Flood Adaptation and Water Management in the areas of Yorkton, Saskatchewan: A Case Study

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Content

1. Abstract

Flooding remains a major challenge in Saskatchewan's prairie watersheds because of extreme rainfall, altered drainage networks, wetland loss, and limitations in existing infrastructure. This case study examines how the Yorkton area has adapted to repeated flooding and what other prairie communities can learn from its experience. The study draws on academic literature, Bridging the Water Adaptation Gap materials, Assiniboine Watershed Stewardship Association reports, field observations, and a stakeholder session held in Yorkton in June 2026. These sources were reviewed thematically to identify drainage problems, infrastructure limitations, effective responses, coordination efforts, and remaining barriers. The findings show that channel clearing, flow-control structures, culvert improvements, beaver-management practices, mapping technologies, and targeted diversions have reduced specific local risks. Their success often depended on identifying the actual restriction, assigning responsibility for maintenance, and combining technical information with local knowledge. However, aging infrastructure, vegetation buildup, overlapping jurisdictions, approval delays, private-land access, and limited funding continue to restrict adaptation. The case also shows that improving drainage in one location may transfer risk downstream. Long-term flood adaptation therefore requires watershed-scale planning, regular maintenance, wetland protection, monitoring, cooperation, and continued learning.

2. Introduction and Background

Water management in the Canadian Prairies is influenced by great climatic variability and by the presence of many depressional wetlands, which are usually referred to as prairie potholes. These wetlands temporarily hold water, help to regulate runoff, aid in the recharging of groundwater, and play a role in both flood mitigation and in improving water quality. Yet changes in land use, in the draining of wetlands and drainage infrastructure can affect the way in which water moves across the landscape. (Pomeroy, Boer, & Martz, 2005)

Drainage may lead to a reduction in surface water storage and an increase in hydrological connectivity, thus raising the volume of runoff that reaches areas downstream and contributing to larger flood magnitudes and more frequent flooding (Baulch, Whitfield, Wolfe, Basu, & Bedard, 2021). This is particularly important in the context of changing precipitation patterns and an increase in the number of extreme rainfall events, both of which are placing extra pressure on prairie communities and on water management systems.

Yorkton, a town in the southeastern part of Saskatchewan, serves as a clear example of a community dealing with repeated flooding. The city was hit by three serious flood incidents in 2010, 2014 and 2016, all of which caused damage to houses, businesses, public infrastructure and transport networks. (Salman & Hurlbert, 2022)

These floods showed that shortcomings remained in Yorkton's stormwater system and proved that effective flood management requires more than just engineering capacity, it also needs good emergency planning, coordination between institutions, communication with the public and long-term investment.

After these floods, the city put in place some infrastructure upgrades and made changes to its emergency response and water management practices. Earlier research has shown that these experiences have led to social learning among municipal officials, City Council and the residents, so that Yorkton is now better prepared for future flooding. Yet not all the proposed improvements have been carried out, and confidence in the structural protection may result in less public concern about flood risk (Salman & Hurlbert, 2022).

This case study examines Yorkton's adaptation to frequent flooding, focusing on drainage and infrastructure issues, measures taken, stakeholder coordination, and ongoing challenges. It addresses: ***How has the Yorkton area adapted to recurring flood events, and what lessons can its experience provide for improving learning about flood disaster in Saskatchewan's prairie communities?***

