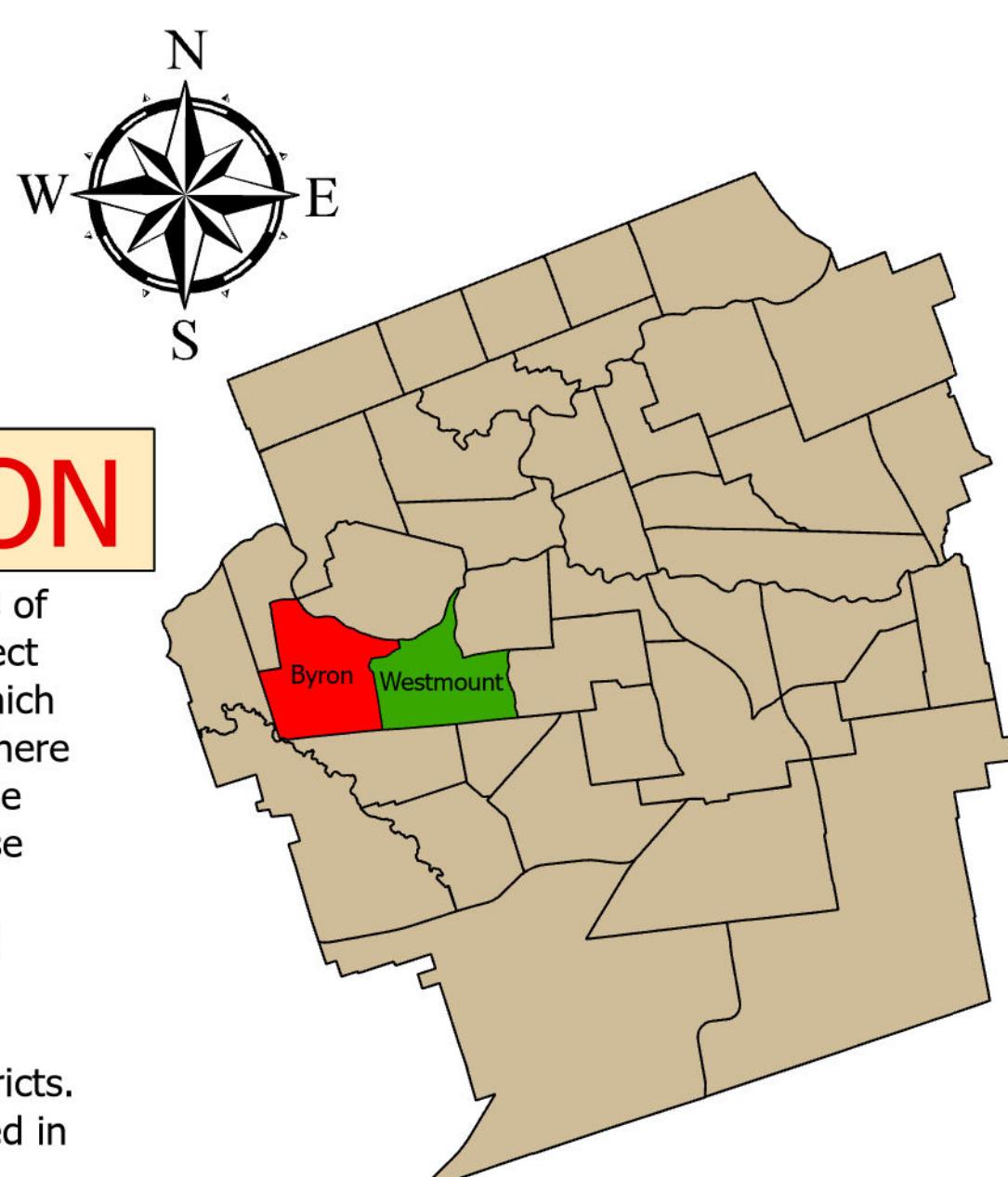


## INTRODUCTION

This Study tries to do Supervised image classification which allows for precise differentiation of surface features based on their spectral signatures. This project focuses on identifying impervious and pervious surfaces in the Byron and Westmount planning districts of London, Ontario, using high-resolution infrared imagery. The classification will distinguish between buildings, roads, paved surfaces, vegetation, and other land cover types. By analyzing these images, we aim to provide valuable insights into land use patterns and urban development in these districts. The results will support better planning and environmental management. This poster will present the findings and implications of the classification work, highlighting the effectiveness of remote sensing in urban analysis.

