



Tracing Trails: Proposed Loop Extension of the Arrowhead Trail GIS Lesson in ArcGIS 9.x

Lesson Difficulty: ADVANCED

Length of Lesson: 1:20 – 1:40

In this lesson students will:

1. Display RMNP's road and trail network
2. Propose an extension of the Arrowhead trail to the Lake Katherine trail.
3. Select sites for garbage bins and benches along the new trail.
4. Insert project information, north arrow, scale bar, and descriptive text box.

GIS Skills acquired through this lesson:

- Thematic mapping
- Formatting, viewing, and identification of spatial data
- Inserting new line and point features within an editing session
- Proper understanding of map layout and functions in Arc

Required Data and Software:

- ArcGIS 9.x (ArcGIS 9.2 or ArcGIS 9.3)
- Data layers (enclosed within CD-ROM): ***New_Benches.shp***, ***New_GarbageBins.shp***, ***New_trail.shp***, ***RMNP_0625.ecw***, ***RMNPtrails.shp***, and ***Roads.shp***



Teacher Summary

As is the case with most national parks, Riding Mountain National Park (RMNP) maintains an extensive network of trails. According to the level of service offered, trails are designated as either front-country or back-country and they are maintained throughout the four seasons for the enjoyment of all Canadians.

Specifically in regards to the environment, RMNP's trail network plays an important role in enhancing the public's understanding and appreciation of the principles of environmental stewardship and sustainable development. There is no better way to start thinking about these pressing concepts than by taking a hike, bike or horseback ride on any of the park's gorgeous trails.

More recently, park authorities have noticed that trail use is declining. It seems that the recreational needs of Canadians are changing and less people today are interested in "roughing it" in the back-country, where service and amenities are at a minimum. Rather, Canadians nowadays show greater interest in shorter trails not far from the amenities of towns, such as RMNP's townsite of Wasagamung.

To ensure RMNP's trail network addresses change and remains relevant to Canadians, park authorities have begun public discussions to learn what changes to the trail network could increase visitation. This lesson will sensitize students to the on-going discussion on trails. It will also foster their appreciation of the work and thought that goes into RMNP's trails as they will be asked to draw out a trail extension for themselves.

It is suggested that students first learn the basics about RMNP and successful trail design. Fact Sheets, Web links and various Challenge Options have been included to help with this process. Next, students can proceed to the GIS lesson itself. The first-person scenario will help set the scene and detailed instructions will guide students and teachers each step of the way. Lastly, consult the Challenge Options section to see how the GIS activity can incorporate outcomes in other subjects.

For students:

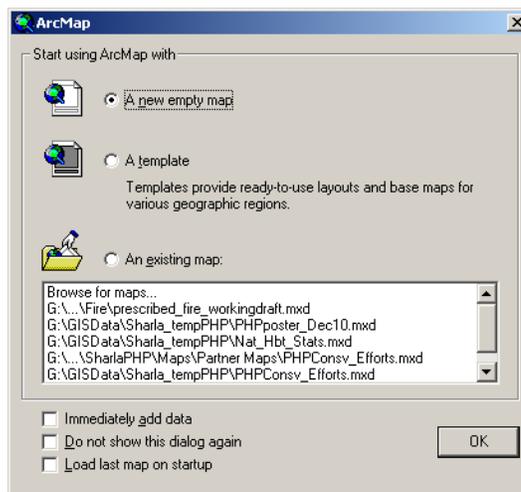
This is Your Mission

After a challenging interview process, you've been hired by Riding Mountain National Park (RMNP) to work as a part-time GIS assistant. For your first assignment, your supervisor has asked you to work with the trails committee. It was recently convened to review RMNP's 400 km of front-country and back-country trails to ensure they meet today's visitors' needs and expectations.