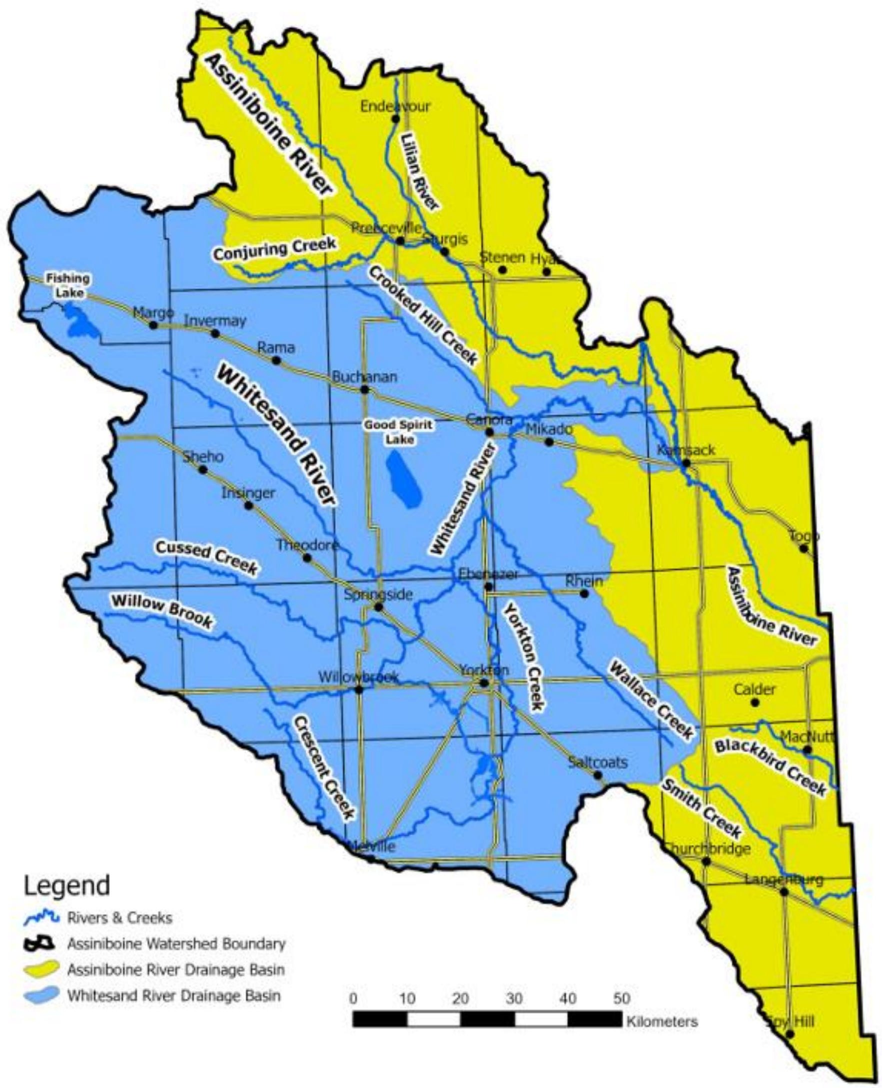

Figure 1
Assiniboine River Watershed and its principal drainage basins.

Note: From Annual report 2025 (p. 16), by Assiniboine Watershed Stewardship Association, 2025. Copyright 2025 by Assiniboine Watershed Stewardship Association.

3. Problem statement

Although various measures have been taken after the floods of 2010, 2014, and 2016, Yorkton still faces problems with heavy rainfall, stormwater management, and its drainage infrastructure (Salman & Hurlbert, 2022). It is impossible to get rid of flood risk simply by making improvements to the infrastructure, especially since the drainage system's performance is affected by the need for maintenance, limited financial resources, and changing climatic conditions.

Water movement goes beyond the borders of cities. Coordination is therefore necessary among the city of Yorkton, the adjacent rural municipalities, provincial agencies, infrastructure operators, landowners, and other stakeholders. Difficulties in defining responsibilities and in terms of priorities can make it hard to arrive at and put into action coordinated solutions.

The main challenge lies in finding out if the present adaptation measures are helping to improve the long-term resilience of prairie watersheds or are mainly dealing with the immediate effects of separate flood events. The example of Yorkton offers a chance to assess the role of infrastructure improvements, cooperation among stakeholders, and watershed governance in flood adaptation and to draw lessons that could be useful for other communities in Saskatchewan.

