

The Value of Nature: A Study of the Importance of Green Space in the City of Prince George, British Columbia

**A Report from ENVS 210 University of Northern
British Columbia**

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Preface

This report was completed by the students of ENV5 210, a course in the Environmental & Sustainability Studies at the University of Northern British Columbia. The research and recommendations are the students own.

I note that, as students have noted in their reports, these findings reflect upon young adults' perceptions of the critical need for ecological protection in the world as well as for the community they currently call home. They have noted here and elsewhere that the preservation of green space and ecological protection in the city of Prince George is critical to the attraction and retention of new community members, including graduates of the University of Northern British Columbia, and thus the long-term future of the city and region.

The class thanks all those who assisted them with their research through discussion, completing surveys and sharing insights.

With respect,

Annie Booth
Course Instructor

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Summary of Recommendations from Reports

The Value of Nature: Ecological Protection and the Impacts of Urban Sprawl in Prince George

Based on our review of research, conducted interviews, assessment of the Prince George Official Community Plan and examination of recently approved development projects within the city, our recommendations are as follows:

- 1) Prioritize densified, infill, mixed-use developments which minimize reliance on vehicle traffic and maintain functional connectivity of ecosystems
- 2) Ensure developers follow through with the affordable housing options in these proposals, to create housing security for students, seniors and low-income community members

These recommendations serve as initial steps which will help to ensure accountability for developers who include affordable housing options in their initial proposals and fail to follow through with construction of multi-family units after single family dwellings have been built and purchased. By prioritizing sprawling development rather than aiming to densify existing building spaces within the city, we continue to compromise green space in and around Prince George, while failing to consider the input of community members (Prince George Citizen, 2022).

The Value of Nature: Financial Benefits of Green Space Retention

Maintaining green space in Prince George will generate tax revenue and reduce operating costs through increased property values, ecosystem services, and increased climate resilience. Accessible green space has a positive impact on property values. Further, through our survey, it was found that green space is a major factor in the population growth and population retention in Prince George. The maintenance of green space in Prince George will encourage city growth in the future. Green space is responsible for many city functions, such as cooling and water retention, as well as the maintenance of local ecosystems. Retention of green space also contributes to increased climate resilience, as green space can reduce the risk of floods and landslides. The review of the Official Community Plan in Prince George should prioritize the retention of green space to reflect the values of its citizens, to retain the ecosystem services provided, and to create climate resilience in the city.

The Aesthetic Value of Greenspace

In general, aesthetics relates to the visual appeal of an object, place, or event. In the context of city planning, aesthetics may be the design, topography, accessibility, cleanliness, and even safety of a greenspace. Recommendations

1. City planning should recognize the beneficial cognitive and mental health effects of greenspace and plan for biodiverse, species-rich, and varied greenery experiences.
2. City planning in Prince George can create tourism opportunities in naturally appealing greenspaces, promoting the economic growth of the city.
3. Interventions to Preserve Natural Aesthetics at Cottonwood Park:
 - a. Educational posters in Cottonwood on negative impacts of feeding wildlife.
 - b. Seek environmental consultation for recommendations on wildlife feeding at Cottonwood Island Park

The Values of Nature Report: Mental and Physical Health

A survey was conducted to determine the impact of greenspace on overall mood and physical health, focusing on a time before, during, and after great emotional stress. The emotional stress in question was

the onset of Covid-19 travel restrictions. The results showed that participants did find their mood and physical health improved after spending their time in greenspace. In order to get a sense of the importance of greenspace to participants, they were also asked how important they personally found greenspace, and how they would feel losing said greenspace to development. The majority of participants found greenspace to be important and indicated that they would not want to lose greenspace to development. As losing greenspace to development can cause environmental disaster which may create great emotional damage to those affected, the survey also asked who participants believed should be held liable for this damage. Most participants indicated that they believe the government (Municipal, Provincial or Federal), or city planners should be held liable for these emotional damages.

Green Space as a Benefit to Humans: Social and Educational

We recommend that the City of Prince George preserves this valuable greenspace between Ginters and Forests for the World by rezoning the area as a park. This will preserve the educational and social benefits of the area for future residents. The housing development being proposed provides few benefits to the residents of Prince George that cannot be achieved through other, lower impact, forms of development. The proposed housing development also comes at a massive cost to the community with the loss of an area that is so highly valued and well used.

The Value of Nature: Ecological Protection and the Impacts of Urban Sprawl in Prince George

Mariah Curry, Tate Fowler, Hayley Heidinger, Nicholas Holmes, Denae Meise

Recommendations

Based on our review of research, conducted interviews, assessment of the Prince George Official Community Plan and examination of recently approved development projects within the city, our recommendations are as follows:

- 1) Prioritize densified, infill, mixed-use developments which minimize reliance on vehicle traffic and maintain functional connectivity of ecosystems
- 2) Ensure developers follow through with the affordable housing options in these proposals, to create housing security for students, seniors and low-income community members

These recommendations serve as initial steps which will help to ensure accountability for developers who include affordable housing options in their initial proposals and fail to follow through with construction of multi-family units after single family dwellings have been built and purchased. By prioritizing sprawling development rather than aiming to densify existing building spaces within the city, we continue to compromise green space in and around Prince George, while failing to consider the input of community members (Prince George Citizen, 2022).

Purpose of Research

This research was conducted to explore how the value of nature, more specifically urban greenspace, is maintained and reinforced through ecosystem protection. By exploring the greatest impacts on urban greenspace, animal habitats and ecosystems overall, we found the greatest detriment to urban environmental health to be sparse urbanization, better known as urban sprawl (Artmann et al., 2019; Dupras et al., 2016). Prince George is reputed as being a “City in Nature” (City of Prince George, 2017), yet existent green spaces are waning or compromised by projects which fail to prioritize densified infill development. This degradation of greenspace or lack of conservation is a regular occurrence in local development. Community concerns, such as those related to increased traffic and environmental impacts of sprawling development fail to be considered in planning and the municipal approval process (Prince George Citizen, 2022). The aim of this research is to highlight the negative impacts that accompany sprawling development in Prince George and the social, economic and environmental impacts of this phase on our city and surrounding areas.

Additional Considerations

In addition to looking at the ecological impacts of urban sprawl presented through peer-reviewed research and a thorough review of considerations for green space protection in the Official Community Plan, we consulted with representatives from environmental groups in Prince George, and city council candidates from the recently concluded election. The interviewees stressed the importance of greenspace, as well as educating people on its value and importance. They outlined how inadequate investigation was conducted prior to development in Prince George, and how it is solely in the interest of municipal growth, rather than environmental retention. This short-sighted method of development interferes with many natural ecosystems, and creates unforeseen issues including inadequate organic material in topsoils,

and fire risk in previously logged areas which lack biodiversity. The interviewees also shared many great benefits to natural, undisturbed, and undeveloped green spaces. What could be considered undesirable ecosystems for development and industry can be extremely valuable for environmental preservation and remediation. Examples of this are aspen groves, which serve as an effective tool in fire mitigation, or the ways in which wetlands provide water-purification and serve as a carbon sink. In addition, greenspace's benefits to human mental health, and ability to provide safe corridors for wildlife are invaluable. All parties consulted agreed that the developments slated in the City of Prince George's 15-year municipal plan are detrimental to wildlife, the public's access to greenspace, and the city landscape that Prince George residents are familiar with. The interviewees offered less harmful alternatives to development, such as increased vertical expansion being favoured over horizontal expansion. It would also be beneficial to develop land that is already available for use, rather than clearing and preparing vast swathes of forest. Another aspect mentioned was that nature should be incorporated into development, and that wildlife should be taken into consideration when planning.

OCP Review

Prince George's current OCP, adopted in 2011, is a key component in the protection of greenspace as it creates a framework for decision making that the city must act in accordance with. In our research, we have discovered that the current OCP does not sufficiently protect greenspace and natural areas as urban sprawl continues throughout the city. We have found critical gaps in the city's plan as objectives and policies surrounding protection of greenspace are either non-existent, or not prioritized. As previously outlined, urban sprawl is the root cause of ecosystem loss in municipalities while also having social and economic repercussions. The OCP lists urban sprawl as a key issue, yet we found that the plan lacks objectives and policy to decrease this type of development.

The City of Prince George's OCP highlights the importance of nature for residents of the city. There are numerous policies in this section that call for the protection of natural habitats in greenspace. Policy 6.4.7 states "The City should maintain the habitat, landscape connectivity, and ecosystem diversity needs of wildlife within the greater landscape context, where appropriate within municipal boundaries"; policy 6.4.15: "The City should monitor and respond as appropriate to forest and ecosystem health trends influenced by climate change, pest or pathogen infestations, wildfire suppression, urban development, and other factors." and policy 6.4.34: "The city should work toward conserving or protecting areas having significant natural habitat value and/or important wildlife corridors." Additionally, some policies specifically mention preserving greenspace, such as policy 8.3.5 which states: "The City should retain most existing green spaces to ensure that residents continue to have good access to local recreation as populations increase."

The OCP encourages creating areas which prioritize foot traffic and recreation over vehicle dependencies. Densifying neighborhood centers is also said to be a priority as it is key when attempting to minimize urban sprawl (Artmann et al., 2019). The densification we are referring to is that of infill and mixed-use development which include multi-family residential buildings rather than strictly large, single-family homes. Though these single-family dwellings generate substantial tax revenue, they cater to limited demographics within urban areas and can be considered an inefficient use of land. In continuing this form of sprawling development, we see increased environmental impacts while simultaneously failing to provide housing options for numerous demographics within Prince George. Throughout the OCP, there is an acknowledgement of issues surrounding protecting ecosystems and greenspace. Development patterns since the adoption of the OCP in 2011 do not align with policies aimed at

protecting the natural environment. We have seen with the University Heights that clearcutting natural greenspace to build single family homes is still happening. Further, future neighborhood plans outlined by the OCP such as Wessner Heights, Fraser River Bench Lands, and the expansion of University Heights are going directly against it.

The continued development of greenfield areas for suburban neighborhoods fragments ecosystems, creates more vehicle dependency, and is the driver of urban sprawl. This issue is ongoing and proves that the OCP is not sufficient in protecting greenspace. As many of the policies within the OCP only state that ecosystems and habitats should be considered when development occurs, the value of green space becomes commodified while failing to acknowledge the endless benefits these spaces provide.

Literature Review

The maintenance of valuable green space in urban environments is not only made possible through conservation but also via sustainable development practices that aim to decrease pollution, increase viability of public transportation and maintain buffer zones or wildlife corridors (Artmann et al., 2019; Dupras et al., 2016; Tannier et al., 2016). Research illustrates that dense urban environments have markedly less impact on wildlife species and ecosystems than that of sprawling development (Tannier et al., 2016). In densifying development and protecting accessible green space both in and around the city, ecosystem connectivity may be increased and the biodiversity and functionality of riparian zones such as wildlife corridors may also be maintained (Dupras et al., 2016). Though roads make up roughly 1% of land use in North America, roadways have adverse environmental impacts on 20% of total land (Tannier et al., 2016). Sparse urbanization not only decreases functional connectivity for wildlife but also increases reliance on vehicle use and subsequent environmental impacts associated with lessened viability for sustainable forms of travel such as walking, biking and public transportation (Dupras et al., 2016; Tannier et al., 2016). In considering development options which meet the housing needs for growing populations in urban areas such as Prince George, we must include the social, economic and environmental repercussions of development proposals which fail to prioritize densification or infill construction.

A study of Canadian municipalities suggests that degradation of green spaces and natural infrastructure are directly linked to nearby residential development (McWilliam et al. 2015). The article points to a lack of policy and monitoring tools which could limit urban sprawl (McWilliam et al. 2015). These practices act as barriers, further protecting ecosystems and wildlife habitats. Studies looking at the combined effects of urban sprawl point not only to increased vehicle traffic and longer commute times for residents but also to the soil degradation and functional connectivity of ecosystems that result in less densified urban spaces (Artmann et al., 2019). A 2021 municipal natural asset inventory report identifies pressure on greenfield development as a significant risk for ecosystems (MNIA, 2021). It also highlights numerous plans from the city in regards to these issues, but the lack of enforcement is why we are still seeing much of our greenspace developed (MNIA, 2021). British Columbia's Local Government Act is the legislative framework that outlines many of the powers and responsibilities of municipalities. Section 875 explains Official Community Plans (OCP), which are meant to outline the long-term vision of communities. It serves as a statement of objectives and policy to guide decision making, and a critical planning tool to be used by residents, developers, and local governments. While the utilization of an OCP is not mandatory, government actions following adoption must be consistent with the plan.

Conclusion

To conclude, the purpose of our research is to explore how ecosystem protection is maintained and reinforced in urban greenspaces. Urban sprawl is a leading threat to functional connectivity of ecosystems as well as the overall structure of greenspaces. We created recommendations based on the collection of information from research and interviews with a wide range of perspectives. With these recommendations, we aim to reduce the disregard for valuable greenspace, and the destruction caused by increasing urban sprawl. Our research concludes that urban sprawl and an overall lack of accountability for developers compromise the health and preservation of valuable green space within the city. The degradation of municipal greenspaces caused by urban sprawl is thoroughly discussed as an issue in Prince George's OCP. Yet many gaps remain between policy which aims to protect greenspace and the development practices that take place in our city. Our research and recommendations aim to bring accountability to developers and city officials in hopes of allowing Prince George to truly be seen as a city in nature.

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The Value of Nature

Financial Benefits of Green Space Retention

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Executive Summary

Maintaining green space in Prince George will generate tax revenue and reduce operating costs through increased property values, ecosystem services, and increased climate resilience. Accessible green space has a positive impact on property values. Further, through our survey, it was found that green space is a major factor in the population growth and population retention in Prince George. The maintenance of green space in Prince George will encourage city growth in the future. Green space is responsible for many city functions, such as cooling and water retention, as well as the maintenance of local ecosystems. Retention of green space also contributes to increased climate resilience, as green space can reduce the risk of floods and landslides. The review of the Official Community Plan in Prince George should prioritize the retention of green space to reflect the values of its citizens, to retain the ecosystem services provided, and to create climate resilience in the city.