As part of their review, the trails committee wants to propose a new long loop extension of the Arrowhead trail. The committee believes that this, along with other measures, would address the public's demand for more short to medium length trails near the community of Wasagaming. You have been asked to follow the instructions in this document to complete a map entitled ***Proposed Long Loop Extension of Arrowhead Trail.***

Part A: Getting Started

- Launch the ArcMap program. If you have a shortcut to ArcMap on your desktop double-click it.
- Otherwise, click **Start > Programs > ArcGIS > ArcMap**
- In the ArcMap startup dialogue box click **A new empty map**



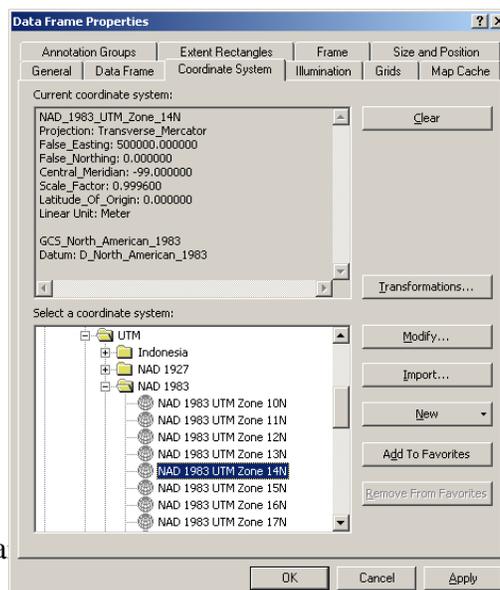
- Click **OK**.

- Click on the **Save** button  and save your project as ***Proposed_Trail_Extension.mxd*** within your working directory.



From the **View** menu select the **Data Frame Properties**.

- Click on the tab labelled **Coordinate System**.
- Under **Select a Coordinate System** select:
Predefined > Projected Coordinate Systems > UTM > NAD 1983 > NAD 1983 UTM Zone 14N



- Click **OK**.

Save your work!

Part B: Adding Data Layers

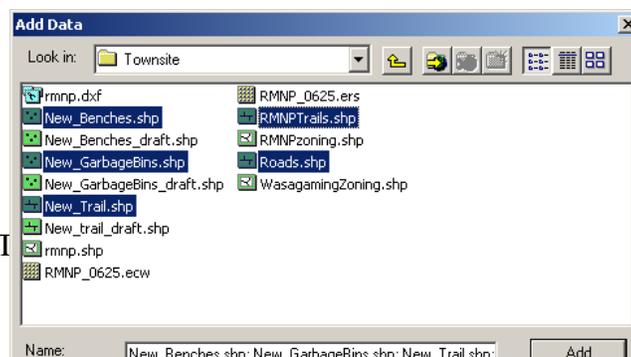
- Click the **Add Data** button  (located at the top of your screen). This will allow us to add the data layers we wish to work with.
- If you are unsure where the files are located please check with your teacher.
- Click the **Add Data** button  and click on the orthophoto: **rmnp_0625.ecw**.
- Click **Add**.

An orthophoto is an aerial photograph that has been geometrically corrected ("orthorectified") so the scale of the photograph is uniform and the photo can be considered equivalent to a map.

- We are now going to add the road and trail layers, as well as 2 empty shapefiles.

A shapefile is a format used for storing the geometric location and attribute information of geographic features. Geographic features can be represented by points, lines, or polygons (from ArcGIS Desktop Help).

- Click the **Add Data** button . Use the **Ctrl** key to select more than one layer at a time.
- Select the following data layers: **Roads.shp**, **RMNPTrails.shp**, **New_Benches.shp**, **New_GarbageBins**, and **New_Trail.shp**.



- Click **Add**.

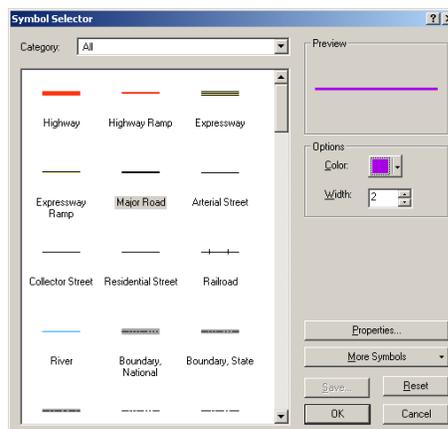
Save your work!

Part C: Formatting Data Layers

- We are going to format the roads and trails so they are visible on top of the ortho photo.