4. Literature review

4.1 Saskatchewan Prairie Watersheds

The prairie watersheds of southern Saskatchewan form part of the Prairie Pothole Region, an area characterized by level to gently rolling terrain, productive agricultural soils, cold winters, and highly seasonal water movement. Precipitation is relatively low and variable, and much of the annual surface runoff is generated during spring snowmelt, when meltwater moves across frozen or partially frozen soils (Pomeroy, Boer, & Martz, 2005).

Hydrological connectivity is therefore a defining characteristic of prairie watersheds. Human activities, particularly agricultural drainage, can modify these natural connections by accelerating runoff and reducing the capacity of wetlands to retain water and contaminants. As a result, alterations in watershed connectivity influence not only flood dynamics but also the transport of nutrients and sediments, ultimately affecting downstream water quality and ecosystem health (Baulch, Whitfield, Wolfe, Basu, & Bedard, 2021).

4.2 Flooding, Agricultural Drainage, and Climate Change

Agriculture represents one of the dominant land uses across Saskatchewan, making effective water management essential for both environmental protection and agricultural productivity. Drainage systems have been widely implemented to remove excess water from agricultural fields, improving field accessibility and crop production. However, while drainage provides short-term benefits for producers, it also increases hydrological connectivity, accelerates runoff, and reduces the natural flood mitigation capacity provided by wetlands (Pattison-Williams, J. K., Badiou, & Gabor, 2018)

Climate change has intensified these challenges by increasing the frequency and severity of extreme precipitation events. Greater rainfall variability and more frequent flooding place additional pressure on existing drainage infrastructure, much of which was designed under historical climatic conditions. Consequently, communities across Saskatchewan are facing growing demands to improve drainage systems while simultaneously protecting the ecological functions of wetlands that naturally regulate water movement and reduce flood impacts (Baulch, Whitfield, Wolfe, Basu, & Bedard, 2021).

4.3 Community Adaptation and Watershed Governance

Recent research has demonstrated that successful climate adaptation requires more than physical infrastructure; it also depends on collaborative governance and community participation. Watershed management involves multiple stakeholders, including municipal governments, watershed associations, agricultural producers, researchers, and provincial agencies, each contributing different perspectives and responsibilities. Effective adaptation therefore relies on coordinated decision-making that integrates scientific knowledge with local experience. (Salman & Hurlbert, 2022)

The Assiniboine Watershed Stewardship Association (AWSA) has implemented several initiatives aimed at encouraging the adoption of Beneficial Management Practices (BMPs), including wetland restoration, perennial forage establishment, regenerative agriculture, and cover cropping.

These programs recognize that financial incentives alone are often insufficient to encourage conservation. Instead, successful implementation also requires technical assistance, flexible program design, and continuous engagement with producers to address practical barriers such as equipment availability, operational logistics, and farm profitability (AWSA, 2026). This collaborative approach aligns with the objectives of the Bridging the Water Adaptation Gap (BWAG) project, which emphasizes stakeholder participation and adaptive governance as key components of climate resilience.

4.4 Yorkton as a Regional Case Study

Yorkton exemplifies flood adaptation in Saskatchewan's prairie watersheds due to its flood history and location in the Assiniboine River watershed. The 1990s floods revealed that a fragmented water management approach failed to address hydrological challenges, leading to collaborative governance like the Smith Creek Regional Watershed Association (AWSA, 2026). Research shows that agricultural drainage, wetland loss, and changing precipitation have significantly altered hydrology, increasing streamflow and flood risks.

The Yorkton case illustrates the complexity of balancing agricultural development, infrastructure management, and environmental conservation under changing climatic conditions. Examining the adaptation measures implemented by local stakeholders provides valuable insights into the opportunities and challenges associated with building resilient prairie watershed systems that can respond effectively to future climate variability.

5. Methodology

This study used a qualitative case study approach to examine flood adaptation in Yorkton, Saskatchewan. The methodology included the following components:

5.1 Case Selection

- Yorkton area was selected because of its experience with recurrent flooding.
- The city provides an opportunity to examine infrastructure improvements, local responses, stakeholder coordination, and continuing adaptation challenges.

