

Tutorial for Geographical Information Systems (GIS)

Objectives:

- 1) Familiarize educators with GIS technology
- 2) Familiarize educators with the various functions of the Peel Water Story GIS application

Introduction: Geographical Information Systems (GIS)

"GIS is a "smart map" tool that allow users to create interactive queries to analyze [...] spatial information and edit data." (WIKIPEDIA)

GIS is all around us, allowing professionals to make decisions about the space on our Earth. For example:

- Large retailers use GIS to analyze demographics in a given area in order to decide the best location for a new store.
- Emergency services use GIS when routing vehicles to places they are needed.
- The Peel Public Works Department uses GIS to manage and catalogue regional infrastructure, like the thousands of kilometres of water main and sanitary sewers under our streets.
- Conservation Authorities use GIS to make decisions about environmentally sensitive areas.
- Urban and Regional Planners use GIS to determine the most logical places for different types of land use.

GIS is a growing industry and students with an interest in geography, the environment, and/or computers may find GIS an interesting tool, or even a future career path. Check out these links for more in-depth information:

- <http://gislounge.com/>
- <http://geography.about.com/library/weekly/aa080397.htm>
- <http://www.gis.com>

The Peel Water Story GIS & this Tutorial

The Peel Water Story GIS exists to allow teachers and students to explore the Region of Peel's hydrologic features. It is labelled 'GIS' and not 'MAP' because it is not just a static piece of paper; it is an interactive tool that can be changed and interacted with to suit the needs of your classroom.

NOTE: The effectiveness of the PWS GIS tool depends on computing power, as well as the speed of the Internet connection. Where either is deficient, a capable computer(s) must be found.

This is a basic tutorial where functional components of the GIS are explained. Simple commands begin with a computer mouse icon and are written in **bold black letters**. As you go through this tutorial you will find Task Boxes (appearing in *blue italic letters*) that allow you to practice the commands and components covered thus far. Answers to Task questions are found at the end of the tutorial.

The PWS GIS essentially provides two “views.” The first is a larger “Regional View” of the entire Region of Peel. The second view is a smaller “Local View” (1.5 Km x 1.5 km) centred upon each school in the Region.

1. Regional View

- ☞ Open web browser and type <http://www.peelwaterstory.ca> in your browser’s address box.
- ☞ Click the GIS tab in the PWS blue menu bar. This will take you to a page with the title “MAPS/Geographical Information Systems (GIS).”
- ☞ Click the box labelled “GIS MAPS: Human Water Features” on the right side of the screen. This link will take you to the Regional View map, which is interactive.

Layers

- There are multiple layers of information that can be displayed on the map. In Geography/GIS terminology these layers are usually referred to as “features.”
- The legend on the right hand side of the window lists these layers.
- Selecting which layers to turn on and off can show geographical relationships that would otherwise be hidden.
- ☞ To make these layers appear or disappear, click the check box beside each feature on the legend.

Displaying Feature Information

- Information about particular features can be displayed (e.g. sewer pipe diameter) simply by clicking on the object. Not all features have information that can be displayed (e.g. roads).
- ☞ Click on the blue lines which represent water mains, the diameter of the pipe should appear.

Zooming and Panning

- When zoomed out to the extent where the entire Region is visible, discerning different features on the map may be difficult. Using the Zoom tool can improve their visibility.
- ☞ To Zoom In, hold down the CONTROL (Ctrl) key; the symbol for a magnifying glass will appear instead of your cursor. Move the magnifying glass to the spot you wish to zoom to and click the mouse. Or hold the Ctrl key, hold the left mouse button down and drag the magnifying glass to create a box around the desired ‘zoom area’.

- ☞ To Zoom Out, right click on the map area and select 'Zoom Out.' Repeat to Zoom Out more. Alternatively, select 'Original View' to return to a view of the entire Region.
- To see information that appears out of a zoomed-in viewing space you can use the PAN function, which moves the map without changing its size.
- ☞ To PAN, hold the ALT key. Click and drag the mouse cursor (which will become a hand) so the desired feature is shown. The PAN function works slowly; do be patient.

TASK: Turn on only 'Roads' and 'Reservoirs.' Using the Zoom tool, zoom into the reservoir closest to where Bloor Street and Tomken Road intersect (East Mississauga). Click on the reservoir to see its name.

(1) What is the name of this reservoir?

TASK: Now turn off all layers except 'Water Main', 'Reservoir' and 'Elevated Tank'. The Regional View map shows all of the major water distribution lines. With the exception of our well-based system in Caledon, all water mains in Peel Region start at either the Lakeview Water Treatment Facility or Lorne Park Water Treatment Facility on the shores of Lake Ontario and extend northward to distribute water throughout the Region. (You may want to use the Zoom tool at time; see below)*

(2) Follow the water main lines north from the eastern Lakeview Water Treatment Facility to where it ends. What is the name of the feature at the northern extreme? In which community is this feature located?