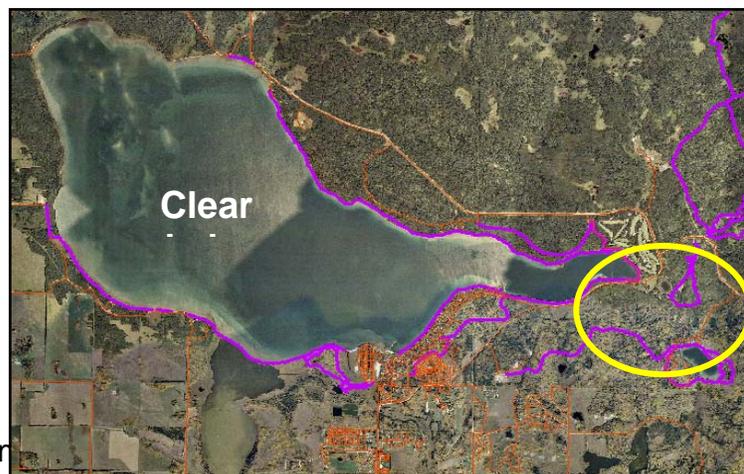
At the left side of the screen make sure the orthophoto (*rmnp_0625.ecw*) is located below the other data layers. If it isn't **click and drag it under the other layers**.

- Click on the line below **RMNP_trails**. Change the **Colour** to a bright colour and the **Width** to **2.00**.



- Click **OK**.
- Click on the line below *Roads*. Change the **Colour** to a different bright colour and the **Width** to 1.00.
- Click **OK**.
- We are going to create a trail extension from the **Arrowhead Trail** to the **Lake Katherine Trail** by adding a connecting loop.

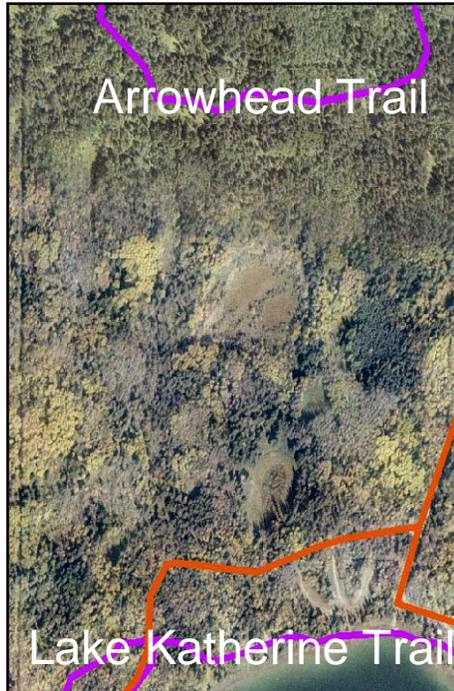
- First **Zoom In**  to the area surrounding **Clear Lake**, the largest body of water in Riding Mountain National Park. The park is shaped more or less like a pistol; Clear Lake is in the “trigger” region.



- To determine the **Lake Katherine Trail** use the **Identify Tool**  to view the attributes of the trails in RMNP (**hint* these two trails are located south-east of Clear Lake and the Arrowhead trail is a small loop).

If you cannot find the **Zoom** tools at the top of your screen then select **View > Toolbars** and then make sure there is a checkmark beside the **Tools** option.

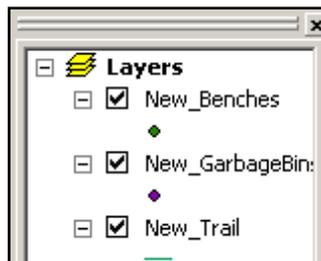
- Once you have determined where these trails are use the **Zoom In** tool  to look at just these two trails more closely.



Save your work!

Part D: Creating Our New Trail

- Now that we have determined where the **Arrowhead** and **Lake Katherine** trails are we are going to create a trail extension of the **Arrowhead** trail.
- Make sure your 'New' shapefile layers are turned on.



- To create our new trail select the drop-down arrow from the **Editor** toolbar and select **Start Editing**. Set the **Task** to **Create New Feature** and the



Target to **New_Trail**. Make sure the pencil active.

(**Sketch Tool**) is

If you cannot find the Editor tools on your screen select **View > Toolbars** and then make sure there is a checkmark beside the **Editor** option.

