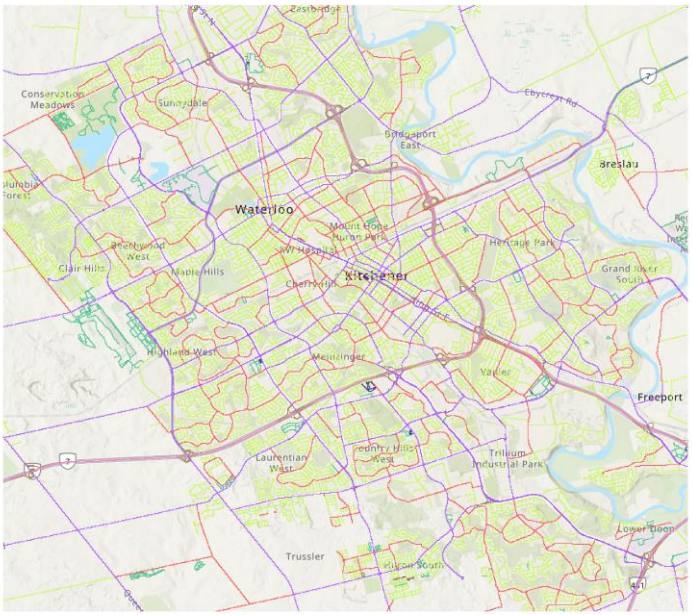
GEOG281 A3 Vy Tran 21119790

The following report is an analysis of the impacts of flooding from the Grand River on the roads, buildings, and the landcover of the Region of Waterloo using raster multiplication.

In preparation for the raster multiplication, the landcover and regulatory floodplain raster data was obtained from the Grand River Conservation Authority, while the roads, buildings and region boundary shapefiles were obtained from the Region of Waterloo.

Using ArcGIS and the World Topographic Map base layer set to NAD 1983 UTM Zone 17N, upload the above-mentioned data in the project with the NAD 83 UTM Zone 17N projection using the function “Batch Project”. To perform raster multiplication, the road, buildings, and landcover vector data should be converted to raster data and be clipped to match the political border of the Region of Waterloo.

First of all, to convert vector data to raster data, using the Geoprocessing tool, “Feature to Raster” to convert the road vector data into road raster data, using the “CartoClass” field as the new raster field. Ensure that the road raster data, named “RoadRaster” is correctly projected as above-mentioned, and the cell size is matched to the landcover raster data using the “Environment” tab.

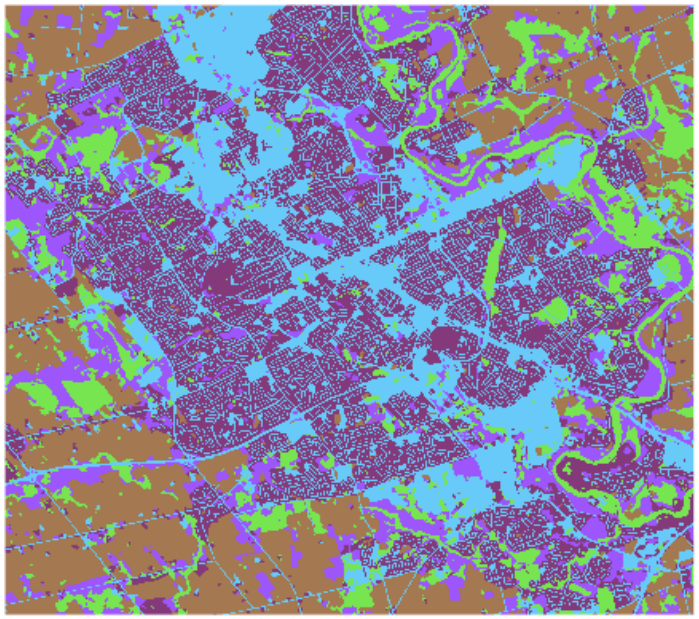


The road raster data in the Region of Waterloo.

Esri, NASA, NGA, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Repeat this procedure for the building vector data with the field “BuildingTy”, named “BuildingRaster” and for the flood plain data with the field “GR_feature” named “FloodRaster”. This procedure allows vector and raster data to be converted to raster data with the appropriate spatial resolution.