Introduction

Green space is a valuable asset to municipalities, not only because it is enjoyed by people who live nearby. Prince George's green space increases property values, lowers building maintenance costs, reduces the risks and damages from flooding, prevents landslides, cleans water, reduces the risk of wildfires, lowers summer temperatures, and more. All of these services provided by green space saves the Prince George tax-payer dollars. This report briefly outlines some of the many areas that the City of Prince George can save funds and even generate revenue. The Pembina Institute of Canada estimated in their report on boreal forests that the ecosystem services provided, not including resource extraction, was valued at \$93.2 billion in 2002 (Anielski & Wilson, 2005). This is actually greater than the value of natural resources extracted which for 2002 was valued at \$37.8 billion (WWF, 2020). It is important for the City of Prince George to consider the services provided by green space in future land use planning.

Green Space Revenue Potential

The preservation of green space within Prince George will generate revenue for the city. Green spaces are much less expensive to maintain than established parks or other public spaces within the city, property values have been shown to increase with proximity to green space, generating tax revenue through property tax. Further, maintaining green space is important for making Prince George an attractive city as population moves north.

Green spaces cost less than parks, with more benefits to humans and ecosystems. In manicured parks, maintenance is between 80 to 90 percent of the total cost (Tempesta, 2014). This cost is greatly reduced in green spaces, which are left more "natural" and require minimal upkeep. Green spaces also have more benefits than traditional parks, as is discussed in the following sections of this document.

Property values increase with proximity to green space. Studies have been done that show a direct correlation between greenspace access and property value, showing "an average increase in housing prices of around 0.1 % with each 10-metre decrease in distance" (Hoover et al., 2020). Of course, this statistic is highly subject to the values that the community holds, and the increase in property value is probably more significant in a city such as Prince George. It has also been found that with an increase in green space as small as 1%, housing prices within approximately 100 metres will increase by 0.1 - 0.2% (Conway et al., 2008). This relationship has various causes, including access to trails, ecosystem services, and scenery (Pawel, 2015). In fact, in some instances, the view of green space and proximity to green space had the same property value effects, even when the properties with scenery did not have good access to green space (Pawel, 2015). Moreover, population density has more effect on the value of green

space, with more dense neighbourhoods valuing green space three times as much as people in low density areas (Pawel, 2015). This well-documented phenomenon of increased property value with proximity to green space can make the city money through property taxes and ensuring that green spaces are included in new developments in Prince George will create higher-value neighbourhoods.

This group conducted a survey based in Prince George pertaining to property values and green space values in the community. The survey was shared online with local groups and was completely anonymous. 100% of over 100 participants indicated that living near green space adds value to the area they live in. 95% of participants indicated that green space would be an important factor if they were to move (figure 1), and 78% of participants indicated that they would pay more for a property with easy access to green space, both renting and buying (figure 2). This shows that the citizens of Prince George value green space in their lives. Survey participants were also given the opportunity to add comments (below) and identified the value of green space in their lives.

“Conserving green space that is easily accessible to city residents is critically important for the well-being of the city’s residents and the liveability of the city.”

“Urban green space and urban forests are some of the best assets that PG has to offer their residents, and protection of them should definitely be prioritized in the upcoming OCP review”

“Being able to be lost in the middle of a wild forest within a 5 minute drive from my home is a huge reason why I am staying in Prince George despite having better job prospects elsewhere and increasing rents/housing costs making the housing cost trade off less and less present.”

“It is essential that we preserve what we have rather than continuing to develop. Green space must be accessible to people with disabilities, seniors, people who don’t drive, children and all other members of our community. If it’s accessible to people with disabilities it is accessible to everyone.”

“The green spaces in Prince George make it unique. Other cities need to plan for these. It is now time for us to plan to keep these.”

“[Green space is a] hugely important factor in why we love living in Prince George.”

“Green space is a priority for us in choice of community and choice of property/housing.”

If you were to move somewhere else in the future, would you consider green spaces as an important factor when deciding where you will live next?

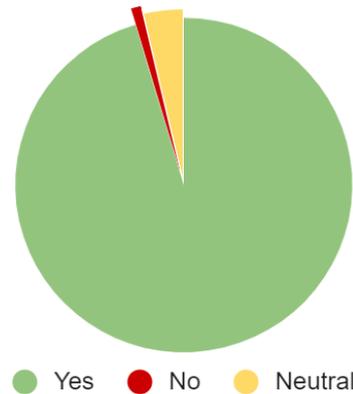


Figure 1: Survey participants were asked “If you were to move somewhere else in the future, would you consider green spaces as an important factor when deciding where you will live next?”

Would you be willing to pay more for property with access to green space?

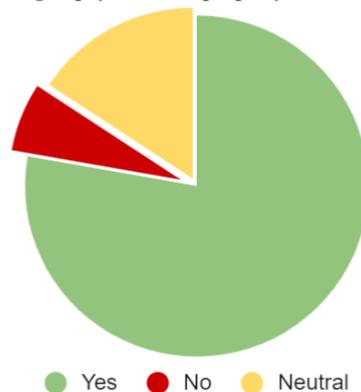


Figure 2: Survey participants were asked “If you were to move somewhere in the future, would you be willing to pay more for property with access to greenspace (whether renting or buying)?”

Green space has been shown to increase property values if it is preserved in neighbourhoods. It is also evident that green space is valued by the people of Prince George. Green space was identified by many as a primary reason for living in Prince George and can serve as a draw for people in the future. Prioritizing the preservation of green space in the review of the Official Community Plan will create higher-value neighbourhoods in the city and generate revenue for the city through increased housing costs.

Finally, green space will attract people to Prince George. Young people in Canada are more concerned with green space in cities than youth in other countries (Boulianne and Ohme, 2022), and retaining green space in Prince George will make youth stay in the city. Moreover, through our survey we identified that the easy access to green space in Prince George is the reason many people moved to and remain in the

city. Ensuring the retention of green space in the Official Community Plan will help make Prince George an attractive option as the population moves north.

Maintaining Green Space

Maintaining green space within an urban centre will save the City of Prince George from having to spend extra money on air conditioning, health care, agriculture, and infrastructure repairs. This section will discuss the monetary savings possible if all the city does is simply maintain the existing greenspace they already have.

Heat Island Effect

The heat island effect is a phenomenon that occurs in urban areas that have limited natural features such as forests or water bodies. Buildings are paved areas that absorb and then re-emit solar radiation thus raising the temperatures in urban areas higher than they would be in areas with water bodies and forests (Environmental Protection Agency, 2022). Solar radiation that falls on natural features is used to vaporize water, evaporation for water bodies, and transpiration for vegetation (Green Ribbon, 2014). Therefore, the solar radiation in these areas is used and not re-emitted as it is when it encounters man-made structures. Figure 3 shows the various contributors to the heat island effect.

● How the Heat Island Phenomenon occurs

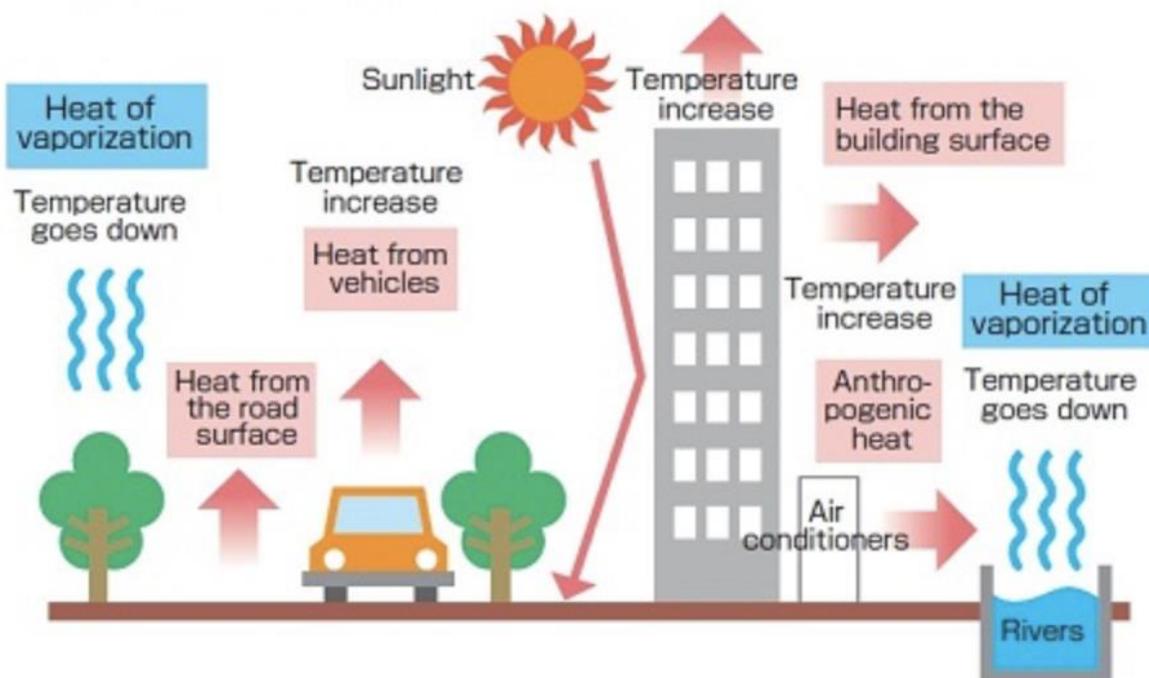


Figure 3: A visual outline of the heat island effect (Green Ribbon, 2014)

<http://www.gardinergreenribbon.com/heat-island-effect/>

This effect can increase urban temperatures 1-12°C higher than surrounding areas (Green Ribbon, 2014). This increase in temperature directly translates to higher electricity costs through the increased use of air conditioners. Planting or maintaining mature trees around buildings can reduce the need for air conditioners by 25-40% annually (Heidt & Neef, 2008). For the City of Prince George, this results in savings for residents but also savings on energy bills for the City’s public buildings.

Aside from building cost, the heat island puts added pressure on health care systems. Extreme heat is a health risk, especially to young children, people with chronic illnesses, outdoor workers, Indigenous Canadians, the marginally housed or homeless, and socially isolated seniors (Government of Canada, 2020). A study conducted in Canada found that the mortality rate associated with heat increases 4% to 7% with a temperature rise of 2°C to 3°C. While the City of Prince George is not directly responsible for the expenses of public health care, the cost of human life is a high one to pay. Figure 4 shows some of the many factors attributing to a personal risk of heat related illness.



Figure 4: Risk factors that can impact vulnerability to heat-related illnesses (Government of Canada, 2020)

Biodiversity

Biodiversity refers to the maintenance of a variation of species found in one location. High biodiversity means that many different species of flora and fauna can be found within the same area. Maintaining biodiversity is important for maintaining the health and viability of ecosystems but even further it is

essential for human life and productivity. Biodiversity is essential for food production, creation of medicines, pest control, access to clean water and prevention of disease (World Health Organization, 2015).

The pest control aspect alone is estimated to save \$21.84/hectare green space maintained, as this service would have to be replaced by chemical pesticides and/or genetic engineering of crops (Anielski & Wilson, 2005). Similarly, green space maintains the population of pollinators which are essential for agriculture and the continuation of existing ecosystems. Artificial pollination is already required in parts of the world, and it is expensive and time consuming. Simply put, biodiversity loss costs money. North America has lost 33% of its animal population in the last 45 years and some of the contributing figures can be seen in figure (WWF, 2020).

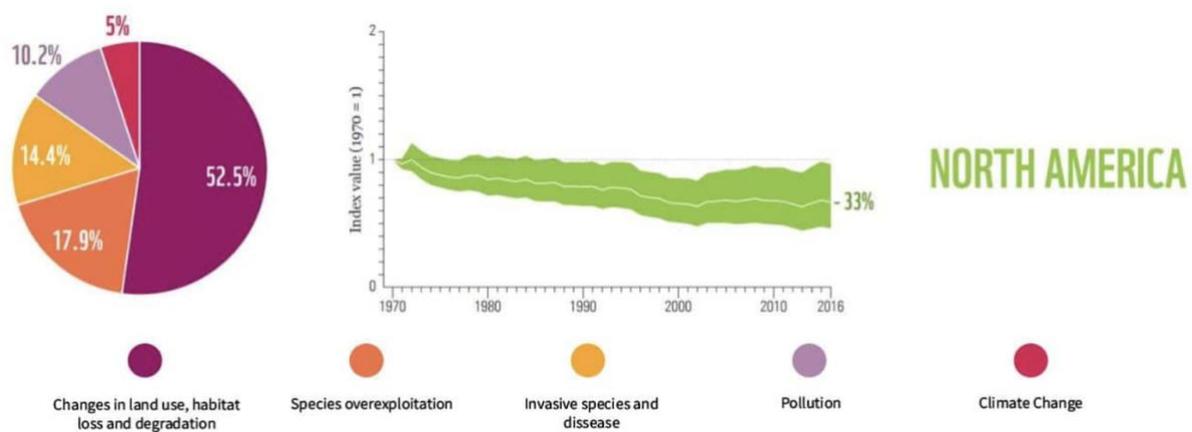


Figure 5: biodiversity loss in North America (WWF, 2020)

Ecosystem Services

Water cleaning, run off control, pest control, pollination, temperature reduction and carbon sequestration are all ecosystem services that are currently being provided to Prince George by green space in and around the city. Maintaining these assets is essential for the health and vitality of Prince George’s future. Losing these services will be costly to the city as they will have to substitute more and more man-made infrastructure. Figure 6 below has been included as an inspirational image to show how urban areas can

co-exist with the natural environment and continue to benefit from the services it provides.



Figure 6: Example of beneficial green infrastructure within an urban environment (Biodiversity Information System for Europe, 2021)

Prevention and Mitigation of Natural Disasters

Climate change increases the possibility of natural disaster occurrence and with a higher intensity (USGS, 2022). Some of these impacts include the increase of extreme heat, droughts, wildfires, and floods. Green spaces have been shown to protect against these impacts, for which two main ones will be discussed: floods and landslides. In addition, forest management will be discussed. The costs associated with these disasters are large and can be saved by protecting these spaces. The Insurance Bureau of Canada commented that in 2020, \$2.4 billion was paid for insurance damage from these severe weather events, which historically has accounted for an average of \$600 million (BIV Staff, 2021). Similarly, in November 2021, Emergency Management BC gave an estimate of \$4 billion in response to floods and landslides across British Columbia, before local government work even began (Mitham, 2022). Figure 7 shows the hazards associated with the district in which Prince George is located.

