

The St Lawrence Seaway



Introduction

Since its opening in 1959, the St Lawrence Seaway is one of the world's most important international water routes. The expansion and creation of several canals systems opened up the Great Lakes to all sea traffic from the Atlantic. As a result of the expansion of the Seaway, there was a great deal of growth in the cities bordering its shore, both in industry and in population. Not only has the seaway contributed to an increase in water transportation, but it has also had a major influence on the creation of intricate road systems. The Seaway has also allowed for large expansion of the ports located along its shore.


Objective

The objective of this exercise is to create a map of the St Lawrence Seaway. You will include features such as major water bodies, major cities, roads and railways. You will explore how the infrastructure of the St Lawrence Seaway has had an impact on the growth of the area.



Before you begin...

1. **Start ArcVoyager.** (If you are not sure how to do this, ask your teacher.)
2. The ArcVoyager Guide will appear. Scroll down and click on the link called **Creating New Worlds: Turn Me Loose.**
3. Click on **Creating New Worlds: Start-up Project.**
4. In the new dialogue box *click* on the **magnifying glass**  to start the project. A blank ArcVoyager project will appear behind this window.
5. *Click* on the  in the top right hand corner of the window to close the ArcVoyager Guide. (You can always bring this window back by going to the Help menu and choosing ArcVoyager Guide.)

Let's Get Started...

1. First, you need to do is set some properties for the **View**. Go the **View** menu and choose **Properties**. Change the **Map Units** to **Meters** and then change the **Distance Units** to **Kilometers**. Click on **OK**.
2. Next, we need to do is add some maps to our **View**. Click on the **Add Theme** button . From the dialogue box that appears, go to the "**c:\seaway**" directory. Hold down the SHIFT key and click on all the files that are listed here and then click on **OK**.

Cities.shp
Lakes.shp
Rivers.shp
Roads.shp
Seaway.shp

3. The theme names will appear in the **Table of Contents** (the gray area next to the map window). Turn on the visibility for the Seaway.shp, Rivers.shp, Lakes.shp and Cities.shp themes by placing a check mark the grey box next to each theme's name.
4. You may have to change the order in which the themes are listed in the **Table of Contents** so that you can see them all (ArcVoyager draws the themes from bottom to top so sometimes themes on the bottom get "hidden" by those on top). To change the order the themes, click and hold on the name of the theme you want to move, then drag it up or down in the **Table of Contents** and release the mouse button. Repeat this until the themes appear in the following order from top to bottom: (1) Cities.shp (2) Roads.shp (3) Rivers.shp (4) Lakes.shp (5) Seaway.shp.
5. For the Seaway theme, we are going to shade each of the states and provinces a different color. To do this, double click on the theme name to bring up the **Legend Editor**. Change the **Legend Type** box to **Unique Value**. Change the **Values Field** to **Name**. Choose an appropriate **Color Scheme** from the drop down menu ("pastels" or "minerals" is recommended). When you are satisfied with the colors, click on **Apply** and close the **Legend Editor**.
6. You are now going to label all the states and provinces that border the St Lawrence Seaway. First you need to set the size and type of font you wish to use. From the **Window** menu, choose **Show Symbol Window**. Click on the **ABC** button  to bring up the text palette. Change the **Font** to **Arial**, change the **Size** to **12** and change the **Style** to **Bold**. Close the **Symbol Window**.
7. To start labeling, click on the **Text tool** . With the cursor, click inside the state or province where you want your text to appear and then release the mouse button. A **Text Properties** dialogue box will appear and this is where you type in the name of the state or province. Once you have typed it in, click on **OK**. Do this for all the states and provinces listed here.

Quebec
Ontario
Wisconsin
Michigan
Minnesota
New Hampshire
Illinois

Ohio
New York
Pennsylvania
Indiana
Vermont
Maine

HINT!!!


Be careful where you place your text labels because in the next few steps of the exercise you will have to label all the cities on the map. If you decide that you want to change the location of the labels, you can use the pointer tool and click once on the blurb to make handles appear around it and press the Delete key on your keyboard. You can now make a new blurb.


8. You must now label the following cities on your map. Again, we are going to set the text label properties. From the **Window** menu choose **Show Symbol Window**. Change the **Font** to **Arial**, change the **Size** to **7** and change the **Style** to **Normal**. Close the **Symbol Window**.
9. Make the **Cities** active by clicking once on the theme name. Go to the **Theme** menu and choose **Auto Label**. Leave all the settings as they are and click on **OK**. All the cities listed below will now be labelled.

