissioning of abandoned wells
- ▶ Role of the Lower Souris Watershed Committee and Water Security Agency, engaging with landowners in increasing adaptive governance
- ▶ Funding through Water Wells - funded from the Ministry of Agriculture, from the Saskatchewan Farm & Ranch Water Infrastructure Program (FRWIP) and assisted by the Watershed authority
- ▶ Farmers flooding fields for better agro-productivity and lower costs of operating machinery
- ▶ Agricultural drainage the solution to flooding
- ▶ NBS-There is regulation of freshwater quantity and quality



Case 7- Weyburn

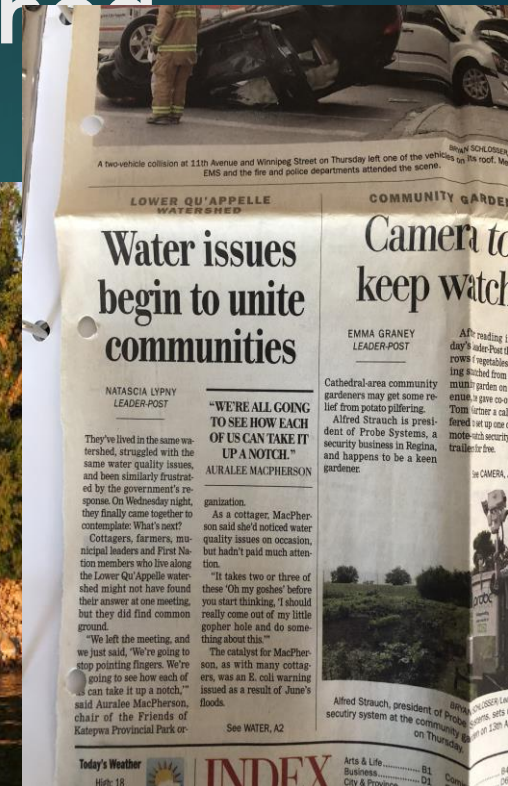
- ▶ The water treatment problem was solved through creation of Weyburn Water treatment plant through a collaboration between City of Weyburn, the provincial government, and the federal government, the Weyburn utility board and the Rural Pipeline Association.



Case 8-Contested Narratives on securing the waste water system in the lower Qu'Appelle Watershed

Case of Katepwa Village

The Katepwa case study is a study of voluntary community mobilization of downstream Qu'Appelle Watershed residents, First Nations community, working along with City of Regina, Water Security Agency, to protect their water system from effluent contamination, salinity and other forms of pollutants from the city of Regina and the creation of the water treatment plant of the City of Regina.

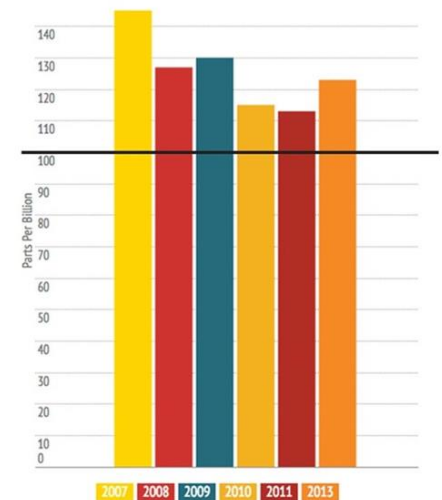


Case 9-Shifting Primary Water Source in the City of Estevan

- City of Estevan water treatment plant upgraded by City with Effective Stakeholder engagement and communication and through partnership with Water Security Agency



Trihalomethane Levels In Estevan's Water Since 2006



These averages are based on the quarterly one-time grab samples in Estevan's Water Treatment Plant between 2006 and 2013, which were found in the city's annual water reports. At the time of publication, there was no water report available for 2012. These numbers are measured in ppb (parts per billion).

Case study 10-Redberry

- ▶ Redberry Lake Biosphere Reserve's (RLBR) Land and Infrastructure Resiliency Assessment (LIRA) project (2010-2013). LIRA was a methodology being proposed by Agriculture and AgriFood Canada (AAFC), as a pilot project to create a national standard for flood management. LIRA is a technology-based decision-making tool. The assessment uses GIS mapping to connect infrastructure, economic, demographic and environmental data. RLBR connected with the LIRA unit of AAFC to create a LIRA pilot project in the prairie pothole region. With technical input from the municipalities in the region and funding from several partners, hi-resolution digital elevation maps were created and based on LIRA's modelling this would limit the negative impacts of an extreme run-off event in the area. (Almeida, 2021).

Case Study 11-Yorkton

- ▶ The City of Yorkton addressed the backwash water treatment problem which arose when the City started the construction of its new water treatment plant, through a partnership between Department of Environmental Services and the city where a backwash treatment system called the Logan Green Backwash was established by engaging community stakeholders in the decision-making process. The second problem that was solved by the City with the help of consulting firms was infrastructure upgrades for flood management in 2010 and 2014.
- ▶ NBS-

Case study 12- Melfort

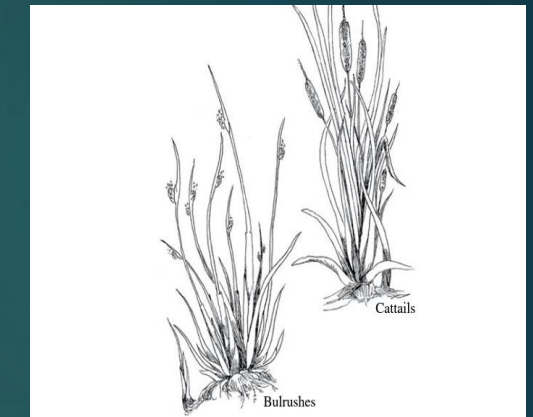
- ▶ Husky pipeline rupture released crude oil into North Saskatchewan River - City of Melfort and SaskWater partnered to use the Star City Reservoir to provide water to residents

Water Advisory over for Melfort and Area (Updated)

By Joshua Santos, The Journal
Thursday, July 28, 2016 2:56:52 CST PM



City workers fill up jugs of water at the potable water station outside Melfort City Hall



Summarising-Adaptive Governance and Nature Based solutions

- Robust models of BMPs/adaptive governance emerging in SK with nature based benefits
- Better adaptive capacity of communities

About the Team



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