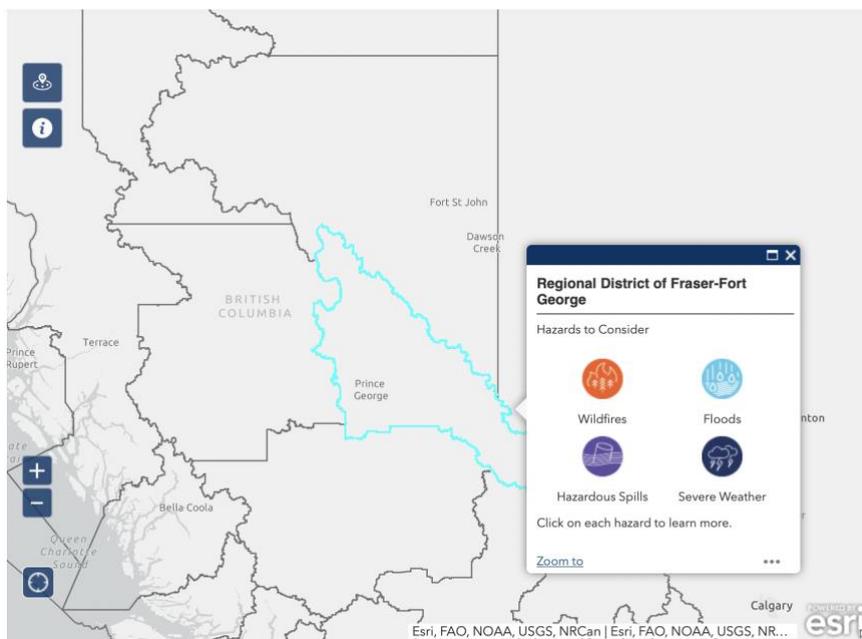


Figure 7: B.C. Hazard Map, 2022

Floods

It is projected that British Columbia will have an increase of floods, which is one of the most damaging and costly impacts (Gifford et al, 2022). Flood damages have been increasing, making November 2021 the costliest by \$450M in British Columbia’s history (Labbé, 2021). Green spaces provide protection from flooding due to their ability to temporarily store stormwater and reduce run-off that would otherwise go straight into sewers, overwhelming the storm drain system (M.K., & EcoHealth Ontario, 2021) (NSSL, 2022). Figure 8 shows how the infiltration of natural areas is reduced by up to 45% when the ground area is covered by more pavement than natural ground cover.

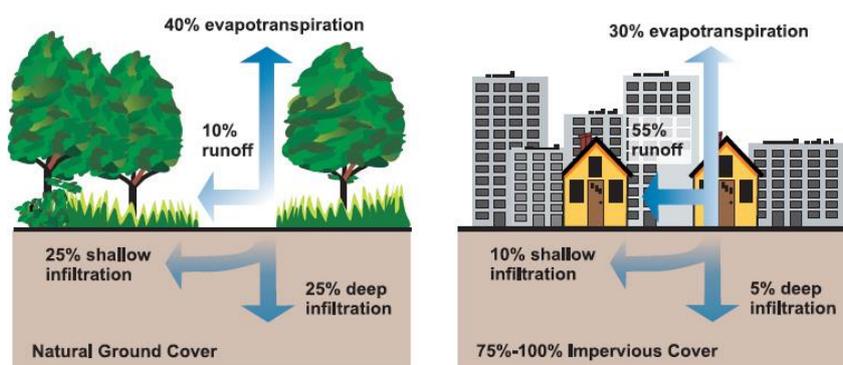


Figure 8: O'Brien, 2020

Landslides

There are four main reasons that trigger the occurrence of a landslide. These are seismic activity, heavy rainfall (groundwater flow), human activities, and deforestation (Babu, 2019). This can be greatly

reduced with vegetation, which decreases surface runoff and increases soil binding capacity. The roots from trees and other plants create a binding effect, which stops soil from moving, thus reducing erosion. Reducing the probability of landslides by implementing urban forestry has been found to be a cost-effective measure. However, the opposite is what creates a problem. By removing forest areas, the soil is more prone to erosion and increases the probability of landslides, which can result in serious property damage and in some cases, death. Figure 9 shows the positive effects that vegetation has on erosion.

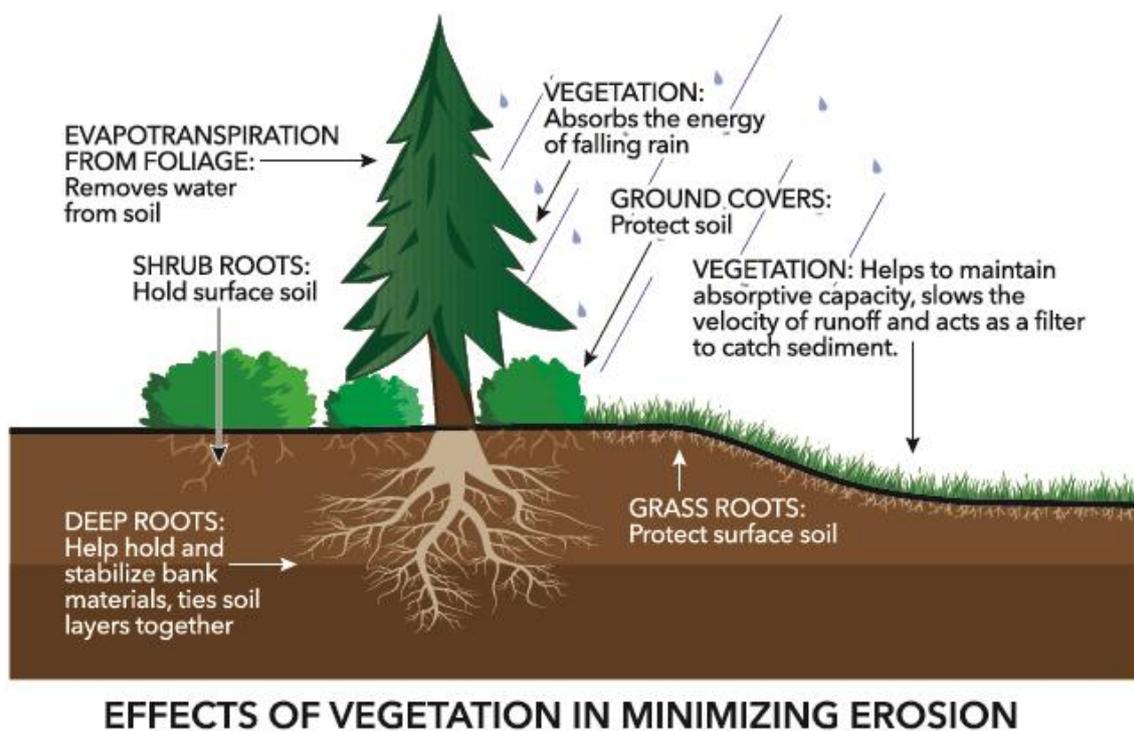


Figure 9: Washington State University, n.d.

Fires - Forest Biodiversity

Forest biodiversity is an important aspect of forest resilience which protects them from fires and diseases. Due to the increasing rate of natural disasters occurrence from climate change, these forests are not adapting fast enough. It is important to learn how to manage these areas to further protect the people living near them as they can also act as buffer zones. As stated by the government of New South Wales, “Open spaces and fire-resistant trees and shrubs are important landscape design elements that can help protect buildings and urban areas from fires” (NSW Gov, 2022). Similarly, the Climate Atlas of Canada mentions the adaptation to wildfire increase can be done by using open spaces and green areas as fire breaks (Climate Atlas of Canada, n.d.). In addition, the opposite is true, logging or removing trees is ineffective against fire prevention. This is because the remnants, such as stumps and branches, are a very flammable fuel, that with a lack of forest canopy, fuels the fire (Arguedas Ortiz, 2020). The key is managing these spaces in order to create a more fire-resistant green space by implementing strategies

such as ensuring there is a mix of native flora in the forests and removing small conifers and hazard trees (City of North Vancouver, 2022). Projects that aim to create a fire resilient ecosystem have been seen around Canada such as in North Vancouver and Toronto, all aiming to manage their green spaces thus protecting their surrounding communities.

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How green spaces provide climate change mitigation: <https://thenarwhal.ca/bc-floods-clearcut-logging/>

The Aesthetic Value of Greenspace

Drew Gilchrist, Colton Savage, Megan O’Bee, Naokah Bailes, Heather Romeyn

Executive Summary

The following report outlines five case studies that support the aesthetic value of green space in urban development. In general, aesthetics relates to the visual appeal of an object, place, or event. In the context of city planning, aesthetics may be the design, topography, accessibility, cleanliness, and even safety of a greenspace.

Recommendations

1. City planning should recognize the beneficial cognitive and mental health effects of greenspace and plan for biodiverse, species-rich, and varied greenery experiences.
2. City planning in Prince George can create tourism opportunities in naturally appealing greenspaces, promoting the economic growth of the city.
3. Interventions to Preserve Natural Aesthetics at Cottonwood Park:
 - a. Educational posters in Cottonwood on negative impacts of feeding wildlife.
 - b. Seek environmental consultation for recommendations on wildlife feeding at Cottonwood Island Park

Psychology of Natural Aesthetics and Greenspace

<i>Preference for Natural Greenspace over Human-Designed Spaces</i>	<i>Mental Health Benefits of Natural Greenspace</i>	<i>Cognitive Benefits of Natural Greenspace</i>
<p>When experiencing nature, individuals prefer more pristine environments (Ibarra et al, 2017; Karden et al, 2015). Overall, people prefer natural landscapes to human-designed landscapes. A case study analysis of Crooked River Provincial Park (outside of Prince George) shows that individuals would likely prefer the aesthetics of the more-natural park space than a developed urban greenspace.</p>	<p>Greenspace positively impacts mental health, and interventions aimed at improving psychological functioning through the use of green spaces are particularly successful in treating mental illness. The practice of ecotherapy can promote physical activity outdoors as a treatment for nature deficit in adolescents (Louv, 2005; Epstein et al., 2006; Davis & Atkins, 2004; Wilson et al, 2008; Allen, 2007).</p>	<p>Exposure to biodiverse, aesthetically pleasing greenspace is beneficial to the cognition of adolescents and adults (Gunnarsson et al., 2016; Joye et al., 2018; Maes et al., 2021). On average, adolescent students with high daily exposure to woodland greenspaces scored over 6% higher on an executive functioning measure than students with low daily exposure to woodland (Maes et al., 2021)</p>

Economic Benefit of Natural Aesthetics

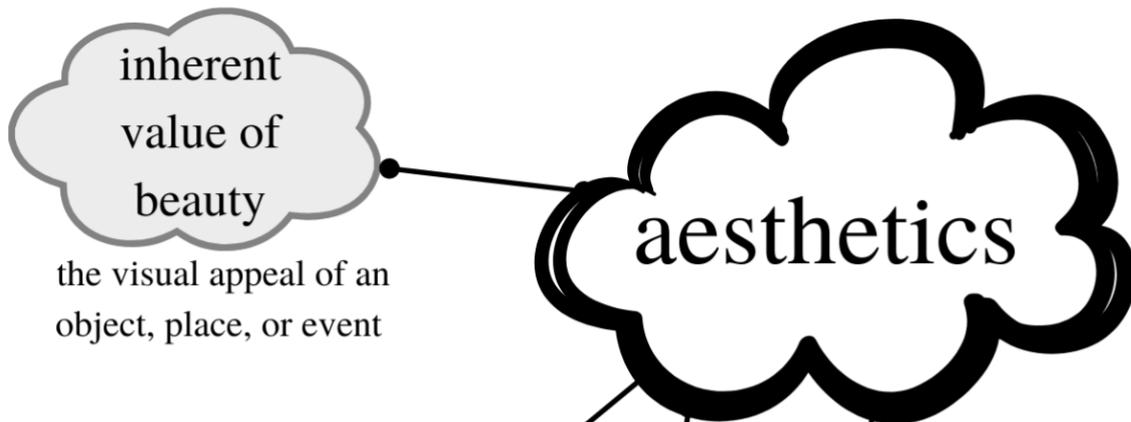
Case Study: Polar Bear Tourism in Churchill Manitoba

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- Unique greenspaces are profitable through tourism (Flanagan, 2011; D’Souza, 2021; Government of Manitoba, 2017). Through prioritisation of greenspace aesthetics, local natural attractions can significantly contribute to the economic wellbeing of a city.
-

Preserving Natural Aesthetic in Prince George

Negative Impacts of Feeding Wildlife at Cottonwood Park

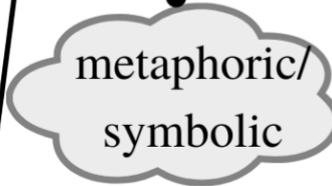
- The preservation of the natural aesthetics at Cottonwood Park in Prince George is an integral case study in the local context of greenspace aesthetics. Artificial wildlife feeding at Cottonwood Park has resulted in over 200 ducks staying in Prince George over the winter, reliant on scatterings of bird seed, bread, nuts, and pet food. Wildlife feeding at Cottonwood Park stresses local ecology (Dunkley & Cattet, 2003; BC SPCA, 2022) and decreases the aesthetic value of the greenspace (i.e., discarded food waste creating unsightly feeding areas). Wildlife feeding at Cottonwood Park is also in violation of the City of Prince George Property Maintenance Bylaw No. 8425, 2012.



the visual appeal of an object, place, or event



how something looks and feels to the person perceiving it can be different compared to another individual



spiritual and metaphysical connection to beauty; aesthetic appeal goes beyond just the visual aspects

Greenspace and Aesthetic

- natural versus human-designed
- subjective emotional experience
- preservation of physical aesthetic

the design, topography, accessibility, cleanliness, and safety of a greenspace.

Psychology of Natural Aesthetics and Greenspace

Preference for Natural Greenspace over Human-Designed Spaces

In general, people tend to prefer natural landscapes over human-designed architecture. According to Karden and colleagues (2015), the cognitive functioning required to perceive human-designed spaces is different to that required for the perception of natural greenspace. When experiencing pristine nature, individuals use bottom-up processing based on the sensations from their physical body, whereas individuals utilise top-down processing in human-designed spaces, requiring a higher cognitive demand (Ibarra et al. 2017).

We can apply the concept of natural preference to past, present and future greenspace projects. Crooked River Provincial Park is a slightly modified forested area for camping, just 40 minutes outside Prince George. BC Parks cannot be modified or maintained unless granted special permissions to modify this environment; a doctrine that keeps the aesthetics of the space as natural as possible. According to Ibarra and colleagues (2017), naturally designed spaces would be easier to process for the brain and people would likely be more drawn to the aesthetics of Crooked River compared to a human-designed urban environment.