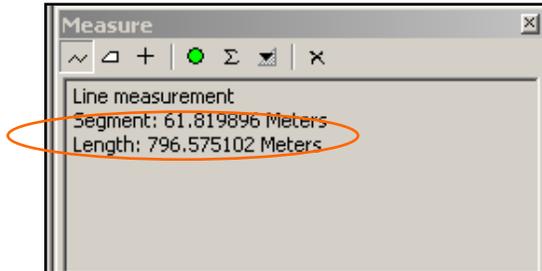


- Your trail should have a natural shape. Be sure to read the **Successful Trail Design** fact sheet, this will provide with more information on how to design a successful trail (your trail does not have to be straight, you can be creative and try to avoid any wetlands!).
- To begin your editing **select any point along south-eastern or south-western portion of the Arrowhead Trail**, and gradually click to add vertices if you want your trail to curve. Continue down towards the Katherine Trail and then loop back to the Arrowhead trail.
- Double-click once you are finished your proposed loop extension.
- Below the **Editor** tool bar click the drop-down arrow and select **Stop Editing**.
- If you are not happy with your trail do not save your edits, instead select **No** and start again. If you are happy with your trail select **Yes** to save your edits and finish this editing session.



- Under **Layers** click on the line under **New_Trail**.
- Change the **Colour** to a bright colour and the **Width** to **2.00**.
- Click **OK**.

- Measure the length of your trail using the **Measure Tool**. 
- Click at the beginning of your trail and follow along the trail until you reach the end point at the Lake Katherine Trail. Click to create vertices so that you can measure the curves in your trail, double-click at the end to finish measuring.



- Record the length of your trail: _____meters.

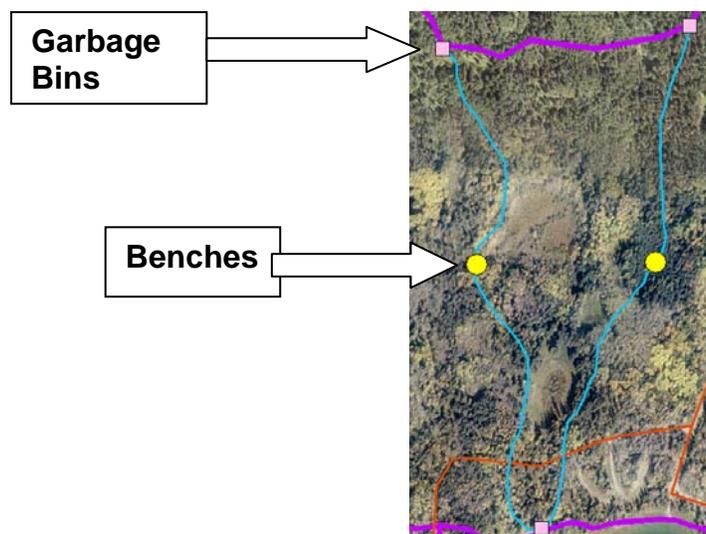
Trail Sign
 Photo: Parks
 Canada



Save your work!

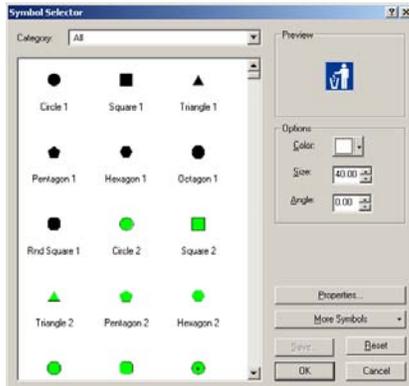
Part E: Adding Garbage Bins and Benches

- We are going to add in three garbage bins and two benches along our new trail.
- First let's add in our Garbage Bins. We are going to add a Garbage Bin at the beginning, middle, and end of our new loop trail.
- To add in the new Garbage Bins select the drop-down arrow from the **Editor** toolbar and select **Start Editing**. Set the **Task** to **Create New Feature** and the **Target** to **New_GarbageBins**. Make sure the pencil (**Sketch Tool**) is active. 
- To begin your editing session use your mouse to click once at the beginning, middle, and end of our new loop trail.
- Double-click to finish editing.
- Below the **Editor** toolbar click the drop-down arrow and select **Stop Editing**.
- Save your edits if you are happy with them.
- To add in the new Benches select the drop-down arrow from the **Editor** toolbar and select **Start Editing**. Set the **Task** to **Create New Feature** and the **Target** to **New_Benches**. Make sure the pencil (**Sketch Tool**) is active 
- You will add **two** benches.
- To begin your editing session use your mouse to click once on each half-way point between the original Arrowhead trail and the Lake Katherine trail.
- Double-click to finish editing.
- Below the **Editor** toolbar click the drop-down arrow and select **Stop Editing**.
- Save your edits if you are happy with them.

