

Peterborough's Landscape Vulnerability To Soil Erosion

Soil erosion is a major threat to the sustainability of agriculture in Canada. It removes the top layer of soil, reduces soil organic matter and contributes to the breakdown of the soil structure.

There are many factors responsible for soil erosion, but here for Peterborough area of Ontario, Canada two factors are taken into consideration, i.e., Slope of the landscape and Wind Direction.

The most windier months are from November to April having an average wind speed of 13.7 km/hr. While the lesser Windier months are from May to October having an average wind speed of 10.5 km/hr. Also it was observed that the wind direction dominant for most of the year is west for Peterborough area.



Elevation Model

For this analysis of Soil Erosion, understanding the topography and terrain of an area is very important.

Therefore, Digital Elevation Model (DEM) was generated from Contour lines data using Spatial Analyst Interpolation toolset.

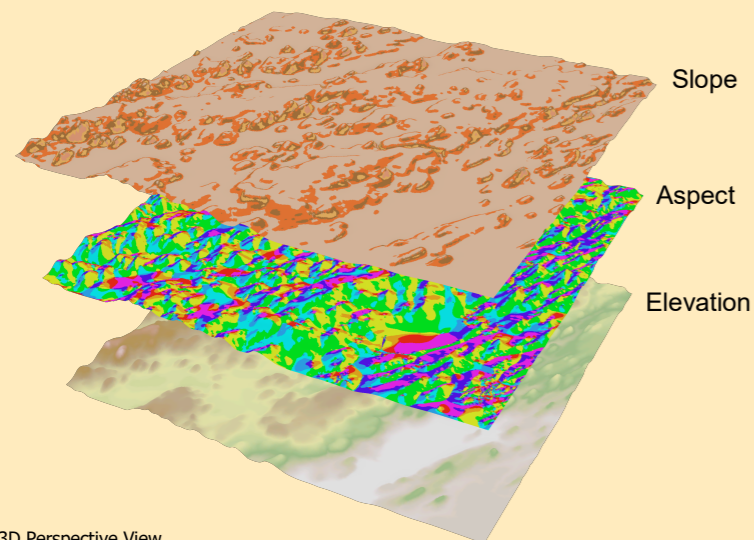
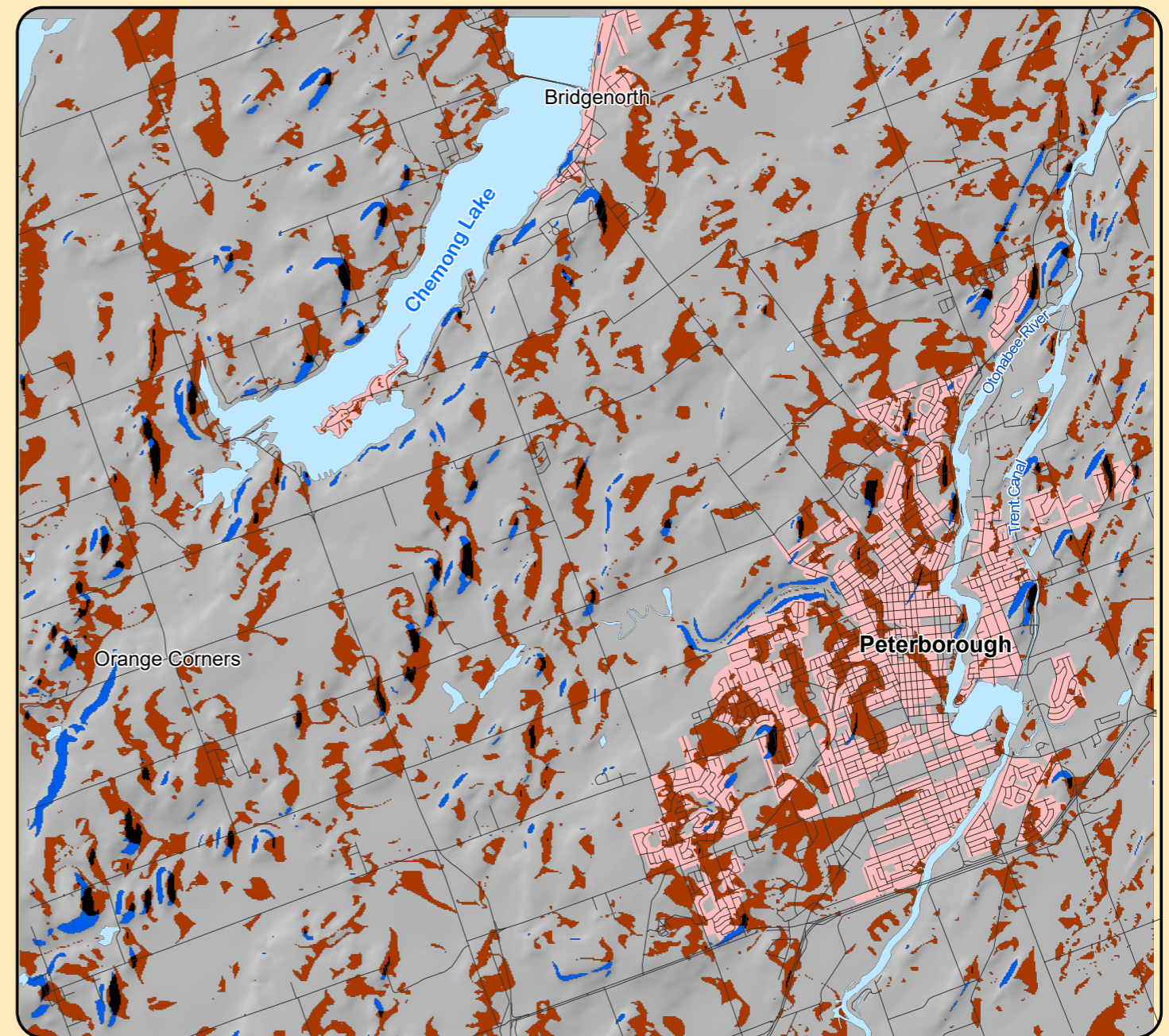
Four Interpolation methods were selected; Inverse Distance Weighted (IDW), Spline, Topo To Raster and Kriging. Topo to Raster generated DEM was found to be the best one because it had more closer elevation values as compared to actual spot height values.