Mental Health Benefits of Natural Greenspace

A new form of psychotherapy acknowledges that interactions with greenspace can have positive effects on individuals' mental health; *Ecotherapy* promotes mental health within the context of the natural environment and through the use of green spaces (Davis & Atkins, 2004). Wilson, Ross, Lafferty, and Jones (2008) defined ecotherapy as the implementation of interventions aimed at improving psychological functioning with green spaces. Richard Louv (2005) introduced the concept of nature deficit disorder, which describes children in today's world who are raised with little access to the natural world and the resulting negative effect on their cognitive, emotional, and physical well-being. When youth have less access to sedentary activities, such as television and computers, they choose other leisure activities instead, such as going outside into their neighbourhoods and parks, increasing their physical

activity. According to a case study on a 17-year-old participant, Sam, ecotherapy interventions could counteract the effects of nature deficit disorder in adolescents (Sackett, 2010). Additionally, green exercise, or exercise outside, has proven to have substantial positive effects on mental health (Allen, 2007; Mind, 2007a). More research is needed to understand which ecotherapy techniques counsellors are using in their everyday practice that may be applied more widely to benefit society. The practice of ecotherapy can bring awareness to the use of physical activity outdoors as a treatment for nature deficit disorder.

Cognitive Benefits of Natural Greenspace

Greenspaces support adolescent cognitive development, especially woodland greenspaces. In a study on 3,568 school-aged adolescents in London, Maes and colleagues (2021) measured how students' proximity to greenspace impacted their cognitive function. Cognitive function was measured with a computerised executive functioning (EF) test, whereas a higher EF score correlated with better cognitive performance. On average, adolescent students with high daily exposure to woodland greenspaces scored over 6% higher on the EF measure than students with low daily exposure to woodland (Maes et al., 2021).

There is a growing body of research on the beneficial effect of greenspace on individuals' cognitive abilities. This effect could be due, in part, to the Attention Restoration Theory (ART). ART is a widely cited theoretical framework that asserts experiences in nature can restore an individual's cognitive capacity for sustained attention (Joye et al., 2018). Sustained attention, or directed attention, is “the effortful process to focus or concentrate on objects or events, while at the same time blocking out distracting stimulation,” (p. 2, Joye et al., 2018). The central assumption of ART is that contact with nature can mitigate the stress of directed attention, allowing for an opportunity for cognitive abilities to restore.

Indeed, greenspaces are linked to cognitive benefits in adults and adolescents, alike (Gunnarsson et al., 2016; Joye et al., 2018). Additional research on the cognitive benefits of nature exposure discovered that people's perception of a positive greenspace is tied to the space's biodiversity (Gunnarsson et al., 2016). That is, exposure to biodiverse urban greenspace tends to have a more positive cognitive effect than exposure to less diverse green space. City planning should recognize the beneficial cognitive effects of greenspace and plan for biodiverse, species-rich, and varied greenery experiences.

Psychology of Natural Aesthetics and Greenspace in Prince George

In Prince George, we have access to greenspace that serves as habitat for diverse species. The biodiversity of such spaces is inherently linked to an individual's perception of the space, so we must be mindful of the preference for naturally designed spaces in Prince George with high biodiversity. Evidence from ecotherapy research highlights the potential for natural aesthetics to benefit mental health outcomes of citizens; Research from the Attention Restoration Theory would support the notion that exposure to such diverse habitats would support the cognitive restoration of individuals in Prince George. Urban greenspaces are plentiful in Prince George (i.e., Crooked River, Cottonwood Park); devotion to keeping these spaces clean and appealing can benefit the cognitive development of adolescents and support attention restoration in adults.

Economic Benefit of Natural Aesthetics

Case Study: Polar Bear Tourism in Churchill Manitoba

The Polar Bear Tourism case study in Churchill reflects the importance of aesthetics for tourists in a northern town in Canada. Churchill Manitoba is a small northern community located on the edge of the Hudson Bay in northern Manitoba with a fluctuating population of approximately nine hundred people (D'Souza, 2021). Churchill's economy mainly consists of tourism, ecotourism, port, and arctic research (Government of Manitoba, 2017). These tourism attractions include: "migratory bird spotting, beluga whale watching, Aurora Borealis gazing, and polar bear viewing" (D'Souza, 2021). The season of polar

bear viewing is short however Churchill still welcomes 12,000 tourists with a profit of \$7.2 million to the local community (D'Souza, 2021).

Churchill's Natural Aesthetic

Churchill is the main hub for tourists to enjoy restaurants, bars, hotels, and events therefore the aesthetic of Churchill has to accommodate the tourists to make their stay comfortable. Churchill heavily relies on the income that Polar Bear viewing brings in for the local economy. When the town of Churchill planned to create a landfill, many were concerned for the Polar Bears and Aesthetic for the tourists. The town of Churchill relies on their landfill to manage waste, when it was time to find a new location for a landfill, the location left community members concerned for the polar bears and tourism. The location of the landfill was planned to be put in a location where it affects the aesthetic of the community and can create an eye sore for tourists in the future. Flanagan explains how “The Town of Churchill's plan to create a landfill east of the town has run into objections from a group of local residents and the Churchill Chamber of Commerce” (Flanagan, 2011). A landfill on the planned site would be highly visible to tourists, whereas the alternative sites that citizens are recommending are further from the shore which lowers the chance of diverting polar bears migratory path and less likely to be seen by tourists (Flanagan, 2011). Aesthetics play an important role in this case study because the unsightly landfill could cause a downfall in the local tourism economy. Since Churchill relies on the polar bear viewing economy, it is best to keep the aesthetic for the benefit of tourists and bears.

Economic Benefit of Natural Aesthetics in Prince George

Prince George is similar to Churchill, Manitoba, boasting scenic northern mountains and wildlife. The economic success of natural aesthetics in Churchill can provide inspiration; Prince George should consider the aesthetic of places that draw in tourists. As a hub for many small communities throughout northern British Columbia, Prince George should be visually appealing for those coming through. Prince George should be prioritising the importance of caring for places that are known for wildlife viewing. Churchill has prioritised the aesthetic of their town to create a more visually appealing place for future

tourists, overall benefiting the economy. City planning in Prince George can create similar tourism opportunities in a naturally appealing city.

Preserving Natural Aesthetic in Prince George

Negative Impacts of Feeding Wildlife at Cottonwood Park

Cottonwood Island Park is a popular municipal park in the City of Prince George. The park is nestled close to the city centre, providing plentiful walking trails and several attractions including wood carvings on trees and wildlife viewing. As previously discussed, aesthetics is an important part of greenspace. It has been found that natural and pristine greenspaces are generally preferred by the public (Karden et al, 2015). Considering the importance of Cottonwood Island Park to the citizens of Prince George as well as the city's stakeholders, it is important to maintain the natural aesthetics of this greenspace in Prince George.

Cottonwood Island Park has been subject to an alarming rate of artificial wildlife feeding, predominantly towards the avian species in the park. It is common to walk through the trails and see scatterings of bird seed, bread, nuts, and even cat food. These products disrupt the natural and pristine aesthetic of the park and are likely to have a negative effect on the animals in this ecosystem (Dunkley & Cattet, 2003). In addition to the ecological and aesthetic issues associated with feeding wildlife, much of the feeding at Cottonwood Island Park goes against City of Prince George Property Maintenance Bylaw No. 8425, 2012 regarding wildlife attractants. Finally, in extreme circumstances, the artificial feeding could lead to a mass die off due to starvation or high pathogenic avian flu. Dead carcasses scattered along the river shore of Cottonwood Island Park would significantly affect the aesthetic of the park.

Duck Populations in Cottonwood Island Park

It has been documented that since at least 2018, two volunteers have been feeding the ducks at Cottonwood Island Park through the winter (Hinzmann, C., 2019). In 2020, the men claimed to be feeding up to 200 ducks. The men who feed the ducks claim to be members of Ducks Unlimited Canada

(DUC), a wildlife conservation organisation dedicated to preserving wetlands (Ducks Unlimited Canada, 2022).

There are many issues associated with feeding wildlife including increased hybridization, delayed migration, overcrowding, and increased risk of spreading disease (NYSDEC, 2014). Avian flu has been a growing risk in British Columbia and can have adverse effects on domestic and wild avian populations (BC SPCA, 2022). The artificial feeding of the ducks at Cottonwood Island Park causes unnatural congregations which increases the risk of spreading avian flu (Government of BC, 2022). In response to the growing concern in regard to avian flu, the DUC released a statement discouraging the feeding of waterfowl (Ducks Unlimited Canada, 2022). In addition to these negative impacts, the regular feeding of the duck population at Cottonwood Island Park can lead to generational impacts, such as limited foraging behaviours and disrupted migration cycles (Dunkley & Cattet, 2003). Lastly, the men feeding the duck populations will not be able to do so forever. If the artificial feeding was to stop abruptly, there could be a mass die off due to starvation.

Recommendations

Educational posters outlining the negative impacts of feeding wildlife, including the relevant Bylaws would help increase public awareness on the issue. It would be beneficial to include information on the avian flu, to help the public understand the severity of this high pathogenic avian flu, and its connection to feeding wildlife. Increasing the presence of bylaw officers to further spread awareness on this issue would also benefit the reception of the posters.

Finally, it is highly recommended to seek environmental consultation regarding the duck populations through qualified professionals. The impact of regular artificial feeding of wildlife may impact the entire ecosystem, and any changes to this regimen should be taken with great care.

Wildlife feeding at Cottonwood Park is only one problem impacting the natural aesthetics of Prince George. However, through addressing this issue, city planners and officials have the potential to change citizen's lives. The natural beauty of a space should not be dismissed; the aesthetics of nature are easier to process than human-designed environments (Ibarra et al, 2017), providing opportunities for mental wellness (Louv, 2005; Epstein et al., 2006; Davis & Atkins, 2004; Wilson et al, 2008; Allen, 2007) and cognitive restoration (Gunnarsson et al., 2016; Joye et al., 2018; Maes et al., 2021). Furthermore, greenspaces with high biodiversity and unique natural features can be particularly beneficial to the local economy, as long as the aesthetic of the space is maintained (Flanagan, 2011; D'Souza, 2021; Government of Manitoba, 2017).

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The Values of Nature Report

Mental & Physical Health

**Kiara Mills
Riana Smith
Qourtney Froehlich
Kingori Mwangi**

Executive Summary

A survey was conducted to determine the impact of greenspace on overall mood and physical health, focusing on a time before, during, and after great emotional stress. The emotional stress in question was the onset of Covid-19 travel restrictions. The results showed that participants did find their mood and physical health improved after spending their time in greenspace. In order to get a sense of the importance of greenspace to participants, they were also asked how important they personally found greenspace, and how they would feel losing said greenspace to development. The majority of participants found greenspace to be important and indicated that they would not want to lose greenspace to development. As losing greenspace to development can cause environmental disaster which may create great emotional damage to those affected, the survey also asked who participants believed should be held liable for this damage. Most participants indicated that they believe the government (Municipal, Provincial or Federal), or city planners should be held liable for these emotional damages.

Introduction

Prince George has unique surrounding biodiversity that is able to be incorporated within the urban greenspace environment. It has long been known that greenspace and natural settings can have positive impacts on mental and physical wellbeing (Nutsford, Pearson, and Kingham, 2013). During the COVID-19 pandemic restrictions, these were considered to be high times of stress on a global scale. Stress induces both mental and physical health strain and many, who had access, turned to local sources of urban greenspace to help combat these effects. There was a large upswell with the use of these urban greenspaces during the COVID-19 pandemic (Berdejo-Espinola, Suárez-Castro, Amano, Fielding, Oh & Fuller, 2021).

To better understand how greenspace was used within the City of Prince George, a study was conducted to gather the community's perspective prior to and since the COVID-19 pandemic restrictions. The purpose of this report is to present our methods, findings, and understand how the community of Prince George uses and values its urban greenspace.

Methods

To conduct the short survey, the program Microsoft Teams was utilized. The survey was created with nine questions and participants were to state that they agreed with the terms of the survey, and informed that they would remain anonymous. Their agreement was required to continue with the survey. Questions were as follows:

1. How often did you use greenspace surrounding Prince George prior to travel restrictions of Covid-19?
2. How often did you use greenspace surrounding Prince George during travel restrictions of Covid-19?
3. How often do you use greenspace surrounding Prince George now?
4. If you used surrounding greenspace during the Covid-19 restrictions, did it help improve your mood?
5. If you used surrounding greenspace during the Covid-19 restrictions did it help improve your physical health?
6. How do you like to spend your time in greenspace?

7. How important would you say surrounding greenspace in Prince George is to you?
8. Would you care about the loss of surrounding greenspace in Prince George due to development?
9. Who do you feel should be held liable for emotional damages caused by environmental disaster due to development?

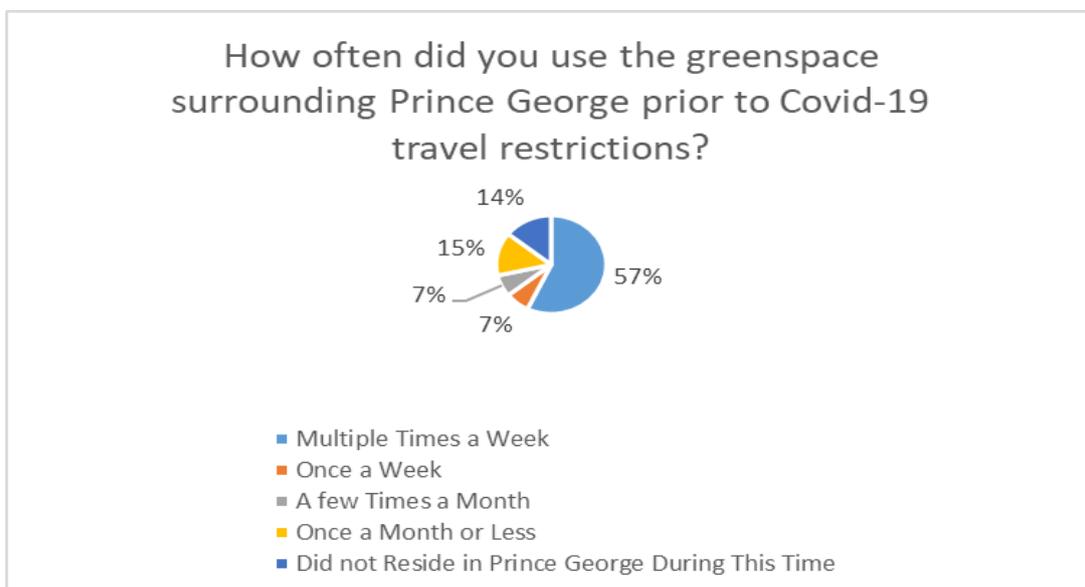
A link and QR code were then created for the survey. The link was distributed to several professors who then distributed it to students at the University of Northern British Columbia (UNBC). The QR code and link were printed on posters and distributed at several greenspace areas around Prince George, British Columbia, including Moore’s Meadow, Ginter’s Field, and Forests for the World. The intent of its distribution was to target those who frequent greenspace. The survey was open to participants starting October 18, 2022, and it was closed November 22, 2022 with 42 total participants. Data from the survey was taken in percentages and expressed with pie charts using the computer program Microsoft Excel.