Study Area

- ☞ Return to Original View. Now click on the Study Area box on the legend.
- In the map's Study Area you can see Regional infrastructure at a much finer scale, not just the main lines. This level of detail does not appear for all of Peel due to large data sizes that would hinder the performance of school computers.
- The Study Area can be viewed to see the extent of Regional water and wastewater infrastructure, and how it is integrated into the settlement pattern of communities.

Two other Regional View maps of are included in the GIS. The "Natural Water Features" map displays some of the Region's natural geomorphologic features (watersheds, rivers, moraines, escarpments, etc.).

- ☞ Click the box labelled "GIS MAPS: Natural Water Features" on the right side of the screen. Explore the layers.

The “Places to Go” map displays a variety of water-related, natural and human-made points of interest, which may be possible locations for field trips. Each location is represented by a pink dot icon, or in the case of trails, a black line.

- ✓ Click the box labelled “GIS MAPS: Places to Go” on the right side of the screen.
- ✓ Ensure your cursor is an arrow. Hover the cursor over the pink dot to reveal the place name (IE- Brampton Community Recycling Centre); click on the pink dot to bring up a Web site (if one exists) for the place.
- ✓ Click on a school icon to reveal the school’s name. School locations are represented here as small blue boxes with a flag.

By using these tools you can see the Region of Peel in a new way. When you become proficient with GIS, you can use it in the classroom to show students important features within their community that are not otherwise apparent.

2. Local View

The Local View map works much the same as the Regional View. The pan, zoom, layers, and information functions work identically. In this view, three new functions are added with the Info, Ruler, and Grid tools.

There are some other layers included in the Local View. For example, the property parcels feature shows the address and postal code of the property.

The Local View shows an area 1.5 kilometers square, centred on the selected school. All PDSB and DPCDSB schools can be viewed.

Selecting Schools

- To access the Local View of each school, determine if the school is in Mississauga, Brampton, or Caledon and whether it is in the public or Catholic system. Select the corresponding radio button in the upper right hand corner of the Regional View window (to the right of the legend).
- This will create a drop down list where you can select your desired school.

TASK: Select the “Brampton - Public” radio button, then select ‘Clark Boulevard’ from the drop down list that appears below the radio button. You will now be in the Local View. The legend works much the same as in the Regional View, except there are many more features to see.

(3) Are there any agricultural areas or woodlands around the school? What about the Oak Ridges Moraine or the Niagara Escarpment? Why or why not?

The Information Tool

- The information tool is easy to use. It allows quick information to be displayed about certain features.
- ☞ Turn the tool on by clicking the icon (lower case “i”) in the Tools section below the legend.
- ☞ Hover the mouse pointer over a desired feature to display information.
- ☞ When finished with the Information tool, turn it off.

TASK: Turn the information tool on. Make the property boundary layer visible by checking its box in the legend. Put the mouse pointer on the property that Clark Boulevard Public School is located on.

(4) What is the address and postal code of Clark Boulevard PS?

The Ruler Tool

- The yellow ruler tool will measure real world distances in metres below the legend, in the 'Measured Distance' section.
- ☞ Turn the Ruler tool on by clicking it.
- ☞ To measure a distance, click and hold the left mouse button as you drag the cursor the distance you want to measure, (e.g. - the length of a street).

TASK: Click and hold the left mouse button at Clark Boulevard PS and drag the cursor to the 'Bramalea City Centre' landmark feature.

(5) What is the measured distance (as the crow flies) from the school to Bramalea City Centre?

The Grid Tool

- The grid tool can be used to find the approximate area of land features.
- ☞ Begin by Clicking the “ Go Back to Main Map” link in the top right corner of the window to return to the Regional View.
- ☞ Open the Local View map of LEVI CREEK PS, found under the “Mississauga - Public” radio button.
- ☞ Click on the grid tool. Click and drag a box around the area that you wish to measure. Below the tools section a “Grid Size” appears in red numbers, which is the measurement in meters for one square in the grid. Area can be estimated by counting the number of squares within a grid that cover a certain area and multiplying by the grid size.

Go to the Local View of Levi Creek Public School and turn the grid tool ON.

(6) What is the approximate area of the woodland south west of Levi Creek PS? (Zoom in to make counting grid squares easier).

- TIP: the smaller you make the 'grid box' the smaller the individual grids become. Small grids can be hard to count. By extending the entire box beyond the area of the object being measure you can create larger grids and save time.
- To create another grid you must click the grid tool twice (turning it off, then on again).

Conclusion and Answers

Hopefully this tutorial has been helpful and you now can use the Peel Water Story GIS in your school program. In addition to this tutorial, you can access instructions from the GIS pages by clicking on the "Documentation / Help" link.

Please see our water activity "Water Distribution in Peel using GIS", available on both the PWS GIS homepage and the water activities Web page.

If you have further questions about this GIS application, please contact us via the email link at www.peelwaterstory.ca

Here are the answers to this tutorial's six TASKS.

Answers to Tutorial TASKS:

1. Silverthorn
2. Bolton Elevated Tank; Bolton
3. No. Mississauga is a suburban, residential area and the Escarpment and Oak Ridges Moraine are situated further north in Peel.
4. 200 Clark Boulevard, L6T 5K2
5. About 270 meters
6. About 6500 m²