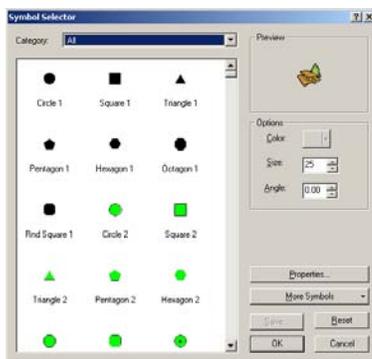


- Select the point below the **New_GarbageBins** layer. Change your **Symbol Size** to **40.00**. Select a **Symbol** to represent your garbage bin.

- Make sure **All** is selected for the **Category**.



- Select **OK** when you are finished formatting your Symbol.
- Repeat this process for your benches. But make sure you select a different symbol for your benches!



Looking at the new trails you have created...

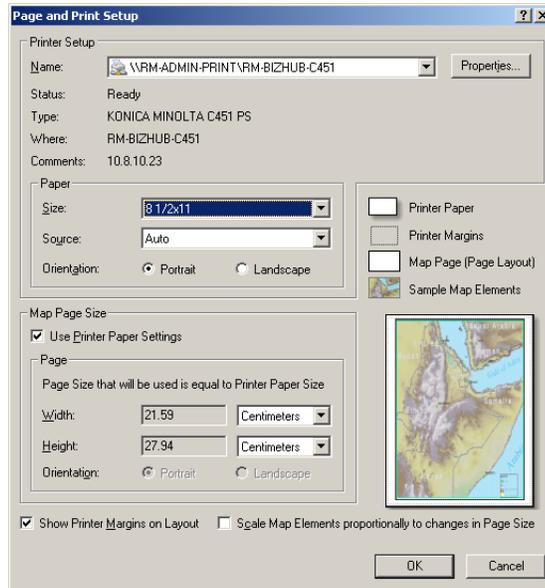
- Do you think that it covers a variety of terrain types (i.e. forest, clearing, wetland, etc.?)
- Considering the terrain and the distance covered, how would you rate this trail: easy, moderate or difficult?

Save your work!

Part F: Final Touches

- We are going to label our new and old trails and then complete the map with a **Title**, **North Arrow**, **Legend**, and **Scale Bar**.

- First select the **Layout View**  icon at the bottom of the screen (if you cannot find this icon you can also select **View** at the top of the screen and then select the Layout View ).
- Under **File** select the **Page and Print Setup...** Check to make sure the Paper Orientation is in **Portrait**.
- Make sure your paper properties is set to 8 1/2 X 11 inches (or **Letter**) so that your map can be printed on one piece of paper.

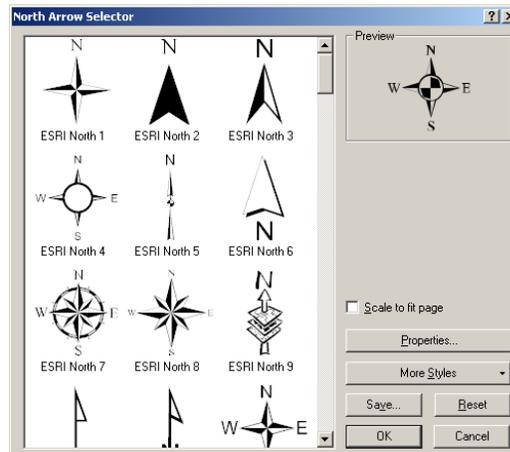


- Click **OK**.
- We are going to label our old trails. Click the drop-down arrow on the **New Text** icon,  select the **Callout** icon.