Results

Results were taken from completed surveys, and pie charts with percentages were created.

Figure 1.

Percent of people who used greenspace in Prince George prior to Covid-19 travel restrictions.



As seen in Figure 1, 57% of participants used greenspace in PG more than once a week prior to the onset of Covid-19 travel restrictions. Seven percent of participants used greenspace once a week, as well as a

few times a month, while 15% used greenspace once a month or less. Fourteen percent of participants did not reside in PG before Covid-19 travel restrictions were placed.

Figure 2.

Percent of participants who used greenspace during Covid-19 travel restrictions.

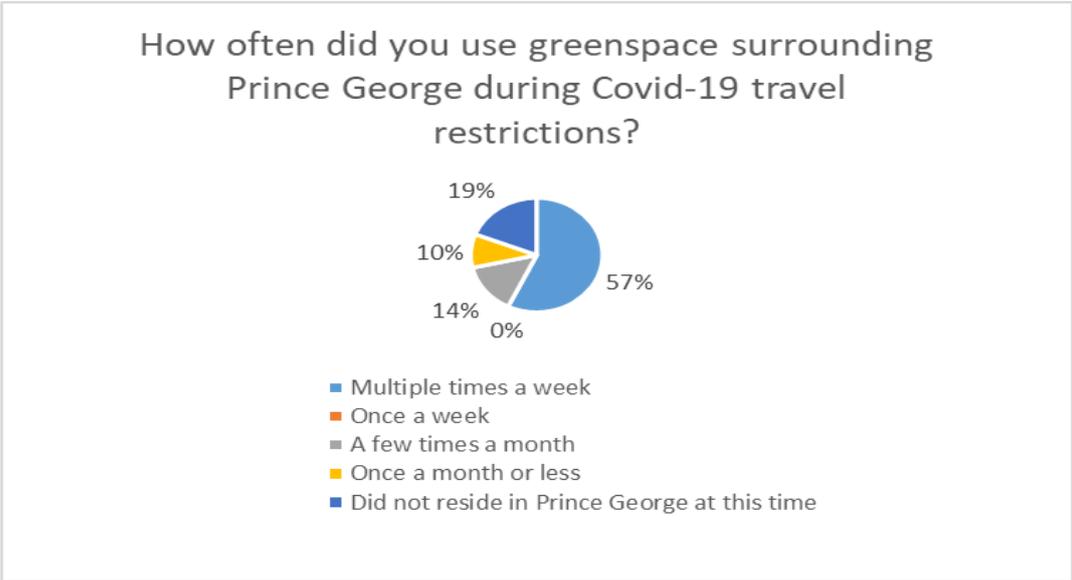
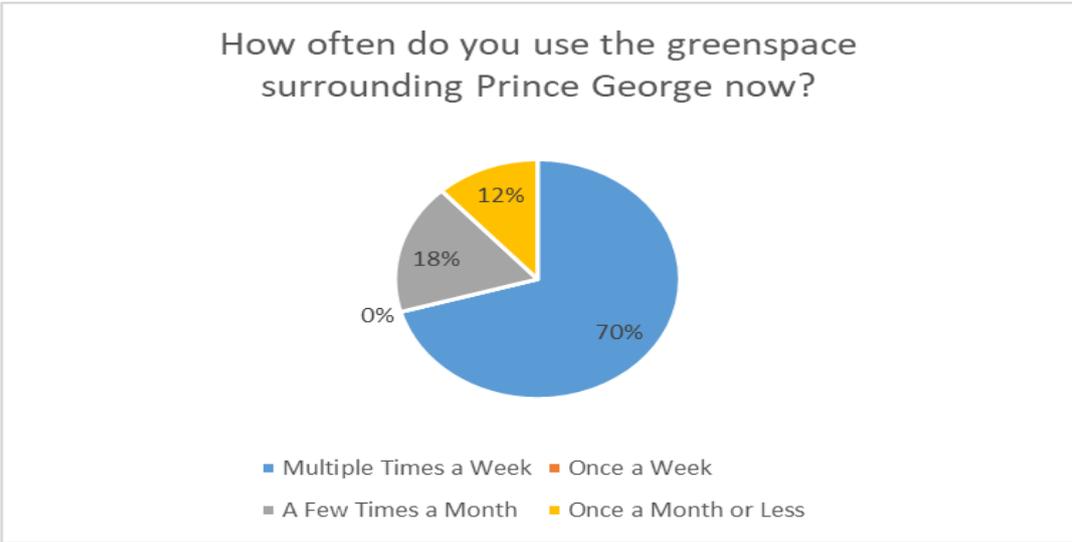


Figure 2 shows the percentage of participants who used greenspace in PG during the Covid-19 travel restrictions. As seen in Figure 2, 57% of participants used greenspace multiple times a week, 19% did not reside in PG at this time, 10% used greenspace once a month or less, and 14% used greenspace a few times a month. No participants used greenspace once a week during this time period.

Figure 3.

Percent of participants who continue to use greenspace after Covid-19 travel restrictions.



As seen in Figure 3, 70% of participants use greenspace multiple times a week, while 12% use greenspace once a month or less, and 18% use greenspace a few times a month. No participants use greenspace once a week.

Figure 4.

Percent of participants who claim their mood improved while using greenspace during Covid-19 travel restrictions.

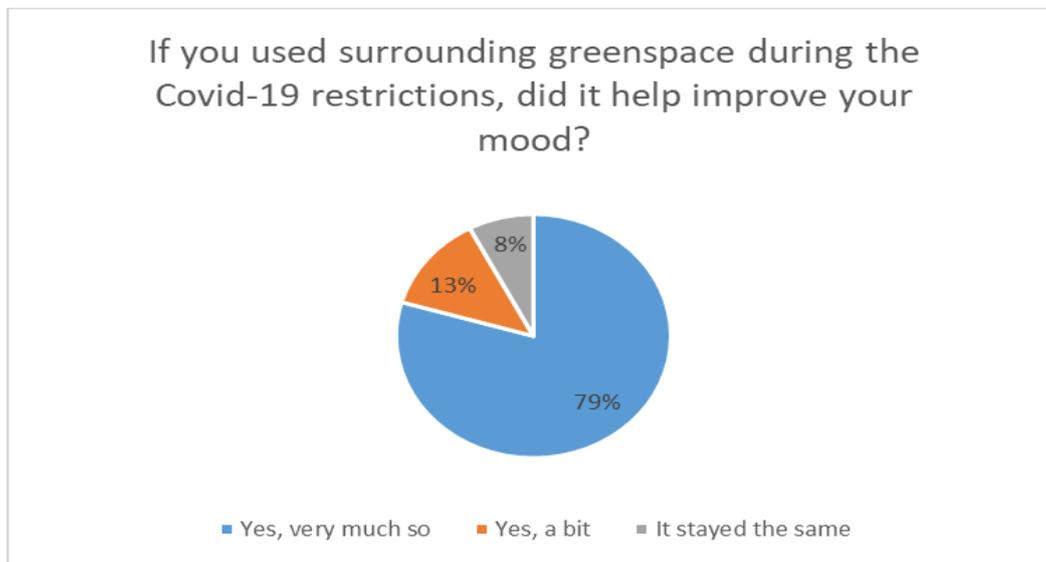


Figure 4 depicts participants' change in mood while using greenspace, with 79% saying their mood improved very much during Covid-19 restrictions. Thirteen percent of participants said their mood was improved only a bit, and 8% say their mood was not impacted.

Figure 5.

Percent of participants who claim their physical health improved while using greenspace during Covid-19 travel restrictions.

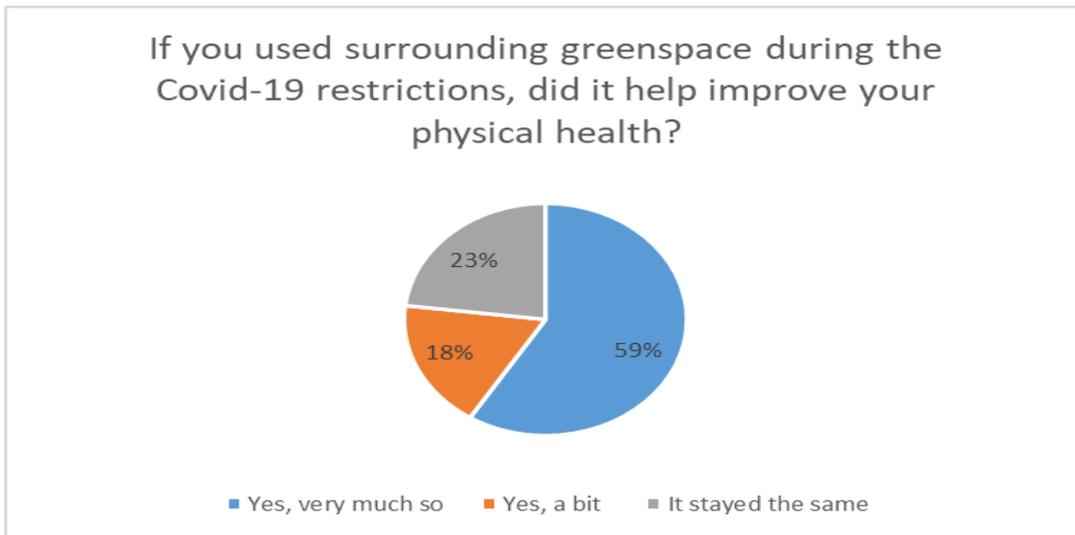
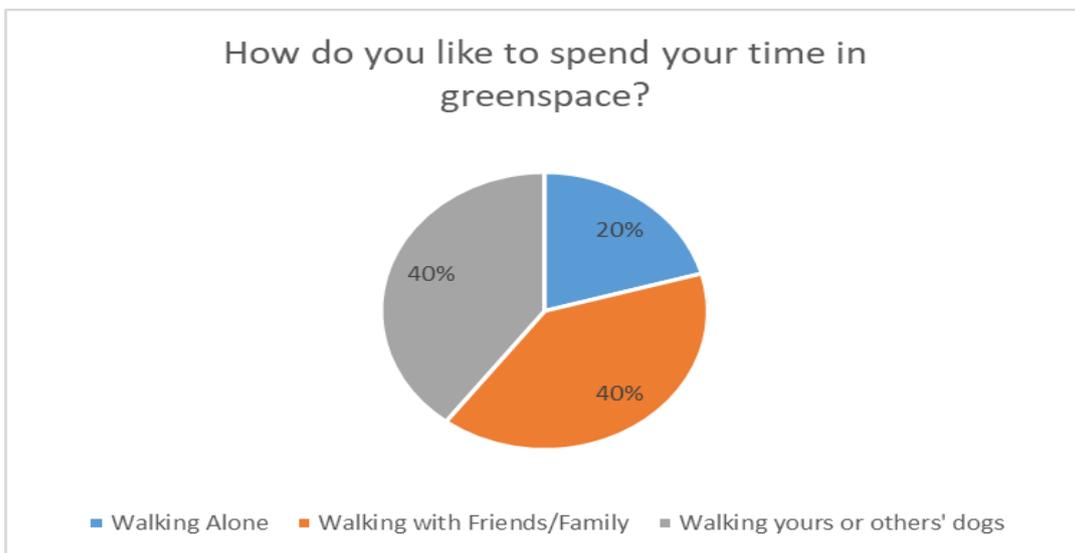


Figure 5 depicts participants’ change in physical health while using greenspace during the Covid-19 travel restrictions. Fifty-nine percent of participants said their physical health had very much improved, 18% said their physical health improved a bit, and 23% said it stayed the same.

Figure 6.

How participants were/are most likely to spend their time in greenspace.



In order to obtain a more accurate representation of how participants spend their time in greenspace, they were allowed to select more than one option in the question depicted in Figure 6. Forty percent of these responses indicated that participants liked to walk with their friends, family, and dogs in greenspace. Only 20% of responses preferred to walk alone.

Figure 7.

The personal importance of greenspace to participants.

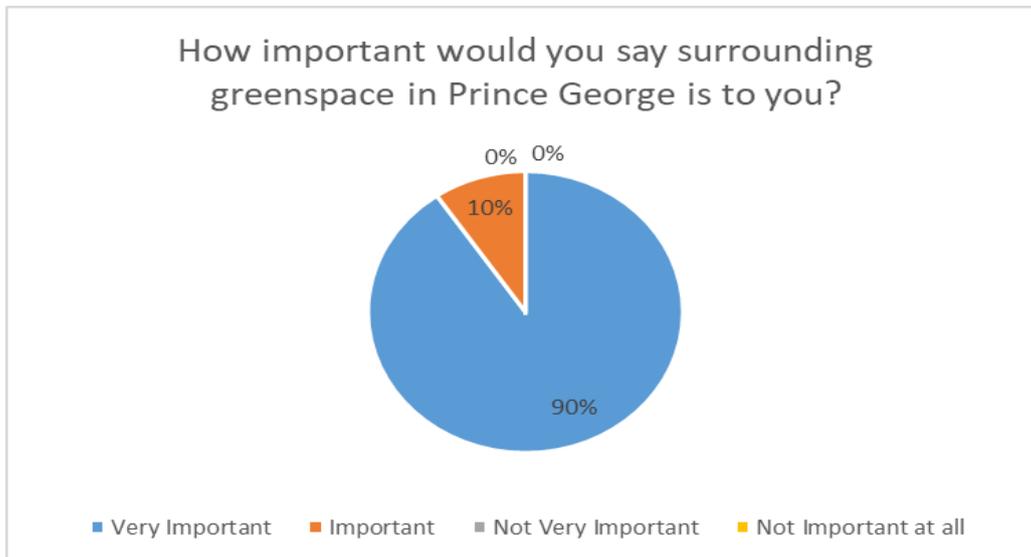


Figure 7 depicts the participants’ personal level of care for greenspace, with 90% of participants stating that greenspace is very important to them and 10% stating that it is just important. No participants believed that greenspace was either not very important or not important at all to them.