5.2 Primary Data Collection

- Primary qualitative information was collected during a stakeholder session held at the Assiniboine Watershed Annual General Meeting in Yorkton in June 2026.
- The researcher attended as a researcher and participant observer to gather information for the case study.
- Participants took part in an approximately 30-minute group discussion.
- They were asked to identify measures that worked during recent flooding and provide examples from specific locations.
- Field observations from the Assiniboine Watershed visit were also used to provide context.
- The discussion followed a standardized question guide covering flood impacts, management practices, adaptation strategies, and gaps in policy, infrastructure, data, and coordination (Guiding Questions below).

5.2.1 Guiding Questions

Small Group Session Questions

(Identify areas of flooding, what worked, what did not work, what needs improvement – 30 minutes of rapid questioning/note keeping)

1. Where did flooding occur, and how severe was it?
2. What were the factors that caused/contributed to the flooding?
3. What areas managed the extremes well? *(worked / minimal impact)*
4. Where did it break down/not work? *(and what happened there)*
5. What made the difference between those outcomes?

6. What worked well that others could learn from?
7. What tools, practices, or decisions would you use again?
8. What tools, practices, or decisions would you change in the future? Explain.

Plenary Session Questions

(30 min – Try to extract gaps in data, tools, policy or coordination)

1. What patterns are we seeing across regions? *(What's consistent? What about downstream – were there any larger basin impacts?)*
2. What approaches are proving effective at managing extreme water events?
3. What needs to change to improve outcomes next time? *(infrastructure, management, policy, coordination)*
4. What practical actions can be scaled or shared more broadly?
5. What should we be doing differently if these events become more frequent?
6. What gaps exist in data, tools, policy, coordination, other?
7. What other specific or general insights might you have for better sustainable adaptation in the future?

5.3 Secondary Data Sources

- Academic articles.
- BWAG case study documents and research materials.
- Reports and materials related to prairie hydrology, wetland drainage, climate change, flood adaptation, and social learning.
- Materials distributed during the Assiniboine Watershed meeting (annual report 2025-2026).

5.4 Data Analysis

- Discussion transcripts, field notes, and secondary sources were reviewed.
- The information was organized into five themes:
    1. Flood and drainage challenges.
    2. Infrastructure limitations.
    3. Measures considered effective.

4. Stakeholder coordination.
5. Remaining barriers.

- Stakeholder observations were compared with published research and BWAG documents to identify common findings, differences, and practical lessons.

5.5 Ethical Considerations and Limitations

- Findings were reported at the group level without identifying individual participants.
- The stakeholder session was brief and did not represent every organization or resident affected by flooding.
- Participant’s statements represented personal experiences and perceptions rather than technical measurements of infrastructure performance.

6. Findings

6.1 Flooding and Drainage Challenges

The Assiniboine River Watershed covers approximately 17,300 km^2 and operates as an interconnected hydrological network. Willowbrook Creek, Yorkton Creek, Wallace Creek, and other waterways collect runoff from local sub-basins before eventually joining the Assiniboine River. Consequently, water-management problems in one location can affect infrastructure, agricultural land, and communities elsewhere in the watershed (AWSA, 2026, p. 18).

Stakeholders cited intense rainfall and limited drainage causing localized flooding. At Anderson Lake near Saltcoats, about 3-4 inches of rain in one day, after 0.75 inch the previous day, caused the lake to rise 5-6 inches and overflow. Cleaning beaver cages didn't help, as the main blockage was in the Highway 16 ditch, where cattails, bulrushes, and dead vegetation restricted water flow. After clearing, water levels dropped about five inches.

6.2 Infrastructure Limitations

Culverts were repeatedly identified as vulnerable components. Participants described culverts that were collapsed, blocked, too small, incorrectly installed, or positioned above the channel bed. In one location, culverts installed to replace a bridge were estimated by a participant to provide only 30 to 40% of the former bridge's flow capacity. These observations were based on local experience and this reflectes persistent concerns about infrastructure performance.

