Greening Downtown Winnipeg:
Green Infrastructure Approaches to Mitigate Urban Challenges

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Reasons for Research

Urban areas are facing numerous challenges, such as biodiversity loss, rising temperatures, extreme precipitation, and flooding. Urbanization and land use changes are exacerbating these challenges. Green infrastructure (GI) has been recognized as a strategy to address these challenges and promote sustainability.

According to Statistics Canada, Winnipeg has experienced a decrease of 24.6% in urban greenness between 2000-2022. This highlights the need to incorporate GI, and this study focuses on examining downtown Winnipeg. Downtown Winnipeg is predominantly covered by impervious areas such as surface parking lots, roads, sidewalks, and buildings. These impervious surfaces strain our drainage systems and raise temperatures due to their low reflective power, causing temperatures to increase in the downtown area, a phenomenon known as the Urban Heat Island (UHI) effect. The goal is to help downtown Winnipeg become a greener, more connected, and ecologically healthier city center by prioritizing GI, which provides space for nature.

Research Questions

1. How are areas of opportunity for green infrastructure identified and prioritized in North American humid continental climates?

2. What are the opportunities for green infrastructure development in downtown Winnipeg? Where and what type of green infrastructure would be most beneficial?

Research Methods

Document Analysis

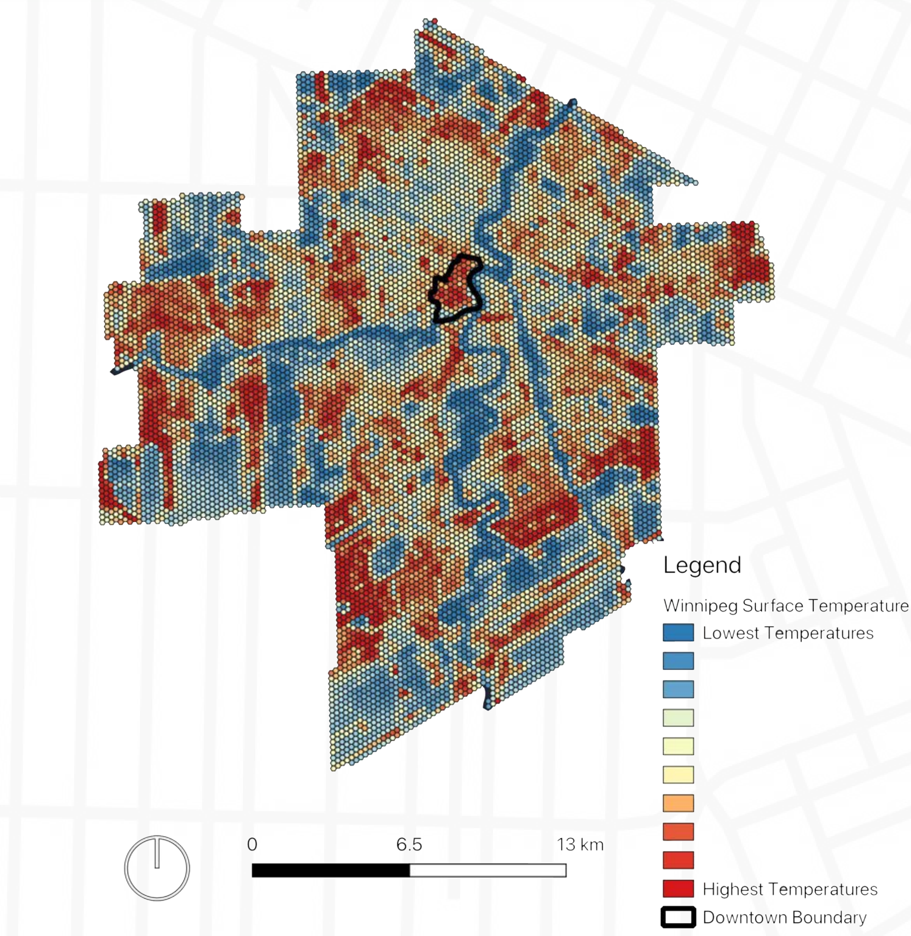
Considering Winnipeg's Humid Continental Climate (Dfb), it was important to select city plans for review that were also classified Dfb, to ensure that similar policies and projects may be implemented and succeed in Winnipeg. The document analysis reviewed the GI plans of Edmonton, Saskatoon, and Chicago.

Spatial Mapping Analysis

Mapping was utilized as a tool for visualizing data, using datasets obtained from the City of Winnipeg Open Data portal, the Province of Manitoba, Trees Please Coalition data, and self-created datasets.