# SUPERVISED IMAGE CLASSIFICATION WESTMOUNT AND BYRON DISTRICTS LONDON

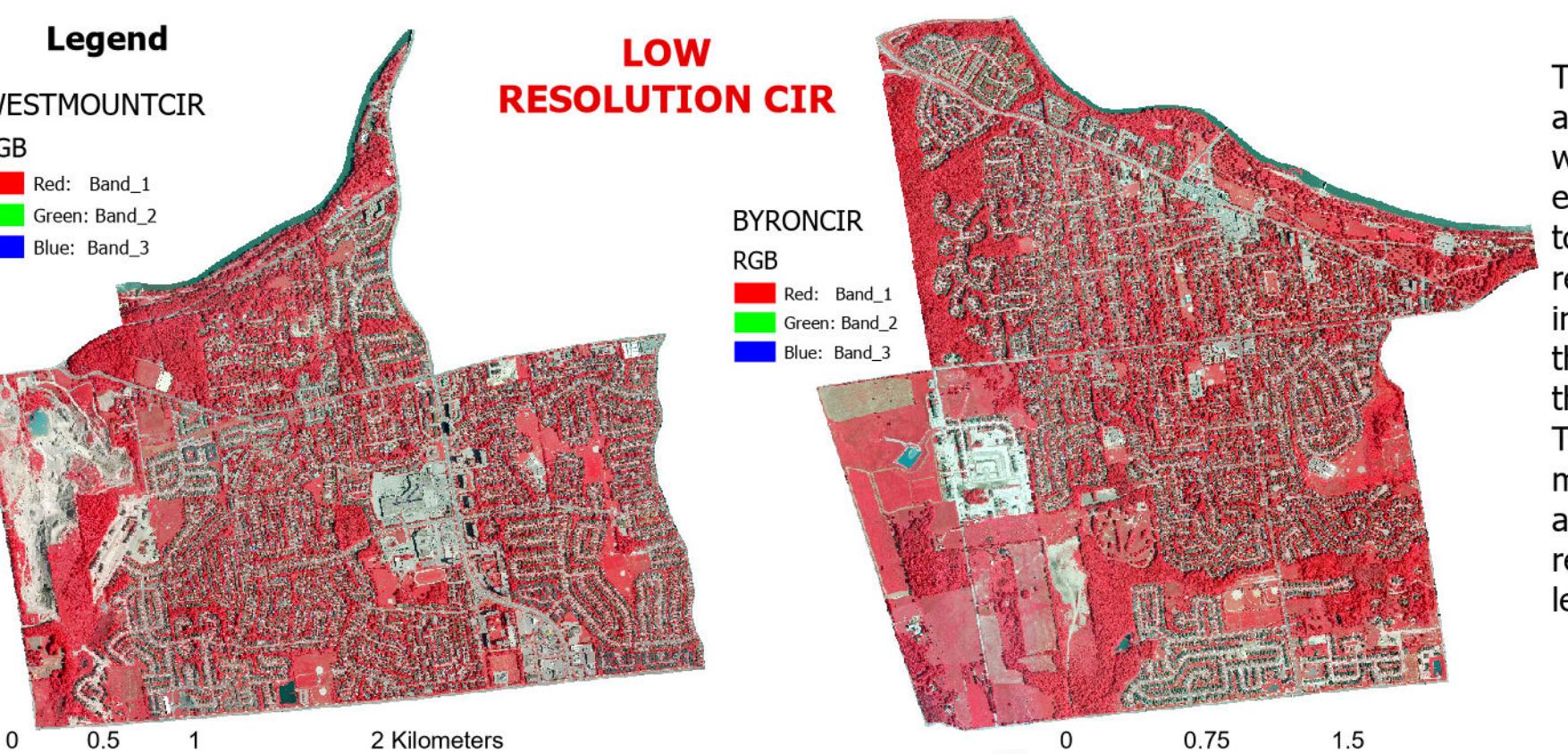


## WORKFLOW - METHODS

### DATA PREPARATION

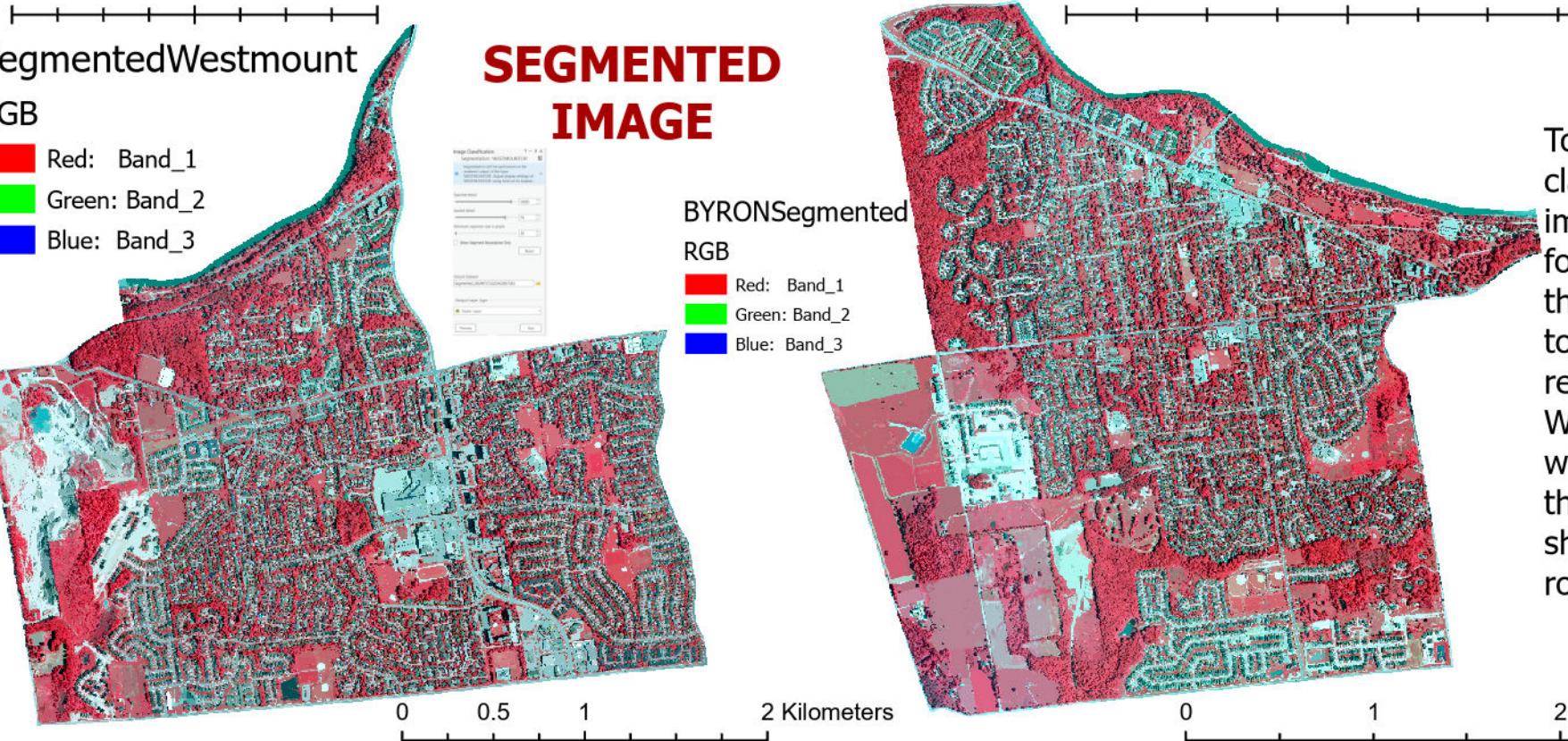
Now we have the clipped Raster CIR for our planning districts, but the file size for these two are huge as we have download high resolution data. To reduce the file size we increase the cell size of the raster, by exporting raster this becomes easy and for our purpose of balancing resolution and easy handling we keep the cell size at around 60cms. Now we have low resolution files for both districts.

To aid in our classification we make a segmented image which roughly gives the segments in our districts which will help us in the classification especially in narrow and short features such as sidewalks and roads.