The annual report also documents how infrastructure changes can transfer risk downstream. At the Highway 309 Wallace Creek crossing, a 7ft culvert was added to two existing 6ft culverts to increase capacity. However, the additional flow contributed to repeated flooding on a property located approximately half a mile downstream. This created the need for a second intervention to regulate and redirect water (AWSA, 2026, p. 24).

The Yorkton Creek system itself requires extensive maintenance. It covers approximately 2,900 km^2 across seven rural municipalities and two urban centres. The system contains 15 control structures, including gates, earthen dams, weirs, and channels. More than 250 registered easements are required to provide access across private land for channel clearing, bank stabilization, and structural maintenance (AWSA, 2026, pp. 20–21).

6.3 Adaptation Measures Implemented

Several positive adaptation measures were identified. The Yorkton Creek Watershed Association uses operating guidelines to determine when to retain or release water. In 2025, the system operated under standard conditions despite a major summer rainfall event that raised water levels in Crescent and Leech lakes. Dead cattails that accumulated at the Leech Lake outlet were quickly removed without affecting the operation of the downstream control structure (AWSA, 2026, pp. 20–21).

A project at Crescent Creek created an overflow channel that allows high water to bypass the main beaver dam. The work improved water conveyance while retaining the beaver pond and associated habitat. This represented a practical adaptation that combined flood mitigation with the landowner's interest in habitat conservation (AWSA, 2026, p. 21).

Wallace Creek also demonstrated measurable maintenance progress. Approximately 55 miles, or 88% of the main channel, had been cleared. Additional work included beaver-dam removal, bank stabilization, and improvements to culverts and creek crossings. Provincial programs covered up to 50% of eligible channel-clearing and beaver-removal costs, while maintenance easements had been secured across 83% of the quarter sections bordering the creek (AWSA, 2026, p. 23).

To address the downstream flooding near Highway 309, a gate was installed on the third culvert and placed under the responsibility of the Wallace Creek board. Approximately 250 feet of new channel was also excavated to bypass the affected property and eliminate a 1,500-foot meander. Photographs taken after construction show the completed diversion and functioning culverts during spring 2026 (AWSA, 2026, pp. 24–25).

Additional adaptations included the clearing of three miles of Blackbird Creek near MacNutt and the use of GPS, GIS, LiDAR, and drone imagery to map culverts, identify barriers, inspect channels, and locate beaver dams (AWSA, 2026, pp. 27, 54). Yorkton also began rehabilitating the Park Street Pumping Station, which is expected to add approximately 4,550 m^3, or one million gallons, of potable water storage and improve emergency preparedness (AWSA, 2026, p. 43).

Figure 2
Berm construction at Crescent Creek, September 2024.

Note. From Annual report 2025 (p. 21), by Assiniboine Watershed Stewardship Association, 2025. Copyright 2025 by Assiniboine Watershed Stewardship Association.

Figure 3
Removal of the secondary dam at Crescent Creek, November 2024.

Note. From Annual report 2025 (p. 21), by Assiniboine Watershed Stewardship Association, 2025. Copyright 2025 by Assiniboine Watershed Stewardship Association.

6.4 Stakeholder Coordination and Remaining Barriers

The findings showed increased coordination among watershed boards, municipalities, AWSA, the Water Security Agency, the Ministry of Highways, CP Rail, landowners, and technical advisors. Participants described a watershed-organized meeting that led CP Rail to commit to culvert upgrades. The RM subsequently cleared the Highway 16 ditch after obtaining provincial approval.

However, overlapping jurisdiction remained a major barrier. Participants reported situations in which highway and railway authorities stated that their individual structures were functioning while flooding continued elsewhere. Projects were also delayed by engineering studies, regulatory approval, landowner negotiations, easements, and funding requirements. The annual report similarly identifies outdated governance arrangements and the need to include local stakeholders directly in water-management decisions (AWSA, 2026, pp. 51–52).