Figure 8.

Participants’ personal level of care for the loss of greenspace to development.

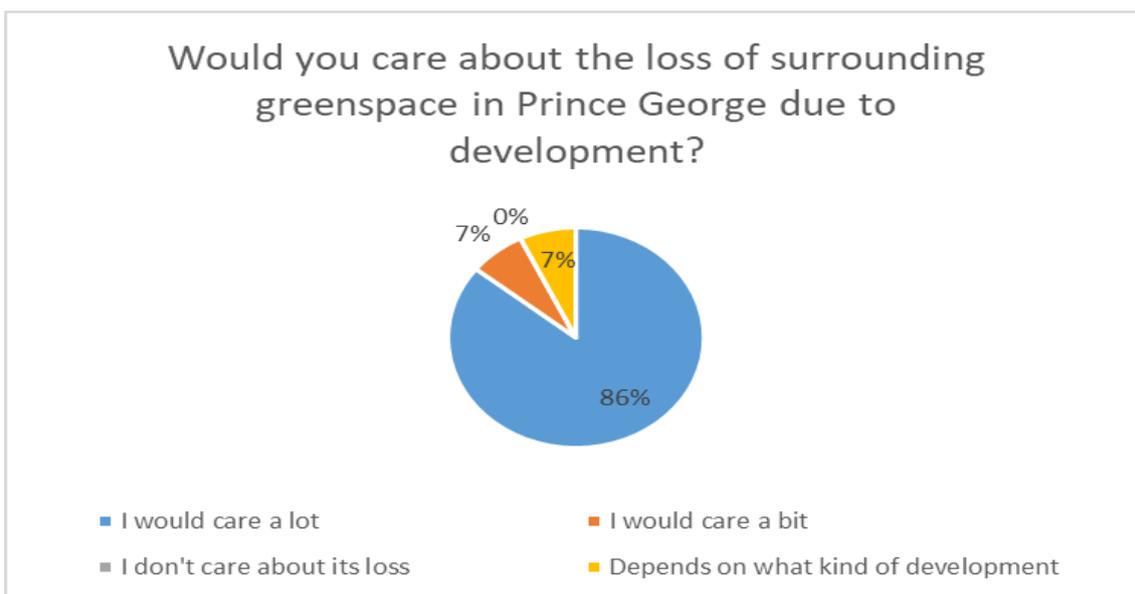
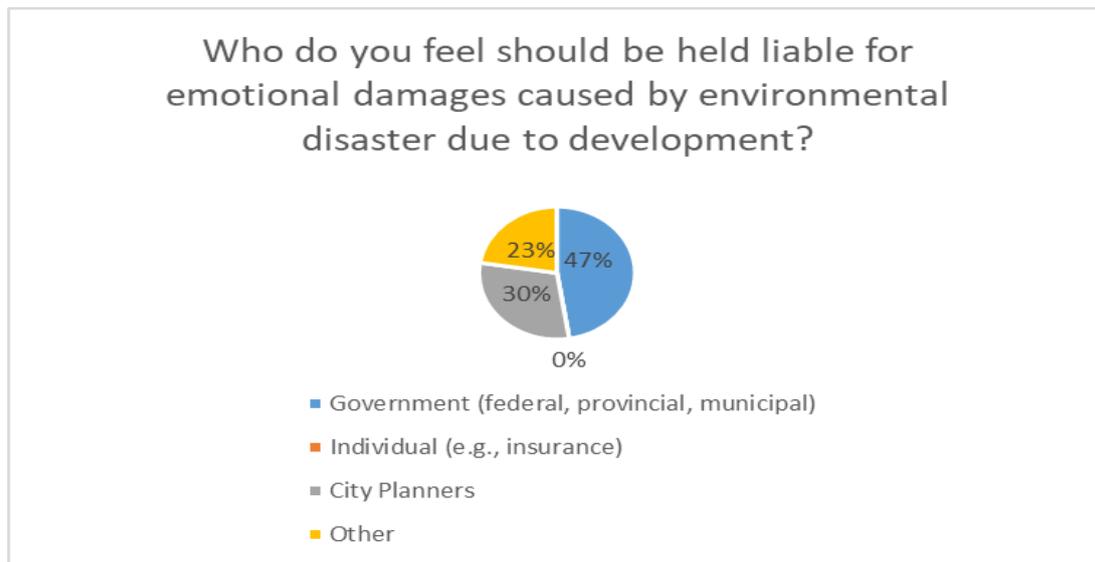


Figure 8 indicates the personal level of care of participants in losing greenspace to urban development. 86% of participants state they would care a lot about this loss, while 7% state that they would care a bit, and that it depends on the type of development to occur. No participants stated that they did not care about the loss of greenspace.

Figure 9.

Who participants believe should be held liable for emotional damages due to environmental disaster, allowed to occur through poor development or planning.



As seen in Figure 9, 47% of participants believe that the federal, provincial or municipal governments should be held liable for emotional damages caused by environmental disasters that have occurred because of urban development. Thirty percent of participants believe that city planners should be held liable. Two participants left this question blank, while 23% of participants responded ‘Other,’ and typed answers into a response box. These answers include: two participants who stated ‘individual (insurance),’ ‘all of us - we allowed by way of apathy,’ ‘landowner/contractor who ignored environmental assessments, building codes/bylaws,’ ‘developers,’ ‘no one,’ ‘the perpetrator, all of the above,’ and ‘it all depends on the circumstances of the development.’

Discussion

As shown in the survey results collected in the report above for ENVS 210, following the health benefits of greenspace in Prince George, residents verify the fact that greenspace is an important part of our city.

With such a broad question that was given depicting of “is greenspace beneficial to our mental and physical health?” The simple answer to that question is yes, a growing body of research surrounding this area of discussion suggests, “greenspace has beneficial effects on mental well-being and reduced anxiety

and depression symptoms (Houlden et al., 2018; Roberts et al., 2019).” Places with more greenspaces have a positive impact on residents improving their mood along with mental well-being. A framework has even been developed proposing that greenspace can reduce harmful exposure (e.g., air pollution and noise), restore capacities (e.g., stress recovery), and encourage health related behaviours (e.g., physical activity and social contacts) (Markevych et al., 2017).

Although the survey conducted related mostly to COVID-19, the evidence can be seen that the residents of Prince George have a connection to the greenspace that is still left. Similarities can be seen between the survey and what the article above has portrayed. **Figure 4** depicts residents' mood while using greenspace during COVID restrictions, which results show that 79% of the greenspace users' moods improved. **Figure 5** depicts if residents' physical health improved with the use of greenspace during COVID restrictions, which results show 59% of residents agreed that their physical health did indeed improve because of the greenspace around them. **Figure 6** also shows evidence that backs up the article's statements of social contacts because it pertains to how one would spend time in greenspace, which the majority either answered with friends/family or dog walking.

Prior To/During Covid 19

Being that the survey reflects greatly upon how Covid 19 and greenspace in Prince George corresponds with mental and physical health, being able to determine benefits in other research is important to consider.

The COVID-19 pandemic brought a new focus and appreciation for outdoor public spaces. Although parks have traditionally served as multipurpose spaces, the pandemic required an even further expansion of these uses and highlighted their role as critical public health infrastructure. Green spaces may be important in either mitigating the negative effects of COVID-19 directly (reducing case counts, speeding recovery) or mitigating indirect effects, such as stress, social isolation, and lack of physical activity. “14 of the 15 studies examining indirect effects revealed that pandemic-related physical and mental health

impacts were indeed less severe among those who reported increased green space access or exposure.” (Eykelbosh A., et al., 2022).

Canadians’ mental health was severely impacted during the start of the pandemic and still is, “research conducted on behalf of Mental Health Research Canada, found that the number of people nationwide reporting high levels of anxiety in April 2020 had quadrupled, and the number of those reporting high levels of depression more than doubled.” (Eykelbosh A., et al., 2022).

Prior to the pandemic, a growing body of research had examined the relationship between green space and health in Canada. Most recently, (Crouse et al., 2022) used the nationwide Canadian Community Health Survey to examine the relationship between mental health indicators and vegetative cover in the neighbourhood. Although the results varied according to demographics (age, sex) and neighbourhood (urban core vs. suburb), there was an overall tendency toward decreased odds of poor self-rated mental health with increasing greenness within 500 m. This positive association between green space and mental health appears to have held true during the pandemic. Several non-academic surveys conducted during the pandemic have reported that Canadians who used urban and rural (provincial and national) parks were doing so because it supported their mental health and social connectivity.

In a national survey published in July 2020, respondents indicated that they were more likely to access parks and informal green spaces if they were closer to home. Prince George is one of those places with greenspace close to homes, which makes the city a valuable asset in helping individuals' health. Without having these greenspace areas many would not be able to have a place in which they may or may not be able to help improve their mental and physical health.

Mental Health and Environmental Disasters/Stressors

The UNBC ENV5 210 Greenspace Survey which was utilized as the primary means of data collection for this report posed the following question to participants: Who do you feel should be held liable for

emotional damages caused by environmental disaster due to development? Seventy-seven percent of the responses stated that government and city planners should be held responsible for the damages that stem from developments they approve. Yet, this is not necessarily the case in Canadian municipalities as research suggests a gap that ultimately leaves the ‘individual’ to deal with majority of the effects that would come about due to environmental disasters, “lack of standards in emergency management legislation, restrictive access to financial assistance and/or compensation and reduced government exposure to civil liability at common law expose private landowners to greater vulnerability to disasters and the liability attached.” (Raikes & McBean, 2016).

With an increased interest in development illustrated by legislators in Prince George, including the current mayor of Prince George, whose campaign centred on a need to “grow the city.” (Petersen, 2022), the people of Prince George find themselves exposed to new potential threats. Should the development along the slopes of University Way continue in the manner currently seen, the likelihood of landslides increases with every tree lost to development on the slope. The impact environmental disasters such as landslides have is often quite blatant such as the destruction of property and loss of life. However, a less pronounced effect is the mental health impacts such events have on individuals and the communities where such disasters occur. Beginning with the fact that these events are traumatic which certainly, “disrupts the fully-functioning life of the victims.” (Makwana, 2019) Once such a disruption occurs, these individuals often see a decline in their quality of life, “uncontrollable stress, and feelings of grief and sadness for a prolonged period of time, substance dependency, and adjustment problems which affects the proper functioning of the individual as well as the community resulting in family conflicts.” (Makwana, 2019).

The effects on the individual are inevitably felt on the community. Individuals dealing with the trauma brought about by these disasters may have a hard time keeping employment, meaning they would be unable to contribute to their local economies. As Prince George has illustrated an interest in city growth, such ambitions would become impossible should the community be exposed to disasters such as landslides.

Through the loss of Prince George's greenspaces, even those who would not be affected by landslides on slopes will not be immune to environmental stressors. Less vegetation cover in urban areas creates heat islands. As climate change has rendered periods of high temperatures in the summer a commonality, heat islands are bound to increase in frequency as well. Even though research into the relationship between mental health and environmental stressors has not been as exhaustive as it could be, "health-effects research on environmental stressors has rarely focused on behavioral and mental health outcomes." (Reuben et al., 2022).

There have still been alarming findings stemming from the research that has been done, such as findings which report, "Being exposed to extreme heat can lead to physical and psychological fatigue (53)—there is a clear association between warming temperatures and rising suicide rates, especially in an early summer 'peak' (56)." (Cianconi, Betrò, & Janiri, 2020).

Impacts on an individual often have a way of spreading to the larger community, as is illustrated below in Figure 1. In the case of environmental stressors which are indiscriminate, it has been found that, "In hot temperatures, increase in discomfort leads to increase feelings of hostility and aggressive thoughts and possibly actions. Hotter cities were more violent than cooler cities. The increase in heat-related violence is greater in hot summers and showed increased rates in hotter years (55)" (Cianconi, Betrò, & Janiri, 2020). It is important to mention that these impacts are felt disproportionately by vulnerable populations, such as "children, the elderly, the chronically ill, people with mobility impairments, pregnant and postpartum women, people with mental illness, and those with lower socioeconomic status" (Cianconi, Betrò, & Janiri, 2020).

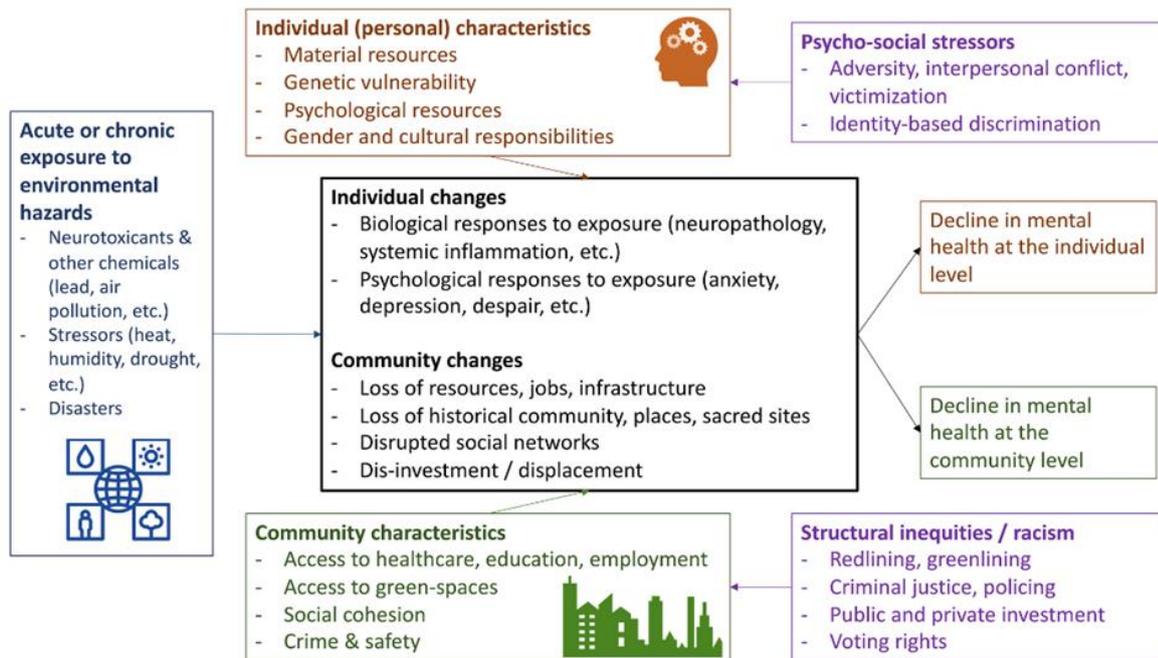


Figure 1. Conceptual model of the association of environmental hazards with mental health outcomes at the individual and community level.

