SPONGE BY THE FORKS

Introduction

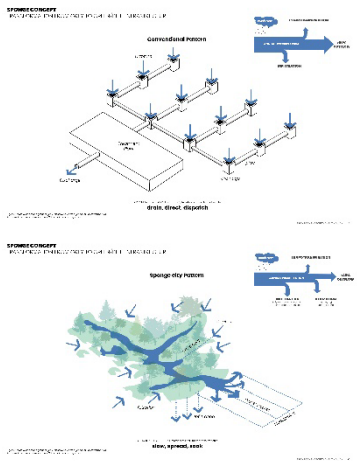
Winnipeg, located within one of the largest watersheds in the world, faces growing water challenges shaped by its unique geography, historic urban development, and the increasing impacts of climate change. This project explores the "sponge city" concept — using nature-based strategies to transform existing grey infrastructure into blue-green systems, building a more resilient and sustainable urban water cycle. Through the Sponge model, my ambition is also to promote greater public awareness of water issues, especially in the face of a changing climate.

Context: What Challenges Winnipeg face?

Winnipeg faces three major water challenges: flooding, pollution, and climate vulnerability. Its flat landscape and clay-rich soil contribute to frequent floods, once mitigated by prairie wetlands now lost to urbanization. Today, the city relies on grey infrastructure like the Red River Floodway, Portage Diversion, and dikes. While effective for major floods, these rigid systems struggle to adapt to climate change's unpredictability.

The aging combined sewer system further compounds the issue. In winter, wastewater is carried to treatment plants, but in summer, heavy rains and snowmelt overwhelm the system, causing combined sewer overflows (CSOs) that discharge untreated sewage into rivers. Climate change with unpredictable heavy rainfall is pushing this system beyond its limits.

These challenges show why Winnipeg urgently needs a more sustainable, resilient approach to water management — one that the "sponge city" concept can provide through nature-based solutions.



What is Sponge Concept?

Traditional stormwater systems follow a "Drain, Direct, Dispatch" model — moving water quickly away to treatment plants or rivers. In contrast, the Sponge concept applies Low-Impact Development (LID) strategies to "Slow, Spread, and Soak" runoff. By slowing runoff and encouraging infiltration, it can reduce outflow by up to 40%, allowing natural filtration before the water re-enters the environment.

Nature-based LID strategies include permeable paving, bioswales, green roofs, and constructed wetlands. They follow a natural sequence: capture water, control flow, store, filter, infiltrate, and finally reuse or discharge. This process eases pressure on existing infrastructure.

Figure 1. Comparison between conventional urban stormwater management and sponge approach.

Integrating the Sponge Framework into Winnipeg's Urban Context

Grey infrastructure in Winnipeg has largely separated the city from its rivers. The Sponge approach proposes reweaving blue and green infrastructure into the urban fabric, reconnecting people with water.

At a citywide scale, the proposal includes sponge parks, green streets with permeable surfaces and bioswales, and improved river edges with floating wetlands near sewer outfalls to pre-treat polluted water.

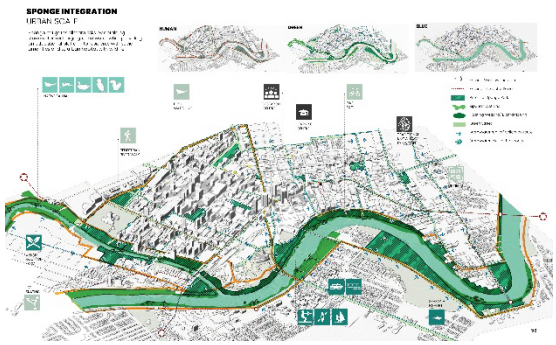


Figure 2. Urban Scale Sponge System: The Interwoven Blue/ Green Infrastructure and Grey Infrastructure.

At the local scale, Sponge by the Forks acts as a catch basin for its surrounding sub-catchment area. It also houses a Water and Climate Impact Research and Educational Centre, making water and climate issues visible and accessible to the public.

How the 'Sponge by the Forks' works?

The Water and Climate Impact Centre lines the main access road, with the educational centre on one side and the research centre on the other. Exhibition spaces wrap around a central retention pond, blending indoor learning with the outdoor landscape. A gentle slope leads to an accessible green roof, merging the building into the naturescape. Built with a mass timber structure, the façades are enclosed toward the city for privacy and open toward the landscape to strengthen visual and physical connections.

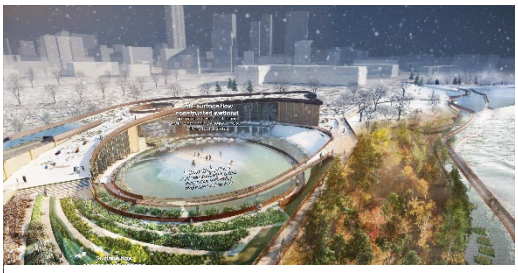


Figure 3. Green Roof, Wetlands and other sponge strategies blended well into the naturescape.

Figure 4. Plants are selected based on their ability to tolerate varying pollutant loads and water flows.

The stormwater natural treatment system is showcased through a series of sponge strategies along the visitor's approach to the building and sponge park. Designed for year-round operation, the system places insulated grease and septic tanks below the frost line. Surface constructed wetlands treat stormwater and river water in summer, while subsurface flow wetlands operate year-round under frozen conditions. Native plants help insulate wetlands and adapt to fluctuating water levels.

Artificial Floating Wetlands (AFWs) are installed within the retention pond and along the river's edge, using plants, microbes, and roots to naturally clean the water.

Using tools like the Green Values Calculator and LID Treatment Training Tool for assessment, the system demonstrates significant reductions in Total Suspended Solids (TSS) and Total Phosphorus (TP), along with substantial stormwater runoff capture.

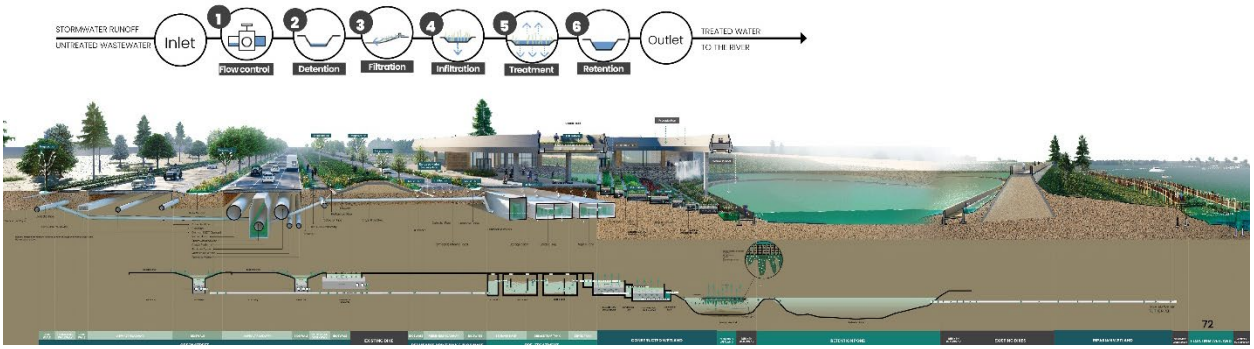


Figure 5. Section cuts through the site, showing how stormwater moves through a series of sponge strategies that work year-round.

Conclusion

Sponge by the Forks aims to be a new model for managing water in Winnipeg. By layering blue, green, and grey infrastructure, it reconnects people with the river, creates resilience to climate change, and raises public awareness through both design and education.