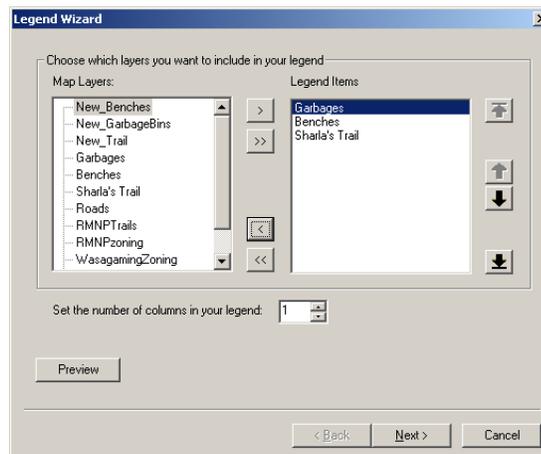


- Click any point along the Arrowhead Trail and drag to just beside it. Label it *Arrowhead Trail*. Repeat this process with the **Callout** feature to label the *Lake Katherine Trail*. You can change your text size and colour by right-clicking the text box, within the **Properties** select the **Change Symbol** icon to change the size and colour to your preference.
- At the top of the screen select **Insert** and select **Title**. Label your title ***Proposed Loop Extension of the Arrowhead Trail***.
- Click and drag your title to the top of the page.
- Select **Insert** again and choose a **North Arrow** symbol of your choice. Click **OK** to close the **North Arrow Selector box**.

- Click and drag your **North Arrow** to the top right-hand corner of your map.

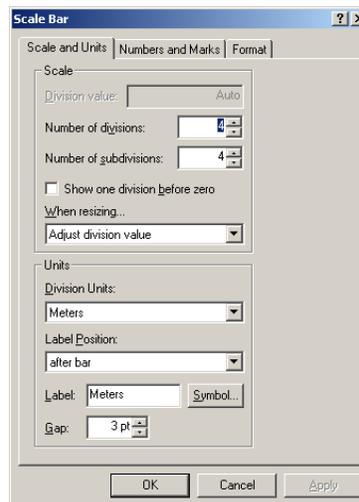


- We are going to change the names of our new features. Click on **New_Benches** once, wait a second and then click again to type in **Benches**.
- Click on **New_GarbageBins** once, wait a second and then click again to type in **Garbage Bins**.
- Click on **New_Trail** once, wait a second and then click again to type in **Arrowhead Long Loop**.
- Select **Insert** and select **Legend**. We only want our new trail, benches, and garbage to appear within our Legend. If the RMNP roads, trails, or ortho photo appear within the list of **Legend Items** on the right hand side, select them and then click the **<** icon within the middle of the **Legend Wizard**. The number of columns in the Legend should be set at one.



- Click **Next>** and type in **Legend** for the **Legend Title**.
- Click **Next>** and click the drop-down arrow to change the **Background** to white.
- Click **Next>** two more times and then **Finish** to create your Legend.
- Drag your **Legend** to the bottom left side of your map.

- Select **Insert** again and select **Scale Bar**.
- Select a Scale Bar of your choice.
- Click **OK**
- Right-click on your Scale Bar. Select **Properties** to change the number of divisions to **2**.
- Change the **Division Units** to **Kilometers**, and change the label to km (type in **km**).



- Select **OK** and **OK** once more to close the **Scale Bar Selector** dialogue box.
- Click on the text icon  located at the bottom left-hand side of your screen to insert text (the **Callout** icon may still be active, select it and then select the text icon)



- Include the name of the author (you!) and today's date along the bottom right-hand corner of the page.
- If you wish to modify the size and appearance of your text, simply right click it and select **Properties**.

Save your work!

Go Green!

If you need to print your work, first check for mistakes! That way you will only print one final copy and **save paper!**

Congratulations! You have completed your map of the Proposed Loop Extension of the Arrowhead Trail!

Mission Debriefing

If you are reading this, you have successfully completed your map of ***A Proposed Loop Extension of Riding Mountain National Park's Arrowhead Trail.***

Questions that may arise include:

1. Approximately how long is the proposed trail extension?
2. The trail extension appears to cross a road. What type of safety measures should occur at these intersections?

What questions of your own do you have for your classmates?

With this new information, the trail crew of Riding Mountain National Park are better equipped to plan a new and exciting trail extension that will be fully sustainable.

Congratulations! On to your next mission...