Reuben et al., 2022

The connections between mental health and environmental stressors and impacts are clear. The impacts on the individual and the community are evident as well. Therefore, on the question of who should be responsible for 1. Proposing and implementing mitigative and adaptive practices to prevent environmental stressors and disasters, and 2. Damages (be it property, emotional) occurring due to the absence of the mitigative and adaptive practices to prevent environmental stressors and disasters, respondents felt that responsibility should fall on the shoulders of the government, “Federal, state, and county-level policymakers should prioritize community resilience in pre-disaster planning—and be held accountable for failing to address community needs in advance of disaster events.” (Reuben et al., 2022).

Therefore, rather than ‘grow the city’ through development, Prince George should grow the trees, protecting the greenspaces available and integrating nature more in the spaces it is currently absent.

Failure to do so could lead to a catastrophic chain of events that have the potential to cripple the city in ways not yet imagined.

Conclusion

Through research and results found through the survey conducted, it is clear to be able to understand the

connections between community members' mental and physical health benefiting from the use of the urban greenspace environment. During times of uncertainty, such as the COVID-19 pandemic and onward, it is seen that these spaces are utilized at a much higher rate than they had been previously. Understanding that these are strong community values for the City of Prince George and that urban greenspace facilitates multi-use purposes for citizens is crucial; these are important to factor into the future choices for Prince George, like the OCP review in 2023. We ask that the community be consulted in future development decisions, along with any other choices in relation to urban greenspace, to gather a better understanding on how the community would feel with these processes.

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Appendix A

Figure 1.

Raw data collected from the survey.

ID	Start time	Completion time	Email
1	10-18-22 14:34:51	10-18-22 14:36:21	anonymous
2	10-18-22 14:39:37	10-18-22 14:42:37	anonymous
3	10-18-22 15:15:50	10-18-22 15:16:56	anonymous
4	10-18-22 15:26:37	10-18-22 15:28:31	anonymous
5	10-18-22 16:02:06	10-18-22 16:04:34	anonymous
6	10-18-22 16:57:13	10-18-22 16:58:24	anonymous
7	10-18-22 17:45:07	10-18-22 17:46:13	anonymous
8	10-18-22 17:58:02	10-18-22 17:58:56	anonymous
9	10-18-22 18:56:22	10-18-22 18:58:00	anonymous
10	10-18-22 23:13:39	10-18-22 23:16:17	anonymous
11	10-18-22 23:46:48	10-18-22 23:50:36	anonymous
12	10-19-22 6:21:54	10-19-22 6:29:46	anonymous
13	10-19-22 11:47:25	10-19-22 11:48:46	anonymous
14	10-19-22 19:13:49	10-19-22 19:16:42	anonymous
15	10-19-22 20:04:34	10-19-22 20:14:24	anonymous
16	10-20-22 10:49:29	10-20-22 11:16:38	anonymous
17	10-20-22 12:35:00	10-20-22 12:37:05	anonymous
18	10-20-22 15:18:10	10-20-22 15:20:28	anonymous
19	10-21-22 8:12:24	10-21-22 8:14:34	anonymous
20	10-21-22 15:55:12	10-21-22 15:57:45	anonymous
21	10-22-22 12:36:17	10-22-22 12:42:26	anonymous
22	10-22-22 16:15:46	10-22-22 16:18:51	anonymous
23	10-22-22 17:09:50	10-22-22 18:03:29	anonymous
24	10-22-22 20:37:54	10-22-22 20:41:45	anonymous
25	10-23-22 10:25:07	10-23-22 10:29:15	anonymous
26	10-24-22 13:50:48	10-24-22 13:53:09	anonymous
27	10-24-22 20:26:18	10-24-22 20:28:21	anonymous
28	10-25-22 17:48:01	10-25-22 18:10:57	anonymous
29	10-26-22 9:35:48	10-26-22 9:36:50	anonymous
30	10-28-22 8:30:13	10-28-22 8:32:32	anonymous
31	10-28-22 10:01:42	10-28-22 10:03:19	anonymous
32	10-28-22 16:25:39	10-28-22 17:15:45	anonymous
33	10-28-22 17:16:47	10-28-22 17:18:38	anonymous
34	10-28-22 17:24:57	10-28-22 17:29:46	anonymous
35	10-28-22 19:48:02	10-28-22 19:51:29	anonymous
36	10-31-22 15:47:56	10-31-22 16:41:05	anonymous
37	10-31-22 18:22:17	10-31-22 18:24:41	anonymous
38	11-3-22 9:31:15	11-3-22 9:34:37	anonymous
39	11-3-22 11:02:20	11-3-22 11:03:57	anonymous
40	11-5-22 19:10:48	11-5-22 19:14:00	anonymous
41	11-4-22 9:17:12	11-6-22 0:46:51	anonymous
42	11-8-22 11:37:50	11-8-22 11:39:35	anonymous

Name	Please review the attach	How often did you use g	How often did you use g
Agreed		Once a month or less	Once a month or less
Agreed		Did not reside in Prince G	Did not reside in Prince G
Agreed		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
Agreed		Once a month or less	Did not reside in Prince G
Agreed		Once a week	Did not reside in Prince G
Agreed		Multiple times a week	Multiple times a week
Agreed		Once a month or less	Once a month or less
agreed		Multiple times a week	A few times a month
Agreed		Once a week	A few times a month
Agreed		Once a month or less	A few times a month
Agree		Once a month or less	A few times a month
Agreed		A few times a month	A few times a month
Agreed		A few times a month	Once a month or less
Agreed		Multiple times a week	Did not reside in Prince G
Agreed		Did not reside in Prince G	Did not reside in Prince G
Agree		Once a week	Multiple times a week
Agreed		Did not reside in Prince G	Did not reside in Prince G
agreed		Did not reside in Prince G	Multiple times a week
I consent		Multiple times a week	Multiple times a week
Agreed		Once a month or less	Once a month or less
Agreed		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
Agreed		A few times a month	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
Agreed		Did not reside in Prince G	Did not reside in Prince G
agree		Multiple times a week	Multiple times a week
agreed		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
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Agreed		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
I agree		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
Agreed		Multiple times a week	Multiple times a week
agreed		Did not reside in Prince G	Did not reside in Prince G

How often do you use gr	If you used surrounding	If you used surrounding	How do you like to spend
Once a month or less	Yes, a bit	Yes, a bit	Walking with friends/farr
Multiple times a week	Yes, very much so	Yes, very much so	Walking with friends/farr
Multiple times a week	Yes, very much so	Yes, very much so	Walking with friends/farr
Multiple times a week	Yes, very much so	Yes, very much so	Walking with friends/farr
A few times a month	Yes, very much so	Yes, a bit	Walking with friends/farr
Once a week			Walking with friends/farr
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Once a month or less	Yes, very much so	It stayed the same	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Once a month or less	Yes, very much so	Yes, very much so	Walking with friends/farr
A few times a month	Yes, a bit	It stayed the same	Walking alone
Multiple times a week	Yes, a bit	Yes, a bit	Walking with friends/farr
Once a month or less	Yes, very much so	It stayed the same	Walking alone;Walking w
A few times a month	Yes, a bit	Yes, a bit	Walking with friends/farr
Multiple times a week	Yes, very much so	It stayed the same	Walking alone;Walking w
Multiple times a week			Walking yours or others c
Once a week	Yes, very much so	Yes, very much so	Walking with friends/farr
Multiple times a week			Walking alone;
Multiple times a week	Yes, very much so	Yes, very much so	Walking alone;
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Once a month or less	Yes, very much so	Yes, very much so	Walking with friends/farr
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking alone;Walking y
Multiple times a week	Yes, very much so	It stayed the same	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking alone;
Multiple times a week	Yes, very much so	Yes, very much so	Walking alone;Walking w
Once a month or less	Yes, a bit	It stayed the same	Walking alone;
Multiple times a week	It stayed the same	Yes, a bit	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Multiple times a week	Yes, very much so	It stayed the same	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, a bit	Walking with friends/farr
Multiple times a week	It stayed the same	It stayed the same	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking with friends/farr
Once a week	Yes, very much so	Yes, very much so	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking alone;Walking w
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking yours or others c
Multiple times a week	Yes, very much so	Yes, very much so	Walking with friends/farr
Multiple times a week	Yes, very much so	Yes, a bit	Walking with friends/farr
Multiple times a week	It stayed the same	It stayed the same	Walking yours or others c

Green Space as a Benefit to Humans - Social and Educational

Namuun Bat-Urnult, Olivia Schneider, Jerek Postuk, Maryann Gabriel, Chantel Wickson

Summary

This looks at the importance of green space in humans' interactions with nature in the urban setting. Our primary focuses are on the social and educational benefits of greenspace and provide examples of the ways in which other communities have addressed greenspace. We conducted a survey of Prince George greenspace use by University of Northern British Columbia staff, faculty, and students to determine the level of use, and values placed on Prince George greenspace by the university community. The central aim of this paper is to highlight the extensive benefits of greenspace for education and in social experiences. With the information gathered from the survey questions, we support the main themes and place the relevance of our research into the local context.

Introduction

Prince George is a city with a large number of parks and greenspaces which are valued by the residents of the city. The greenspace spanning from Ginters to Forest for the World is located on the traditional lands of the Lheidli T'enneh and is a popular area for recreation and education due to its proximity to UNBC. This area is currently being considered for housing development with some of the escarpment between Forests for The World and Ginters already zoned for housing development. Development of this area will not only result in the loss of forests and greenspace but also the loss of an area that provides both social and educational benefits to the residents of Prince George.

Greenspace is incredibly valuable to the citizens of Prince George. We have found through surveying that the vast majority of students at UNBC have found social, and educational benefits from the greenspace around Ginters. These findings are supported by a vast array of peer reviewed research on the topic demonstrating the positive impact of greenspace. Public greenspace is one of the few areas where people are able to exist and socialize without having to spend money. Greenspace also provides educational opportunities that increase the depth of students' learning. The loss of the greenspace between Ginters and Forests for the World would irreparably damage the learning opportunities for not only students at UNBC but all Prince George citizens. This loss of greenspace would also further reduce the number of areas for residents to socialize without cost. The lack of protection for greenspaces in Prince George shows the city falling behind comparable cities with regard to environmental initiatives. Greenspace is a valuable resource to the city of Prince George for the educational and social benefits it provides. The loss of this greenspace

to promote an outdated model of urban expansion would rob these social and educational benefits from the citizens of Prince George.

Methods

The method we used to assess the value of greenspace in terms of educational and social value was a survey, geared toward students and faculty. We chose to target this group as we felt it would give an accurate account of the impacts that these spaces have on people in post-secondary education. The questions selected for the survey were ones that painted us a picture of how greenspaces impact students and their experiences with education.

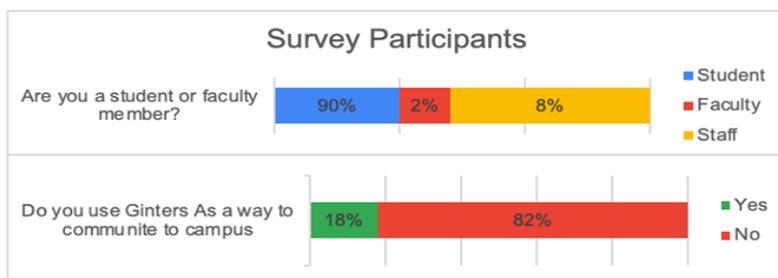
We set up a table in the winter garden on campus at the University of Northern British Columbia and had 50 questionnaires. In under an hour, we collected all of the necessary data and began compiling the data. The questions in our survey are listed below, we wanted to give the participants an opportunity to engage in our survey with experiences they have had while being at UNBC as well as give us a feel for their relationships with green spaces back home.

Greenspace Questionnaire

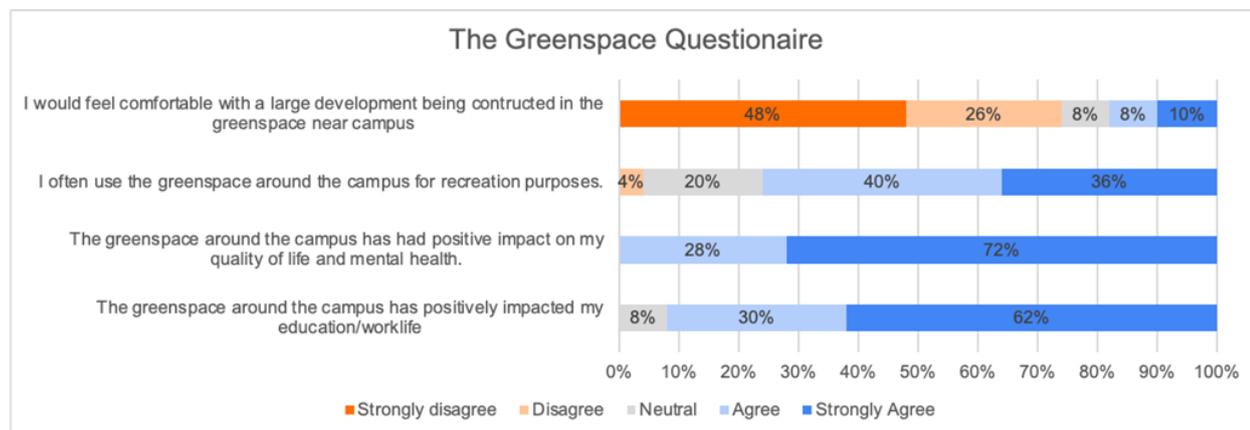
1. Are you a student or faculty member?
2. Do you use Ginters as a way to commute to campus?
3. The green space around campus has positively impacted my education/work life.
4. The green space around campus has had a positive impact on my quality of life and mental health.
5. I often use the greenspace around campus for recreation purposes.
6. I would feel comfortable with a large development being constructed in the greenspace near campus.
7. Describe your relationship with greenspace in your hometown.

Results

The results of our questionnaire will be broken up into two sections, one on participants and one on general responses. The survey participants were 90% students and 10% faculty or staff, this created some bias in the response due to it being the majority of students giving responses. The question of commuting is placed



in with participants because it gives us a sense of where people are living as well as how many people have vehicles they use for daily driving. The outcome of the commuting question shows that 18% of the participants use Ginters as a way to commute to UNBC, whereas 82% of participants do not.



