GGRC30H3: Advanced GIS

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Assigned Date: 2017-10-05

Due date: 2017-10-26

(Total of 20 Marks- 10% of the final grade)

Assignment #2: Geoprocessing and Model Builder

Learning objectives:

a. **You should be able to use geoprocessing tools**
b. **You should be able to create and execute model builder**
c. **You should be able to define variables and create a tool using model builder in GIS**
d. **You should be able to execute the tool to find the answers for the location-based questions.**

Problem background: A lot of major cities are noticing the pressure of population increase in recent years. The City of Toronto is no exception. With the rapid increase in population density, employment lands need to be created, and more subdivisions need to be refined to use the available space optimally. The vertical growth in the downtown and some uptown areas are some of the results of those issues. When the population increases, the existing infrastructures, such as roads, cannot handle the growth without repairs. Traffic becomes an issue. Some contemporary discussions revolve around charging people to drive to downtown, a.k.a. a toll system to enter the city. There are pros and cons of all those options, but another option would be to expand the existing roads. **In a hypothetical scenario, the City of Toronto would like to expand the roads in a watershed within the City as a pilot project. There are no other major issues with construction or budgets, but the only concerning issue is to care for the sensitive forest ecosystem.** You will be looking into a watershed within the City of Toronto and find *the very valuable forest patches* ***within 100m from the roads that will be affected if the roads are potentially expanded*** (in this example, the valuable forests are considered to be of the size *>=4ha* or higher in the urban area such as Toronto). Once you know where they are, you are going to recommend that the City monitor those forests if there is ever going to be a road expansion in those areas.

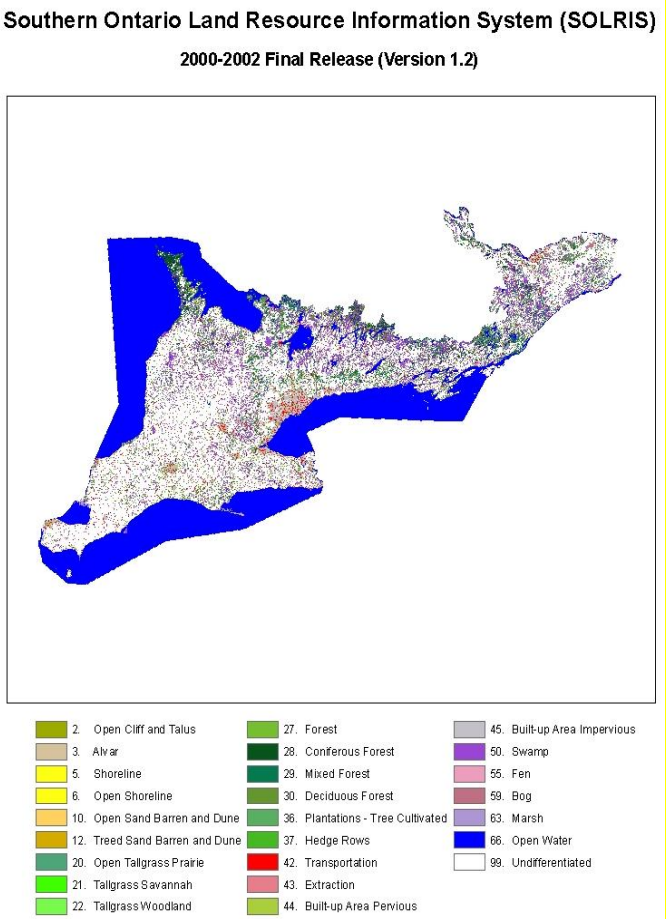
We are going to use *Southern Ontario Land Resource Information System (SOLRIS) Land Classification data*, 2008 to complete this task. The SOLRIS data is based on the Ecological Land Classification (ELC). For further information on ELC, refer to Lee et. al, 1998. **Your job is to create forest patches using model builder, create a tool, and execute the tool to select the patches that actually meet the criteria. You are then going to export the graphics of your geoprocessing model you just created, and provide the stats showing how many forest patches meet the criteria, along with the map showing where they are located within the study area.**