Vulnerability Analysis

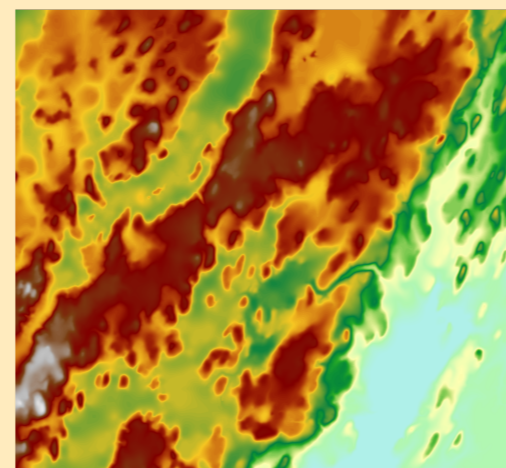
After selecting the DEM for analysis, Slope raster model was generated and then slope classes were identified from 0 to 25% in equal internals. Also, Aspect raster model was generated to know the directions of the terrain.

After a research, it was discovered that the slope direction on the leeward side of an area is more vulnerable to erosion as that part of soil is more dry than windward direction and also after blow of erosion has started, erosion rate is increased on leeward side, here i.e. east direction.

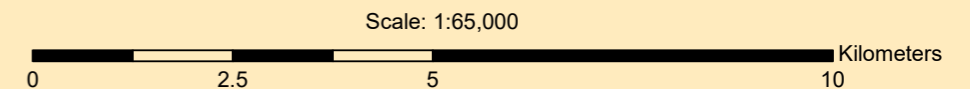
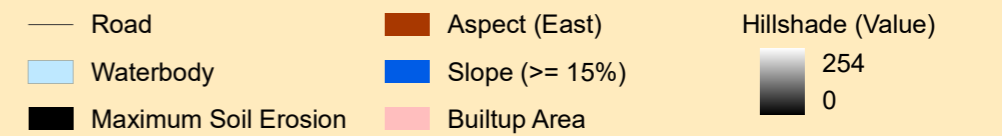
Land having higher slope percent rise of more than 15% and the land having slope of east direction are more vulnerable to soil erosion and thereby, the combination of the two has the highest probability of erosion which is shown here in black color.



3D Perspective View
Vertical Exaggeration: 8x
Note: Scale varies in perspective view



Elevation
340 m
180 m
Digital Elevation Model
Interpolation Method - Spatial Analyst,
Topo To Raster
Resolution 20 m x 20 m



Designed and Produced By Mansi Shivang Shah, 18 February 2022
Created using ArcGIS Pro (2.8.0)

Projected Co-ordinate System: NAD 1983 UTM Zone 17N
Datum: North American Datum 1983

Source:
Canadian Federal Government's National Topographic System 031D08
Clipped Spatial Data (Kawartha Lakes, Ontario), Fleming College
(Original Scale: 1 : 50,000)
NAVTEQ Data, Canada from Fleming College for labels
Food and Agricultural Organization's slope classification for soil erosion
www.weatherspark.com for wind direction throughout the year
Purdue University Manual, Indiana, USA to judge maximum soil erosion