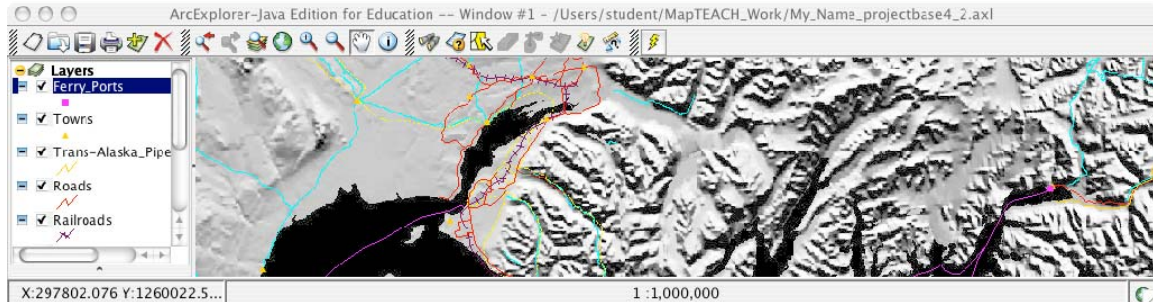


GIS Lesson 5

MAPS WITH RASTER IMAGES II: LOCAL SHADED RELIEF BASE MAP

TEACHER INFORMATION



Lesson Summary Base maps locate, orient and generally describe an area of interest. During this lesson, students learn how to make a base map, centered on their community, using a shaded relief raster layer and several vector layers. Students use the base map to make observations and answer questions centered on the local geography of a chosen community. The base map they construct during this exercise will be used as a starting point for several later GIS lessons.

Objectives: Students will create a customized base map made from a local shaded relief raster image and a set of standard Alaska GIS data layers.

Estimated Time: 1 hour

Correlation to Alaska Standards:

Geography A-6 Use spatial (geographic) tools and technologies to analyze and develop explanations and solutions to geographic problems.

BACKGROUND FOR THE TEACHER

Building a base map to orient, inform and answer general questions centered on a community enables students to make good progress exploring 'their own place' with GIS.

This lesson is exciting for many reasons. First, the students have the chance to make some of their own decisions by choosing a project community, selecting the local raster image best suited to exploring their community, and then choosing how to best symbolize the map layers to make an engaging map. Our experience is that students really enjoy making their map look good. As the teacher you can leverage this motivation by guiding them to also use techniques

that help the GIS work smoothly and that make the map informative from a geographic perspective.

The lesson is also interesting because processing raster images with AEJEE on a school computer pushes the envelope on capacity and performance. Using strategies like turning off the raster layer(s) while working with other layers will greatly speed things up.

MATERIALS

- Computers - one for each student is best or two students can share. The computers must meet the following specifications to run AEJEE:
 - Macintosh: MacOS 10.3 or above, 100 MB hard drive space, Internet connection; recommend G4 or faster processor and more than 64 MB RAM.
 - We recommend: Mac OS 10.4 or above, 500 MB hard drive space (400 MB for data).
- AEJEE software and MapTEACH GIS data can be downloaded from the MapTEACH website at <http://www.mapteach.org>, or provided by MapTEACH on a DVD by contacting:
 - De Anne Stevens - MapTEACH
 - Alaska Division of Geological & Geophysical Surveys
 - 3354 College Road
 - Fairbanks, AK 99709-3707
 - Tel: 907-451-5014
 - E-mail: deanne.stevens@alaska.gov
- Copies of student instructions for the lesson.

INSTRUCTIONAL PROCEDURES

Getting Ready

As always, try out the lesson on a classroom computer ahead of time.

Jot down a list of questions that students might have, questions they should have, and questions that they can answer using lesson resources that we haven't thought of.

Gear-up

- Explain to students that they will be making maps with a personal focus, centered on one Alaskan community of their choice. They will learn how to combine data layers to build custom maps that show where a chosen community is, and what is unique about that place. Have each student choose one Alaskan community that interests them and have them write it down in the space provided at the top of the first page of the student instructions. You can also write the names of students and their chosen communities on the board. You might ask each student why they are

interested in their chosen community. This community will be the focus of this lesson and several later lessons in which GIS is used as a tool to learn more about that community.