7. Analysis

The measures that produced the clearest improvements shared three characteristics: they addressed a specific hydraulic restriction, established responsibility for operation or maintenance, and combined local knowledge with technical information. At Anderson Lake, channel clearing worked because vegetation in the Highway 16 ditch, not the beaver cages, was the principal obstruction. Likewise, the gate and diversion at Wallace Creek improved control by regulating where water moved, rather than merely increasing culvert capacity. GIS, LiDAR, and drone mapping strengthen this preventive approach by identifying damaged culverts, channel barriers, and beaver dams before emergencies occur (AWSA, 2026).

Nevertheless, the findings demonstrate that increasing conveyance at one location can transfer risk downstream. The additional culvert at Highway 309 improved flow beneath the highway but contributed to repeated flooding on a nearby property. This corresponds with prairie hydrology research showing that drainage and greater hydrological connectivity can reduce landscape storage and increase the volume and speed of water reaching downstream areas (Baulch et al., 2021). Infrastructure performance should therefore be evaluated across the watershed, not only at an individual crossing or within one municipality.

Important problems remain unresolved. Aging, blocked, or undersized culverts, vegetation accumulation, limited channel slope, private-property access, fragmented jurisdiction, regulatory delays, and uncertain funding continue to restrict adaptation. The stakeholder accounts also indicate that institutions may consider their own structures functional even when the combined system continues to produce flooding. Because these accounts represent local perceptions rather than engineering measurements, they identify priorities for further technical assessment rather than proving infrastructure failure.

The literature also suggests that engineered drainage should be combined with natural water storage. Retaining existing wetlands can reduce flood impacts while providing nutrient removal and other ecosystem services and may be more beneficial than restoring wetlands after drainage (Pattison-Williams, J. K., Badiou, & Gabor, 2018). However, conservation costs are often carried by landowners while benefits extend downstream, making incentives and collective governance necessary (Lloyd-Smith, Boxall, & Belcher, 2020)

Yorkton's experience further demonstrates the value of social learning. Repeated floods and communication improved preparedness and institutional cooperation, although confidence in completed infrastructure may create a false sense of security (Salman & Hurlbert, 2022). Other Saskatchewan communities can therefore learn to combine routine maintenance, structural upgrades, wetland protection, monitoring, and formal inter-municipal coordination. Climate adaptation should be treated as an ongoing process of learning and adjustment at the watershed scale, rather than as a completed infrastructure project.

8. Recommendations

- **Retain water as well as convey it:**

Drainage improvements should be combined with wetland conservation, vegetated buffers, and storage areas. Protecting wetlands should be prioritized and supported through incentives for landowners whose decisions provide downstream benefits.

- **Use monitoring to guide decisions:**

GIS, LiDAR, drone imagery, rainfall records, and local knowledge should be combined in a map of vulnerable locations. This information can guide investments and revisions to emergency plans as precipitation patterns change.

9. Conclusion

This case study shows that flood adaptation in Yorkton is not the result of a single project, but of a gradual process shaped by repeated events, local experience, and cooperation. Measures such as channel maintenance, flow-control structures, improved crossings, and mapping tools have helped address specific problems and strengthened preparedness. At the same time, stakeholder experiences show that water does not follow municipal or jurisdictional boundaries. A change that improves drainage in one place can create new pressures downstream, especially when infrastructure decisions are made separately.

The Yorkton case therefore highlights the importance of understanding flood management at the watershed scale. Infrastructure remains necessary, but its effectiveness depends on regular maintenance, monitoring, wetland conservation, clear responsibilities, and communication among the organizations involved. Remaining challenges related to funding, approvals, private-land access, and aging infrastructure mean that adaptation is still an ongoing process. Rather than presenting Yorkton as a completed success, this study shows how practical experience and social learning can guide better decisions. These lessons may help other Saskatchewan communities prepare for more variable and extreme water conditions.

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