Context: Downtown Challenges

Winnipeg Surface Area Temperatures



Downtown Challenges

- Stormwater Management
- UHI Effect
- Flooding
- Tree Loss

Document Analysis Key Findings & Discussion

Findings			Chicago	Edmonton	Saskatoon
Identifying GI Areas	Through Land Uses	Buildings and Sites	✓	---	---
		Streets and Sidewalks	✓	---	---
		Parks and Open Spaces	✓	---	---
		Using non-traditional land (e.g. Brownfields)	---	---	✓
		Mapping Natural Assets	---	---	✓
	Based on Environmental Impact Benefits	Air Quality	✓	✓	---
		Stormwater Management	✓	✓	✓
		UHI Effect	✓	✓	✓
	Through Community Engagement	Community Stewardship	---	---	✓
		Community Outlined Priorities	---	✓	---

Key Finding:

As part of the document review, stormwater management and the UHI effect were factors that all three cities acknowledged and considered as an identification strategy to reveal GI opportunities.

Findings			Chicago	Edmonton	Saskatoon
Prioritizing GI Areas	Through Cost Effectiveness and Feasibility	Dedicated Public Funding	✓	✓	✓
		Compensation Funding	---	---	✓
	Through a Regulatory and Policy Framework	Establishing New Policies	✓	✓	✓
		Needs Assessment-Amending Existing Policies	---	---	✓
	Through Maintenance and Restoration	Conducting a Gap Analysis	---	---	✓
		Area Management Plans and Maintenance Procedures	✓	---	✓

Key Finding:

All three plans had similar strategies for prioritizing GI, as they highlighted dedicating public funding and establishing new policies to implementing and maintaining GI.

Recommendations

1 Allocate Resources for Pilot Project Testing

It is recommended that the City of Winnipeg allocate a budget for testing and implementing GI projects given their potential benefits.

2 Develop a Winnipeg GI Plan

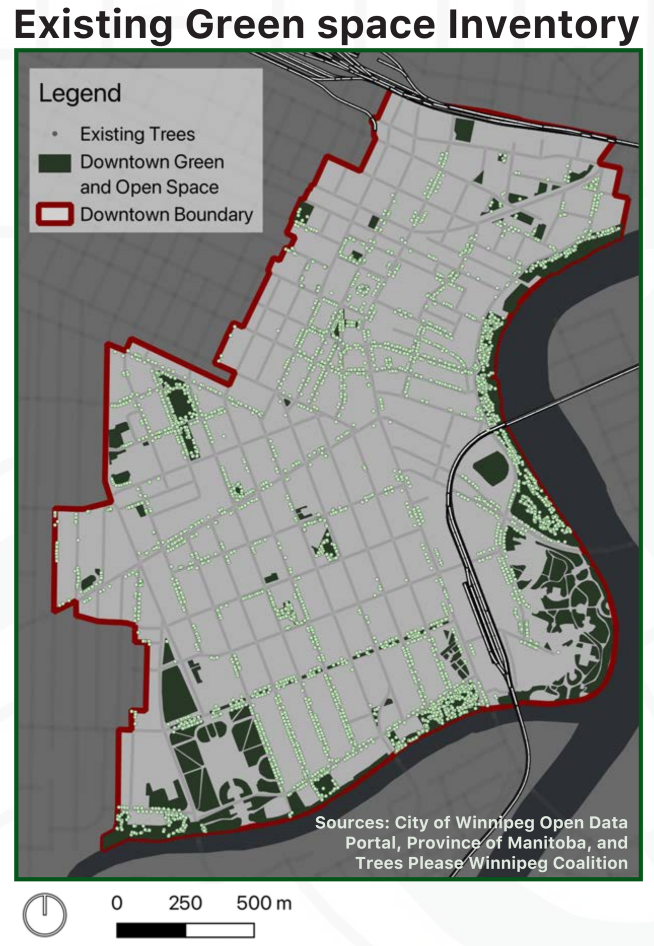
The City of Winnipeg does not currently have a Green Infrastructure plan, and it would be beneficial for the city to create one that outlines clear visions, goals, and funding opportunities.

3 Develop a Point Based Checklist for Green Infrastructure Development

Mandate making new development and redevelopment include at least one, and possibly more types of GI and must reach a certain number of points in order for development to be approved. This initiative aligns with the goals of Complete Communities 2.0 and OurWinnipeg 2045 to strengthen, protect, preserve, and enhance the connectivity of green spaces.