- Use the map on page 2 of the student instructions to help students figure out what region they should be using as a shaded relief raster layer.
- Some communities may be located near the boundary between two or more regions; in these cases, students may need to load several shaded relief layers in order to adequately cover the community area at a scale of 1:1,000,000. These students will need to be especially patient while waiting for the computer to redraw after each command. Be sure that these students know that they can speed up the redraw process by turning off the raster layers (but don't remove the layers from the project!). They can turn them on again once they have symbolized all their vector data the way they like it.
- **Briefly** run through the **key concepts** listed at the beginning of the student exercise section. One way to show the students the difference between raster images and vector data is to use AEJEE to zoom in on an image until it is pixilated, and then zoom in on point, line or polygon features to show that they never become pixilated. You can also show them the size of the files in Finder.
- Caution the students that some patience may be required when dealing with raster layers. Adding or projecting a raster image layer may take a while, maybe several minutes. In most AEJEE lessons we will turn off the raster layer until we are almost done making the map so we don't have to wait so long for the computer to redraw with each step. Let them know that they will be working with smaller rasters than the one used in the last lesson, and that these will process much faster.
- Students love to see their maps in hard copy print. If the computers are connected to a printer, have them print their final base map by going to "File" in the AEJEE menu and clicking on "Print." It's even more fun for students if you have access to a color printer!

MORE EXPLORATIONS

Have students take time to get up, walk around and compare how others have organized and symbolized their base maps. Encourage or require them to describe to another student what they did on their own maps. Then send them back to improve their own maps.

TEACHER RESOURCES

Raster and vector data are succinctly described and contrasted in Wikipedia at http://en.wikipedia.org/wiki/GIS_file_formats

ESRI's "Introduction to ArcExplorer—Java Edition for Education" for AEJEE 2.3 available as an Adobe Acrobat PDF:

<http://downloads2.esri.com/EdComm2007/software/aejee/aejee23.pdf>

MORE RESOURCES FOR STUDENTS OR TEACHERS

Geomorphology from Space is an out of print 1986 NASA publication edited by Nicholas M. Short, Sr. and Robert W. Blair, Jr. designed for use by the remote sensing science and educational communities to study landforms and landscapes. The core of this online collection is a gallery of space imagery consisting of 237 plates, each showing a geographic region where a particular landform theme is exemplified. Commentary, photographs, locator maps, and sometimes a geologic map accompany each plate at

<http://disc.gsfc.nasa.gov/geomorphology/index.shtml>

Visible Earth: A catalog of NASA images and animations of our home planet

<http://visibleearth.nasa.gov/>

Earth Observatory (NASA) provides public access to new satellite imagery (raster data) and scientific information about our home planet [search for Alaskan images] at <http://earthobservatory.nasa.gov/>

Remote Sensing Resources from the Remote Sensing & Geographic Information Facility: American Museum of Natural History (thorough and comprehensive account of resources) at http://cbc.rs-gis.amnh.org/remote_sensing/index.html . The **interactive tools** provided at the bottom right of the home page provide great ways to illustrate basic remote sensing concepts.

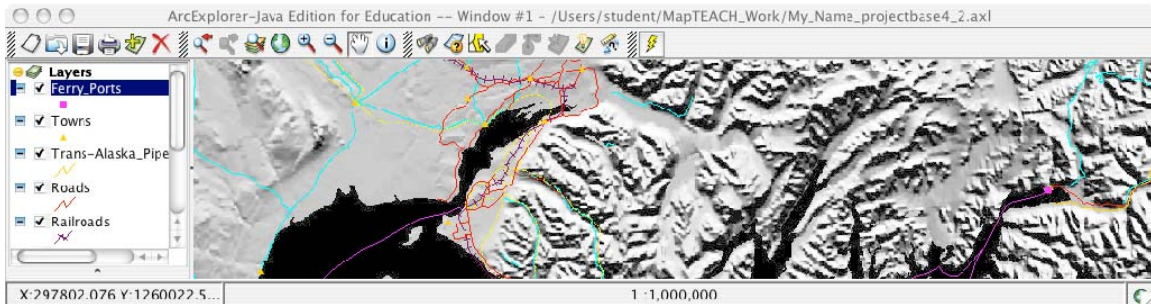
GIS Dictionary. Online at ESRI Support - includes ArcExplorer terms and an exhaustive, technical list of GIS terms, some with graphics.