The second section of this has questions related to green spaces as well as the impacts on mental health and views regarding developments going in on university hill. These questions have been grouped together as they are all answered on the same grading scale. The response to question 1 had a 48% response showing strong discomfort with a large development being constructed near campus. The main responses that we were getting from people were either an immediate no or pondering with the idea of it making housing downtown more affordable by inflating the prices of housing on the hill, creating a break in housing prices for people to get into homes.

Question 2 had a very mixed response; this was asking if participants often use the greenspace around campus for recreation purposes. Only 4% stated that they do not use the greenspace, whereas the other 96% said that to some extent they do use the green space. UNBC is unique in a way that the courses are structured around the use of forests for the world and the surrounding green belt, if these areas were to be used for development, we would lose the spaces that we do outdoor labs in, as well as many of the ORTM courses, utilize these areas. In turn, this would increase class fees as we would have to schedule field trip fees, as well as take away from class time as the travel to and from sites.

Question 3 on quality of life and mental health 100% of people advocated for the greenspace helping with mental health and quality of life by voting agree or strongly agree. This question was a bit tricky as we don't think it is a quantifiable thing, greenspaces and the beautiful scenery around campus are something that inadvertently is helping students and admin on a daily basis. We don't think that the benefits we receive from greenspace are always tangible, therefore making this question harder to wrap your head around.

Question 4 the greenspace around campus has positively impacted my education/work life, this was all agreed, strongly agreed, or neutral. There was no disagreeing with this as UNBC's largest assets lay in its green spaces, from referring to ourselves as the green university, to deeply embedding forests for the world in the class curriculums, to the Christmas tree farm on campus environmentalism is a huge part of the culture at UNBC.

Question 5 was asking about participants' relationships with green spaces in their hometowns, the responses were overwhelmingly similar. A few keywords we kept circling back to were, hiking, walking, relaxing, nature, and mental health. This section was filled out in a variety of different ways not exactly answering the question but often shining a light on the area in question. One response in specific stuck out, it was "Access to greenspace is integral to my mental health and is part of the reason why I chose to study at UNBC". Although this was recorded once we truly believe for the majority of the UNBC population this statement is true.

Impact of Greenspace on Education

Interactions with nature have long been thought to contribute to advanced learning outcomes, but only in recent times have studies and academic work confirmed the previously untested observations. The studies looked at a wide range of demographics, and the results showed a direct relationship between time spent in greenspace, and success in the educational environment. Both the effects of outdoor classrooms on learning for elementary, secondary, and post-secondary students, and the impact of students spending time in greenspace for recreation were covered by the research. The studies' subjects demonstrated higher levels of concentration, information retention, creativity, and self-motivation, improved problem-solving skills, cognitive function, inspiration toward learning, and overall increased engagement in learning (Mirrahimi et al., 2011). The inclusion of greenspace in learning routines provides beneficial learning environments for varied learning styles, encouraging students to engage with their environment through physical activity, and to use sight, sound, touch, and smell to explore (Waite, 2011). Notably, students who used wild green spaces as opposed to groomed parks or designed playgrounds found the benefits of outdoor recreation and learning to be more pronounced (Vella-Brodrick & Gilowska, 2022). Access to undeveloped greenspace contributes significantly to overall student well-being and success.

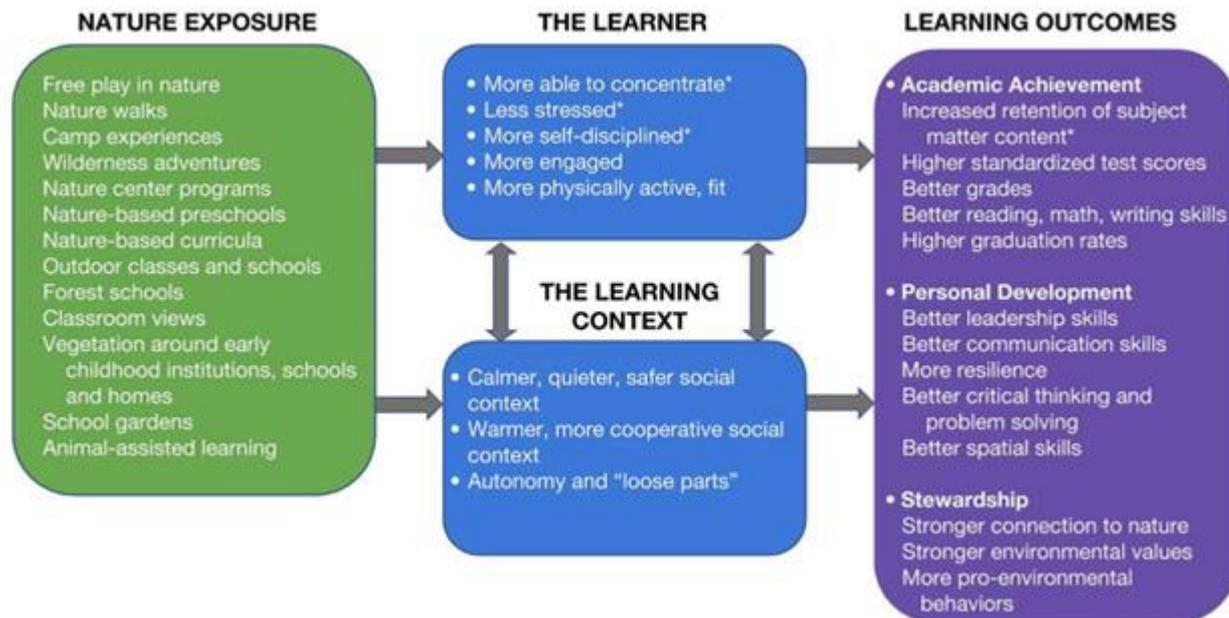


Image credit: Kuo et al., 2019

Greenspace provides a space to develop and maintain physical and mental health. Personal well-being promotes academic and personal success. Students were found to have reduced levels of anxiety and stress after spending time in greenspaces (Vella-Brodrick & Gilowska, 2022; Anabitarte et al., 2021). Greenspace contributes to recovery from mental fatigue and burnout (Brookfield, 2021). Having green space available for use by students either directly in their learning or for recreational purposes positively impacts the student experience and heightens academic achievements.

Children in particular benefit from outdoor play and learning. Those are given the opportunity to focus on their own interests and become more engaged in learning. They take the initiative to discover knowledge on their own and then have a personal sense of accomplishment. Learning in this way also improves retention, as they have interacted personally with the content and have context for what they have learned (Kuo et al., 2019). Kuo et al. (2019) state that, “Student motivation, enjoyment, and engagement are better in natural settings...” Studies found that children were much more active in the learning environment and engaged with their peers when learning and exploring outdoors (Mirrahimi et al., 2011). Cognitive development in children also has also been shown to be advanced through exposure to greenspace (Vella-Brodrick & Gilowska, 2022).

For all ages, greenspace provides a more involved learning experience. One study looked at a group of undergraduate geography students who participated in the fieldwork. The student who participated in the fieldwork had significantly higher grades than those who had not (Brookfield, 2021). Learning in context is an important aspect of the benefits seen in this study. Being able to connect knowledge to its source improves comprehension of the material for both base-level memorization and higher-level understanding.

Wild green space provides a much closer connection to nature and is said to “grow environmental stewardship” (Kuo et al., 2019). Through interaction in greenspace, people gain first-hand knowledge of the natural environment they inhabit and are able to build an empathetic connection to the natural world. Children who play in greenspaces are able to see how they shape the surrounding world and develop more conscientious citizenship practices from an early age. The effects of outdoor education are lasting, helping to develop more sustainable individual practices, and engagement in broader environmental issues (Atik et al., 2022).

Social Impact of Greenspace

Participating in activities within greenspaces have multiple social advantages. One of the first benefits of greenspace that comes to mind is physical health, but interactions outdoors will also improve mental well-being and provide positive social connections to build cohesive communities. Common greenspaces are an opportunity to combat social isolation. Greenspaces encourage people to interact in low-stress situations for simple recreation or social time and to build self-confidence through active learning with peers and the anxiety-reducing and mood-boosting effects of nature (Jennings & Bamkole, 2019). Strong communities create personal support networks, and foster community engagement and environmental citizenship. The long-term physiological benefits include disease prevention and the strengthening of immune systems (Barton et al., 2009). All of this grows a stronger, healthier, happier, more engaged community.

The benefits of greenspace use are dependent on the type of greenspace being used, and the level of biodiversity present (Wood et al., 2018; Parry & Gollob, 2018). Studies have found that wilder, more diverse greenspaces had greater advantages than very urbanized settings. Diverse landscapes promote deeper engagement with a person’s surroundings, and people’s anticipation and enjoyment of the activities performed in the space are greater in less-formed settings.

There is a reciprocal relationship between greenspace use enhancing social interactions, and social interactions in greenspaces capitalizing on the personal health benefits of spending time in nature (Vella-Brodrick & Gilowska, 2022). Whether participating in planned group activities, walking or hiking with friends, or simply spending time with family outdoors, the effects of greenspace on mental and physical health, and connection to nature are advanced. There is a greater increase in self-esteem when people spend time outdoors with friends as opposed to doing solo activities. Studies have also shown that spending time in nature is “especially restorative if it is undertaken with friends” for those aged sixteen to eighteen (Vella-Brodrick & Gilowska, 2022). Strong, healthy communities are more engaged in local and large-scale issues, and better able to deal with the many stresses in today’s world.

Because interaction creates deeper connections to nature, those who have access to greenspace are more likely to practice environmental citizenship and sustainable lifestyles, and to engage in green initiatives (Pirchio et al., 2021). Community-level changes are an important aspect of mitigating climate change making this a higher level of social benefit for greenspace. Due to the benefits of greenspace on mental health, greenspace is also a simple but effective way in which municipalities can help address climate and eco-anxiety.

The low cost of wild greenspace use and maintenance is an important factor for both citizens and municipal governments. Keeping wild parks within cities makes activities such as walking, hiking, biking, and recreational games among others, accessible to people of all ages and economic circumstances. Wild greenspaces also have much lower maintenance costs than those associated with landscaped parks and playgrounds which would make their inclusion in city plans valuable on numerous accounts.

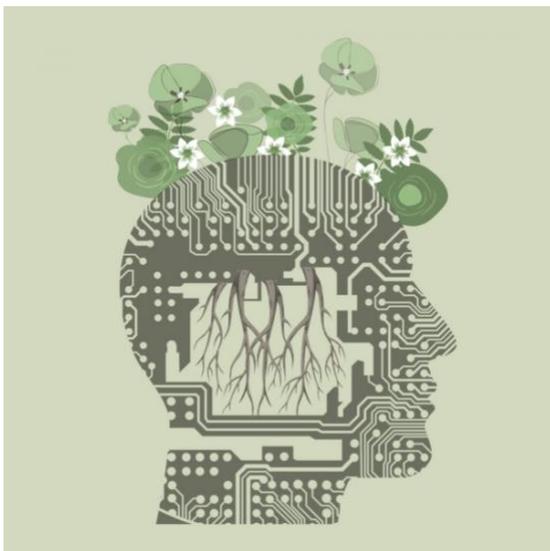


Image credit: EYE 2021, 2017

How have other municipalities addressed greenspace

We've analysed four different municipalities across Canada regarding their park maintenance, people participation, and budget including Kelowna, Calgary, and Waterloo in contrast to Prince George.

Cities	Population	Ha parkland per 1000 people	A total parkland is a natural area	People/Participation (Park Volunteers)	Parks operating budget per person
Prince George*	78'675	24.3	46%	Unknown	\$68
Kelowna, BC	144'576	8.8	75%	385	\$96
Calgary, Alberta	1'306'784	6.7	56%	2,752	\$64
Waterloo, Ontario	121,436	7.8	56%	250	\$65

Data collected from Park People (2022) The Canadian City Parks Report

*Park people (2020) The Canadian City Parks Report

Kelowna is above average for the percentage of parkland that is a natural area at 75%. The city is collaborating with the Municipal Natural Assets Initiative to implement management practices that best integrate species-at-risk and critical habitat considerations within the city's parks and natural areas, using GIS tracking and monitoring. The city is investing \$31.1 million into developing new parks and public spaces and improvements to existing parks. More than half of the funds are sourced from Parks Development Cost Charges, which are collected from land developers whenever a project increases density in the city. (City of Kelowna, 2022)

Calgary joins a growing contingent of cities to allow the consumption of alcohol in parks. The pilot program initiated in 2021 will return this year in six parks. PlayBins filled with games, activities and recreation equipment are located in five Calgary parks in communities with a high proportion of residents facing barriers to connecting with nature. Thousands of volunteers returned for the annual Pathway and River Cleanup this year to remove litter from three city parks, a Calgary tradition since 1967. (Canadian City Parks report, 2022)

Waterloo is improving east-west connections in the beloved Waterloo Park through the Waterloo Park Circuit. The city requested feedback from the public on what materials the walkway should be made of, how to accommodate different user groups, and ways to provide other activities in the parking lot. Trail Mix, a rotating initiative available in several Waterloo parks and trails, allows park goers to discover hidden QR codes along natural trails. When scanned, the codes play songs from local musicians, providing a soundtrack to their stroll. The city has a group of volunteers, known as the Pollinator Working Group, which works to educate youth and adults at community events on the role of native pollinators, as well as the city's designation as a Bee City since 2018. (Region of Waterloo, 2020)

Although Prince George has the highest ratio of parkland per 1000 people, the lack of community initiatives and protection of the natural environment stood out amongst the other municipalities. The Ginters Meadow and surrounding forests should not be sacrificed for an outdated model of urban expansion. Greenspace within the city is an integral part of the natural area since a growing number of infrastructure development projects have already been taking place in the city.

Conclusion

Greenspace is a valuable resource to Prince George. It not only provides educational opportunities, but also social benefits that cannot be achieved through other means. It is clear that the citizens of Prince George value greenspace and use it often, frequently reaping the benefits that have been outlined. The results of our survey and research highlight the importance of preserving greenspace in Prince George due to its numerous positive impacts.

We recommend that the city of Prince George preserves this valuable greenspace between Ginters and Forests for the World by rezoning the area as a park. This will preserve the educational and social benefits of the area for future residents. The housing development being proposed provides few benefits to the residents of Prince George that cannot be achieved through other, lower impact, forms of development. The proposed housing development also comes at a massive cost to the community with the loss of an area that is so highly valued and well used.

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