Data: Download the geodatabase called "Assignment2" containing the following data from the blackboard under **Course Materials.**

a. Study area
b. SOLRIS Data for the study area (Source: **SOLRIS, 2008 (**http://www.ontario.ca/page/open-government-licence-ontario**)**
c. Major Roads

Here are the summary steps for this assignment:

1. Download the SOLRIS data and study area related data from the provided source.
2. Make sure that your data contains the names shown below for SOLRIS data instead of just the class numbers (#3 below helps you with that!):



3. Join the class and type excel data to your SOLRIS data and create and update "**ClassType**" field accordingly.
4. Create a model builder tool where the input data is going to be SOLRIS data, and the geoprocessing is going to be done in model builder.
5. The following criteria will need to be applied for the "Forest Patch":
    a. Select following "ClassType" and call them **Forest patch**:
        i. Coniferous Forest (hint: 'coniferous' with lower case 'c' is same as "Coniferous" with upper case 'C')
        ii. Forest
        iii. Mixed forest
        iv. Deciduous forest

Please note that the *study area only contains those types.*

    b. Model builder and/or the tool will be used to take the base data (SOLRIS), **select** the appropriate "types", and **dissolve** them to create the final "forest patch". You are also required to **add a field** called "Area_Ha" using model builder.

6. Create a tool in ArcMap so that it can be repeated with other similar dataset.

That ends the part of model builder, the data should be added to your ArcMap.

7. Once those patches are created, area calculated, and the ones meeting the size threshold (>=4ha) were selected, run a 100m buffer on the major roads to select the forest patches that meet criteria and create a separate layer from them.

Final submission:

1. A map that shows all forest patches in lighter colour underneath and **fina**l selected (*the ones that meet the >=4ha size criterion and are within 100m from the roads*) forest patches in darker colour (forest patches should have a variation of green colour). (**60 % of the assignment or 12 out of 20)**
    a. The map should have all forest patches with the ones meeting the final criteria in darker shades, major roads and study area boundary – all visible.
    b. The map should include all cartographic elements that you learned in past courses.
    c. Data sources should be clearly labelled on the map, it is very important for open data to be credited for use license. Along with other sources, make sure to use: **SOLRIS, 2008 (http://www.ontario.ca/page/open-government-licence-ontario)** on your map.

2. Answer the following questions on a separate page. (**40 % of the assignment or 8 out of 20)**
    a. Fill out this table: **(3 marks)**

Patch Type	Total Patch Number	Total Patch Area (ha)	# of patches that meet the **size** criteria (>=4ha)	Area (ha) of patches that meet size criteria	# of patches that meet the **final** (buffer) criteria	Area (ha) of patches that meet **final** criteria
Forest Patch						

    b. What are the different types of land classes (just the names) found *within* the study area? (Hint: SOLRIS data has them all) **2 marks**
    c. Export a graphic of the geoprocessing model you created using the model-builder and submit that graphic as a figure on this document. **3 marks**

You are required to submit:

a. **Digital copy of your map in pdf format (#1) and a 1-page word or pdf document answering three questions from #2 above uploaded to the blackboard.**
b. **Hardcopy (from "a." above – including the map and the word/pdf document) by the due date before the lecture.**

Late submissions have to be uploaded online (digital copies). The date and time stamp will be used for the late penalty. For the digital version, if you submit the wrong file online (late or early) by mistake, and need to re-submit it, go ahead and submit the second file with the tag "Final" at the end and email me about what happened and why I should use your second file with the tag "Final".

References:

CVC (Credit Valley Conservation).1998. Credit Watershed Natural Heritage Project detailed methodology: Identifying, mapping, and collecting field data at watershed and subwatershed scales. Version 3, April 1998. 137 p.

Lee, H.T., Bakowsky, W.D., Riley, J. Bowles, J., Puddister, M., Uhlig, P., McMurray, S. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02. 225 p.

Southern Ontario Land Resource Information System (SOLRIS) Land Classification Data. 2008. Version 1.2. Peterborough, Ontario: The Ontario Ministry of Natural Resources. Accessed on September 2015 under open data license (http://www.ontario.ca/page/open-government-licence-ontario).