Brockville
Kingston
Ottawa
Hamilton
Cornwall
Pittsburgh
Sarnia
Windsor
Sault Ste Marie

Port Colbourne
St Catharines
Thunder Bay
Toronto
Quebec
Montreal
Chicago
Detroit
Cleveland

10. Now you need to label the following major water features. There is one more way that we can label feature but we have to change the font properties again. So, from the **Window**

menu, choose **Show Symbol Window**. Click on the **ABC** button  to bring up the Text Palette. Change the **Font** to **Arial Narrow** change the **Size** to **12** and the **Style** to **Bold Italic**. Close the **Symbol Window**.


11. Hold down the SHIFT key and click once on both the **Rivers** and **Lakes** theme names to make them both active. Select the **Label tool** . Now click on lake or river you wish to label so that the name appears.


Lake Superior
Lake Huron
Lake Erie
Lake Simcoe
Niagara River
Detroit River



Lake Michigan
Lake St Clair
Lake Ontario
Welland Canal
St Clair River
St Lawrence River

HINT!!!

If you want to move your labels around, click on the Pointer. Click once on the label you wish to move. When handles appear around the label, click your mouse and drag the label wherever you want.


12. One last thing you need to do is draw the border between Canada and the United States through the seaway. To do this, click and hold your mouse on the **Draw Point tool** .

From the drop menu of tools that appears, choose the **Draw PolyLine tool** . Begin at top of Lake Ontario and click your mouse there once. If you move your cursor around it will appear as though a line is attached to it. Place your cursor where you want to change the direction of the line and click once again. Continue clicking to change direction until you have drawn the border and have crossed Lake Superior. Double click to end the line.

13. When you are done you will notice that handles appear around the line. To make the line stand out a little more, go to the **Window** menu and choose **Show Symbol Window**. Click on the **Line icon**  to bring the **Line Palette**. Change the **Size** to **2** and change the style of the line to a **dashed line** (third down on the left). Now click on the **Paintbrush icon**  to bring up the **Color Palette**. Change the color to **Red** and close the **Symbol Window**.

Questions...


To answer some of these questions there are a number of different tools you can use. Sometimes you will only need to make observations to answer the questions. Follow these guidelines for answering the questions:

To measure a distance – Click on the **Measure tool** . Using the cross hairs, click once on the starting point and then double click on the end point to measure a straight distance. To measure a distance that is not straight, you must click once on the starting point and then click every time you want to change direction. You can double click to end the line. At the bottom left hand side of the screen, you will see the distance listed there. **IMPORTANT:** The **Segment Length** refers to the length of the **last segment** drawn. The **Length** refers to the **total** length of all the segments.

Part A -

How far is Toronto from Montreal:
in a straight line? _____
along the seaway? _____
What direction is Toronto from Montreal? _____
How far is it from Thunder Bay to Cleveland? _____
What direction is Thunder Bay from Toronto? _____

Part B –

You can just use observation techniques to answer these questions or use the **Identify tool**  to find out the names of places (make sure the theme you want to find information about is the active one!).

How many provinces touch the Great Lakes – St Lawrence System? _____
How many states touch the Great Lakes – St Lawrence System? _____

If someone was travelling from Kingston to Detroit along the Seaway, what water features would they have to cross?

Part C –

How many Great Lakes are there in the system? _____
Which is the largest lake in the system? _____
Which is the smallest lake in the system? _____

Part D –

Which city is located...

Downstream of the seaway section? _____
Upstream on the Welland Canal? _____
Downstream on the Welland Canal? _____
On the St Mary's River? _____
Immediately upstream from Windsor? _____
Immediately upstream from Brockville? _____

EXTENSION EXERCISE:

Now that you are familiar with the layout of the St Lawrence Seaway, there are some other features that you can look at. Try adding the **Roads.shp** and **Rail.shp** themes. What patterns do you see? Do most of the cities that are on the seaway have access to them by highway? Identify some of the main highways that link most of the cities together. Could you make the same assumption about the railway lines in the area? What can you say about the infrastructure that has been created in the area of the St. Lawrence Seaway since its establishment?

Also, refer to the non-GIS exercise called Cross Section. This lesson focuses on the topography of the area surrounding the St Lawrence Seaway.