The CIR file for the Westmount district and Byron district is around 650mb which is too large for processing and easy handling in classification, we have to reduce the file size by reducing resolution, to reduce resolution we increase the cell size, we would make the cell size around 60cm and export the raster into our Geodatabase.

The maps here are a low resolution CIR map for both districts as you can see at a zoom out level it is fine but the resolution is slightly reduced at ground level.



To prepare for our Supervised classification, we make a segmented image to aid in our classification going forward. To do this we make use of the classification tools and segmentation tool and set the parameters, this will result in a segmented image over our Westmount and Byron planning districts with roughly segmented segments through our district. This will have blue shade all over our district by shade we can roughly see segments.

**Data Collection**

- Planning Districts selection
  - Byron
  - Westmount
- Collect CIR Data for London City and Clip for our Planning Districts.

**Data Preparation**

Make the Rasters for respective Planning Districts Low Resolution By decreasing Cell Size.

Create a Segmented Image to aid in Classification.

**Classification**

Collect Samples through Training Samples Manager

Create a Schema with the following Classes and Subclasses

- Impervious - Roads, Buildings, Paved Surfaces, Sidewalks
- Pervious - Vegetation, Grass, Unpaved, Water

**Reclassify and Visualization**

Reclassify into Pervious and Impervious

Convert into Polygon for further analysis

Create charts and Graphs

### DATA COLLECTION

In First, we collect the Data required for our Project. The main pieces of Data collection are our Planning Districts in London City, For our project the Planning districts we select are Byron and Westmount districts which are in western end of the city of London. One crucial feature we see here in both districts is the Thames river on the northern boundary of these districts which can be crucial factor in land use and land cover in these districts.

Also, we make use of the CIR data gathered for Ontario province and clipped for London city and with the boundary of our districts for our Planning districts.

These two data sets are crucial for analysis we conduct on these districts. The below map shows the location of our planning districts highlighted in the city of London.

### Supervised Classification

After we have prepared our data, to do the Supervised Classification we need to collect samples for our classification, for this we make use of training samples manager in classification tools.

In here we create a new schema for our samples based on the following groups and sub groups:

Impervious Class:  

- Buildings
- Paved surfaces
- Roads
- Sidewalks

 Pervious Class:  

- Vegetation
- Grassy vegetation
- Water
- Unpaved surfaces

Below is a picture of the schema created

Schema\_PlanningDistricts\_A2

Impervious  

- Buildings
- Paved surfaces
- Roads
- Sidewalks

 Pervious  

- Vegetation
- Grassy vegetation
- Water
- Unpaved surfaces

### SAMPLES

Then through this schema we will collect samples for each sub classes until we cover roughly all our planning district by looking visually. In the adjacent maps we can see the samples collected which cover every part of the districts roughly. We would take 30 minimum samples for the subclasses each and save them and repeat these for other Planning district.

In the below picture we can see the samples collected for Westmount district

Class	# Samples	Pixels (%)
Buildings	50	4.06
Paved Surfaces	39	5.99
Roads	50	5.99
Sidewalks	32	0.98
Vegetation	39	31.43
Grassy Vegetation	34	34.69
Water	36	14.42
Unpaved Surfaces	31	5.77

### CLASSIFY

After collecting our samples we then run the Classify tool in Classification tools with our Training samples as our input, this will categorize based on samples characteristics with the similar characteristics through our district.

The resulting maps look like these here:



In the above map we can see at a first look the tool has predominantly classified most of the Westmount district as vegetation and Grassy vegetation classes and we can clearly see the Thames river in the northern boundary classified almost perfectly. Another feature sticking out here is the gravel pit in the western boundary of the planning district and buildings are spread evenly.

### RE-CLASSIFY

Then after Classification we need to reclassify this based on our focus point Impervious vs Pervious class, to do this we use reclassify tool in Geoprocessing tools and with classify raster as input we make all the classes belonging to same class like in our project we make all classes belonging to Impervious as 0 and Pervious as 1 and save this classification and run the tool. This will result in the below maps where there are only 2 classes and 2 fields in the attribute table for Impervious and Pervious classes.

