

100-year Flood Analysis

Flooding and its impacts on a well-built city not only cause significant environmental risks but also impact the infrastructure and roads. Within this assignment, the maps focus on the potential impact of a 100-year flood event, focusing on the Region of Waterloo. The study emphasizes analyzing affected roads, land cover, and buildings. Using data from GRCA (Grand River Conservation Authority) and Region of Waterloo, specific data was extracted to limit data using ArcGIS, and then the data was specific to present Landcovers, Buildings and roads.

With the data provided from GRCA and the Region of Waterloo, the datasets were projected to NAD 1983 UTM Zone 17N, converted to raster, and then clipped to the Region of Waterloo boundary. After reclassifying the land cover into fewer classes, calculations to overlay floodplains to other raster and calculations for flooded areas using cell counts/areas were done, and the layers were ready for use. Findings In land cover were seen through flood impacts that are more prevalent along the Grand River and through Kitchener and Cambridge. For example, in areas of value 48 (specifically central Waterloo), approximately 73km^2 had been impacted, whereas in areas such as Kingwood (small map figure 1), value 65 areas are impacted approximately 151.5km^2 . The overall findings from the landcover data show that more populated areas, such as central Waterloo, are less impacted individually but rather are impacted more quantitatively. Buildings that are not as impacted as the landcover, possibly due to their infrastructure and the area they occupy. For example, buildings located in the central Waterloo area (figure 2), of value 108 or such, are only impacted 0.92km^2 , compared to buildings near the regional border, of value 72, which only are impacted 3.56km^2 . Within the roads impacted (Figure 3), the smaller areas (near the regional boundary) are most impacted by the floods. For

example, areas of value 60 have only 17.54km² impacted. In contrast, major highways, such as highways with a value of 75, have a 1.27 km² impact.

In conclusion, the analysis of the 100-year flood within the region of Waterloo covers land covers, road types, and buildings. Out of all the analyzed datasets, the most impacted areas are central Waterloo/Kitchener and areas near Cambridge, quantitatively. Although there is more land cover impacted areas than roads or buildings, not much of the total surface area of the land cover was impacted compared to outer areas near the boundary of the region of Waterloo. If roads, buildings, and landcovers were to be compared in terms of surface areas impacted, the landcovers would have a higher number of km² impacted than the other two. Another finding is that there is more surface area impacted in outer areas near the region's boundary, but not a lot in quantity. Although the analysis came with limitations, such as simplified data for floods, cell size that may impact the precision of data, or issues with the program ArcGIS, the data was interpreted in the best way possible to analyze what impacts certain areas within the region of Waterloo have.

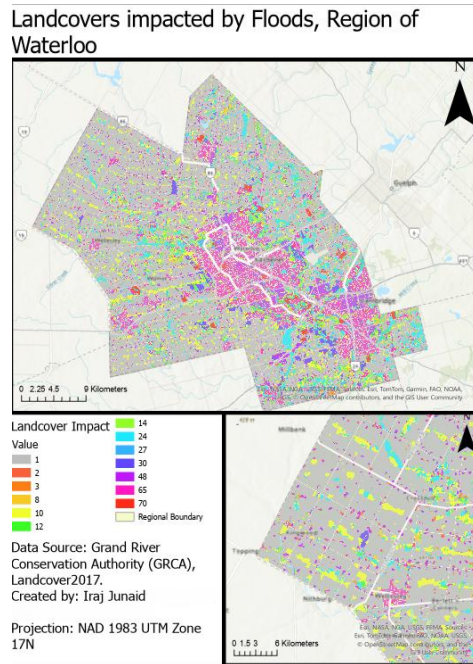


Figure 1

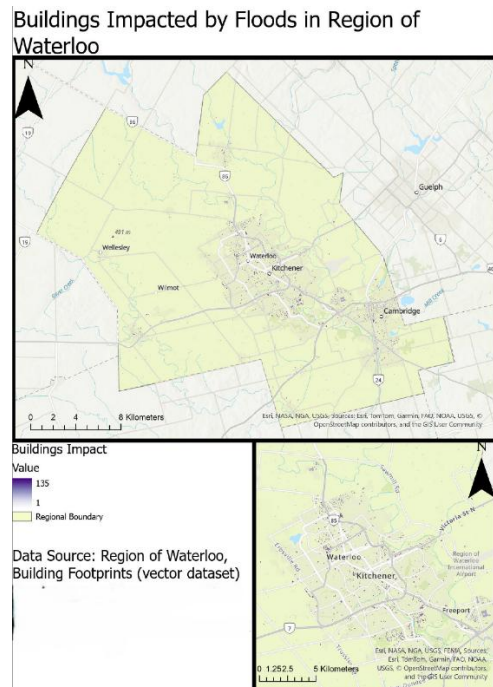


Figure 2

Roads Impacted by Floods in Region of Waterloo

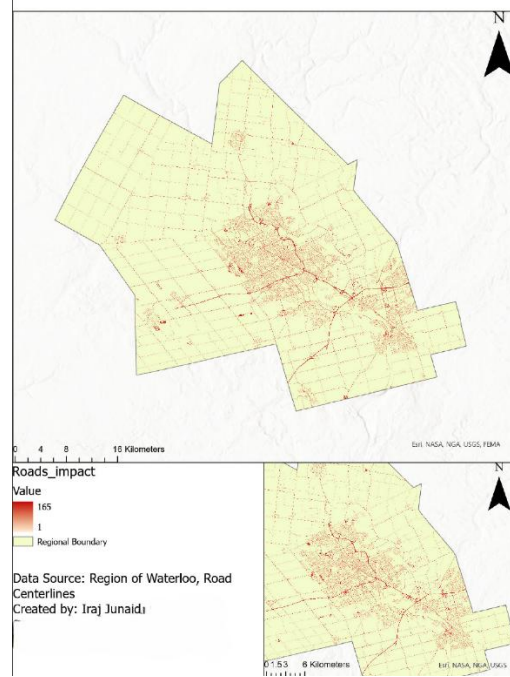


Figure 3

Citations

Grand River Conservation Authority. *Landcover 2017 and Regulatory Floodplain Data for Grand River Watershed*. Grand River Conservation Authority, 2017.

Region of Waterloo. *Roads, Buildings, and Regional Boundary Layers for Waterloo Region*.
Region of Waterloo Open Data Portal, 2024.