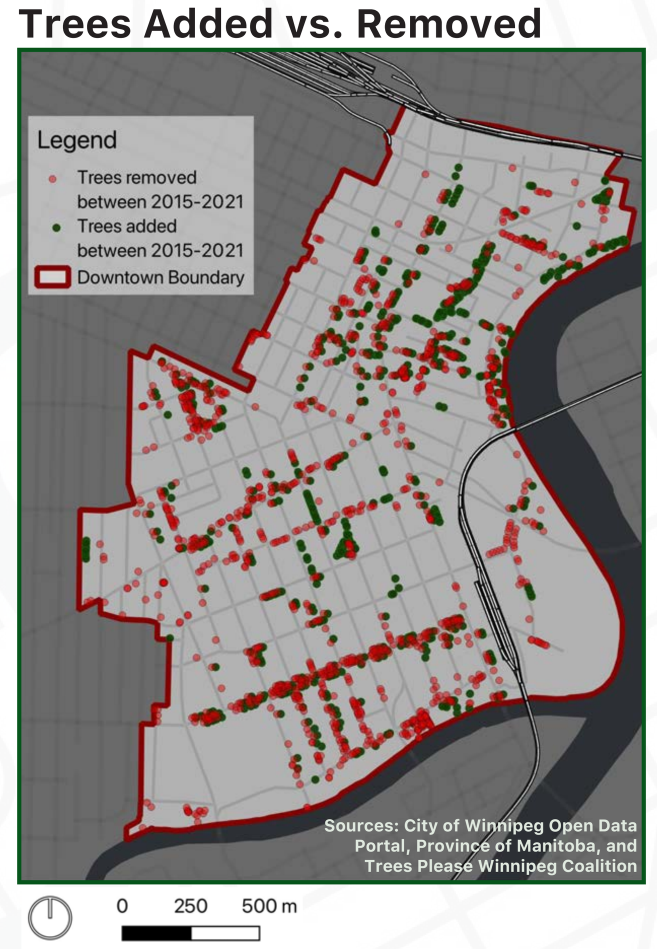
Spatial Mapping Analysis Findings & Discussion

Existing Green space Inventory



There are **3938** public trees in downtown Winnipeg

Trees Added vs. Removed

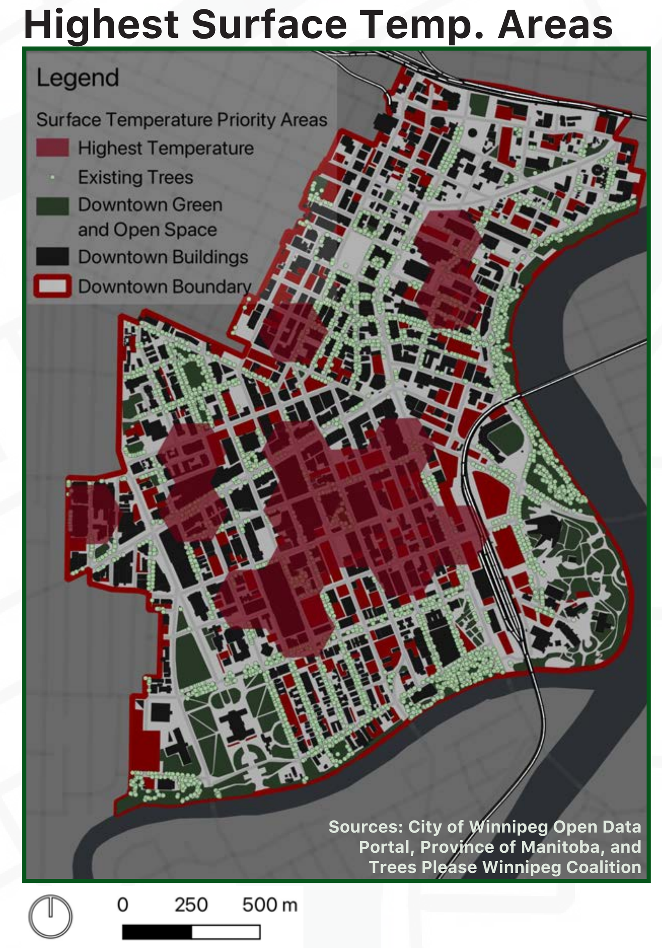


Between 2015-2022

779 trees were added

1233 trees were removed

Highest Surface Temp. Areas



Over **1000** buildings and only **1** green roof

By using spatial data, it was possible to identify areas that are at risk and present opportunities for implementing Green Infrastructure (GI). The surface temperature layer revealed areas with the **highest temperature downtown, require higher priority for GI implementation.** Those areas are mostly comprised of buildings, asphalt surface parking lots, and road networks.

The priority areas are also largely missing trees, further exacerbating the high surface temperatures. **These findings emphasize the critical role that various green spaces play in mitigating surface temperatures.** High surface temperatures are often caused by a concentration of impervious surfaces, which, in turn, contribute to increased stormwater runoff due to limited soil infiltration.

The document review plans identified areas for GI opportunity based on their potential environmental impact benefits, including the UHI effect and stormwater management; these findings confirmed my approach and research to identifying areas of GI opportunity for downtown Winnipeg through spatial mapping and using the surface temperature layer.

Conclusion

This study conducted a document and spatial mapping analysis to identify how cities are approaching GI in terms of identifying and prioritizing areas of opportunity and where and what type of GI can be implemented in downtown Winnipeg. The spatial analysis aimed to identify potential opportunity areas for GI within downtown Winnipeg, and with the help of many different GIS data layers, it became possible to do so.

Local contexts and conditions primarily impact GI and will vary from city to city because many factors need to be considered, such as soil quality, natural asset inventories, and the state of existing GI.

As more frequent and severe weather events occur, Winnipeg's infrastructure will be tested for its resiliency. Therefore, by integrating GI, Winnipeg will be able to address the challenges.