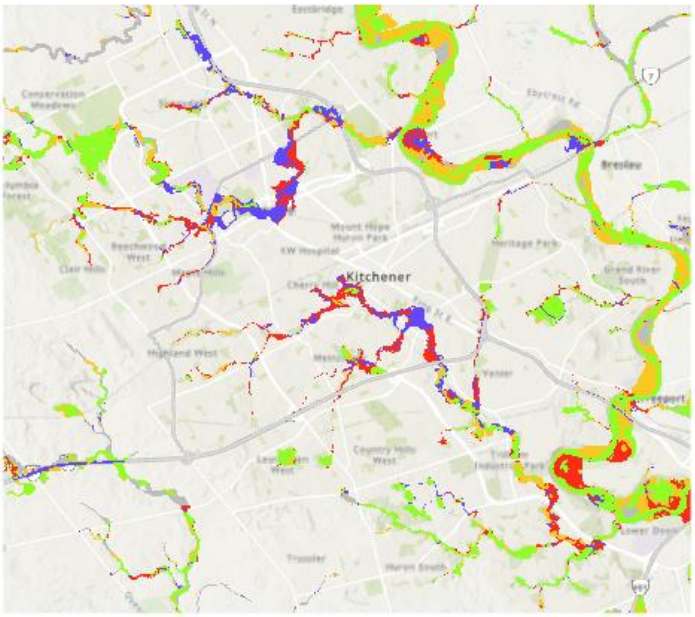
Secondly, use the function “Clip Raster” with the input as “FloodRaster” and “Output extent” as the region boundary shapefiles to produce raster data within the Region of Waterloo, named “FloodRasterClip”. Ensure that the produced raster is correctly projected as mentioned above using the “Environment” tab. Repeat this process for the landcover raster data, named “LandcoverClip”. In addition, for the landcover raster data, use the Geoprocessing tool “Reclassify (Spatial Analyst)” to reclassify the the raster fields into the following groups: Agriculture, Forest, Wetlands, Com/Ind, Residential, with the reclassified raster named “LandcoverRasterReclassifiedClip”.



The classified and clipped landcover raster data in the Region of Waterloo.

The above two procedures should have produced the following raster data: “RoadRaster”. “BuildingRaster”, “FloodRaster”, “FloodRasterClip”, “LandcoverClip” and “LandcoverRasterReclassifiedClip”.

Last but not least, use the function “Raster Calculator (Spatial Analyst)” and perform raster multiplication between the “FloodRasterClip” and the each of “BuildingRaster”. “RoadRaster” and “LandcoverRasterReclassifiedClip” individually to produce the rasters “RoadImpact”, “BuildingImpact” and “LandcoverImpact”.

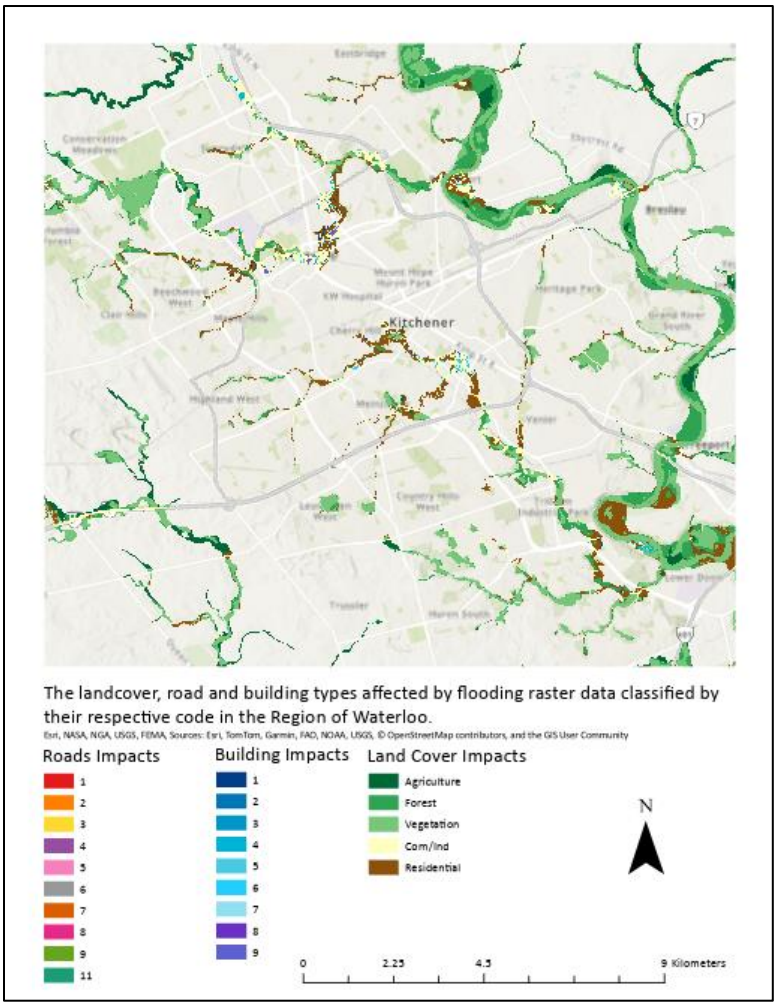


The landcover affected by flooding raster data in the Region of Waterloo.

- Agriculture
- Forest
- Vegetation
- Com/Ind
- Residential

N

0 2.25 4.5 9 Kilometers



The landcover, road and building types affected by flooding raster data classified by their respective code in the Region of Waterloo.

Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Quantitatively, the raster multiplication allows the conclusion that the area most affected by flooding from the Grand River in the Region of Waterloo is often agricultural or forested. Qualitatively, by using the raster count for each of the above raster, it can be noted that the agriculture land cover is the most impacted from the flood, with 96767 raster cells and commercial/industrial land cover being the least with 21527 raster cells. Overall, it can be concluded that while agricultural land is most often affected, a significant area of commercial and industrial is also affected by flooding from the Grand River in the Region of Waterloo and could potentially affects the region of Waterloo's citizens' daily lives. Overall, the method of raster multiplication allows visible intersections between raster datasets and provides crucial evidence for analysis. However, raster multiplication also removes any previous labeling from the input of raster datasets, hindering labeling without a deciphering code.