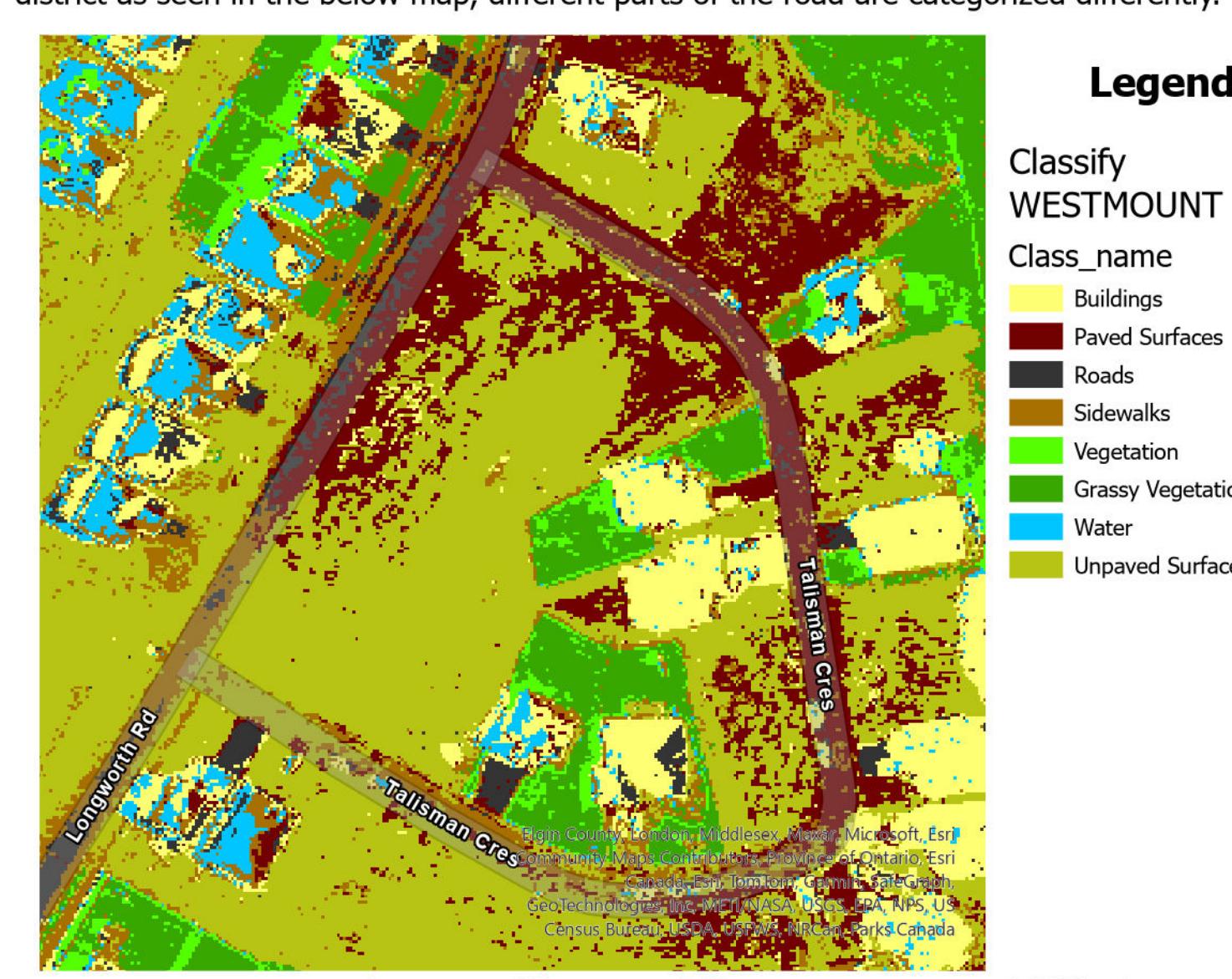


In this Westmount district we can see all the pervious classes categorized into green color and impervious into shade of grey color.

### IRREGULARITIES

As we know the supervised is not accurate to 100%, but in our planning districts we can see it has done a quite good job of classification at least at pervious and impervious level. The irregularities which are visible here are the classification between vegetation and grassy vegetation is not that differentiated between them and some irregularities in the transition.

One example of the irregularities is that of road which is being laid in the Westmount district as seen in the below map, different parts of the road are categorized differently.



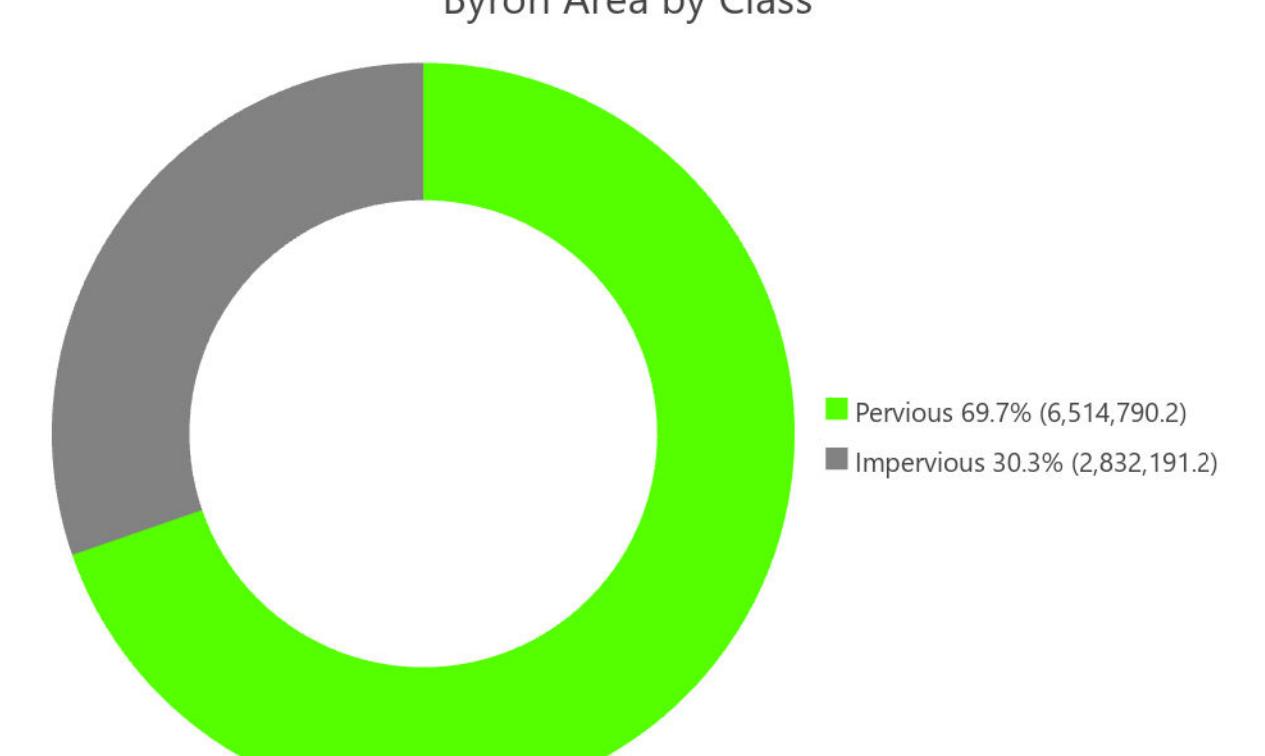
### ANALYSIS AND RESULTS

To do further analysis with this we need to convert the Raster to Polygon for easy analysis and to do any mathematical operations on it. For this we make use of the Raster to Polygon Geoprocessing tool, this will roughly convert the classes into two different classes. One of the main focus areas for us is to how much area is each of the Impervious and Pervious class covering, then we will summarize the attribute table based on the shape area and for grid code this will output a table with summarized area for each class and we can create graphs for each of them, I have gone with the pie chart as it will give you the percentages for each class and it is also easy for comparison between the two classes.

Westmount Area by Class



Pervious 63% (5,214,204.7)
Impervious 36.5% (2,993,941.0)



Pervious 69.7% (6,514,790.2)
Impervious 30.3% (2,832,191.2)

As we can see in the above charts we can see that the both Westmount and Byron districts are pretty similar in the land cover characteristics based on Pervious and Impervious surfaces.

In Westmount district the Pervious surfaces cover 63% of the area which is slightly less than in Byron which has around 70% coverage for pervious surfaces similarly Impervious surfaces cover around 1/3rd of the area in Westmount with 36% coverage which is higher than Byron.