<http://support.esri.com/en/knowledgebase/Gisdictionary/browse>

Name: _____

Project Community: _____

GIS Lesson 5
MAPS WITH RASTER IMAGES II:
LOCAL SHADED RELIEF BASE MAP
STUDENT EXERCISE



Objectives: Students will create a customized base map made from a local shaded relief raster image and a set of standard Alaska GIS data layers, and will use it to answer questions about their community.

Estimated Time: 1 hour

Key Concepts

Project community is the village, town or other place in Alaska that you will choose to focus on while making maps.

Base maps are maps that have basic information on them to help you orient yourself and answer general questions.

Vector layers are GIS data stored as **points, lines or shapes**. For example, towns, rivers and land status are each stored in separate vector layers.

Raster image layers are stored like digital pictures; a rectangular grid of thousands of squares called pixels.

During this lesson you will use a shaded relief raster image as the bottom layer for your project and then add vector layers to make a customized base map.

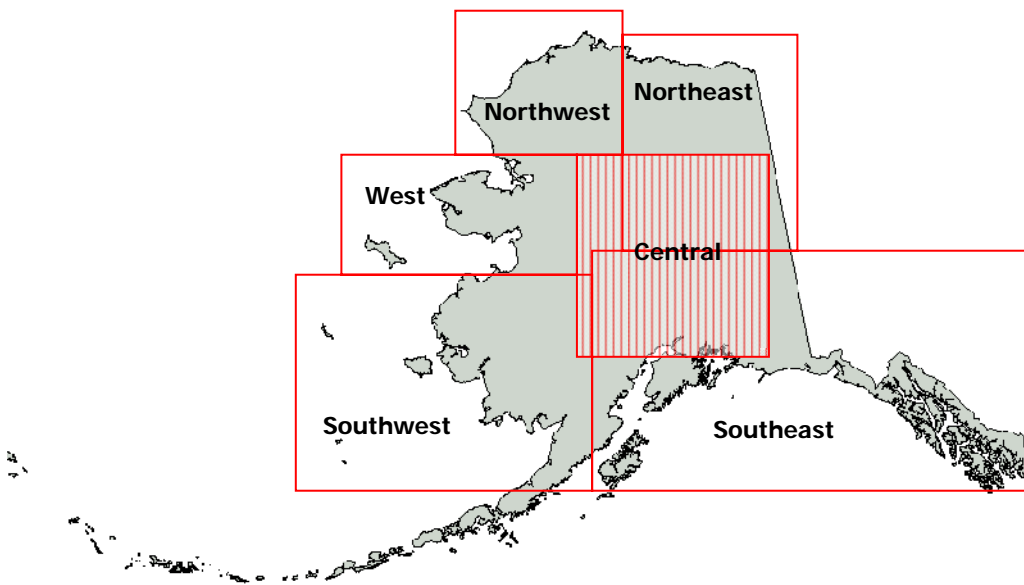
Explore 1: Load Your Data

We can improve the computer's performance by using a smaller piece of the raster data layer used during the last lesson.

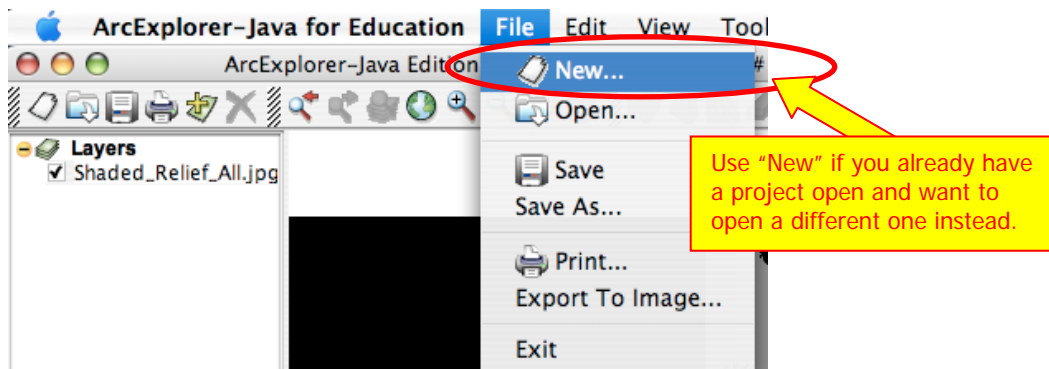
1. **Choose a good raster data layer for your base map and project community** by looking at the picture below. Your teacher can help you.

What is your Project Community? _____

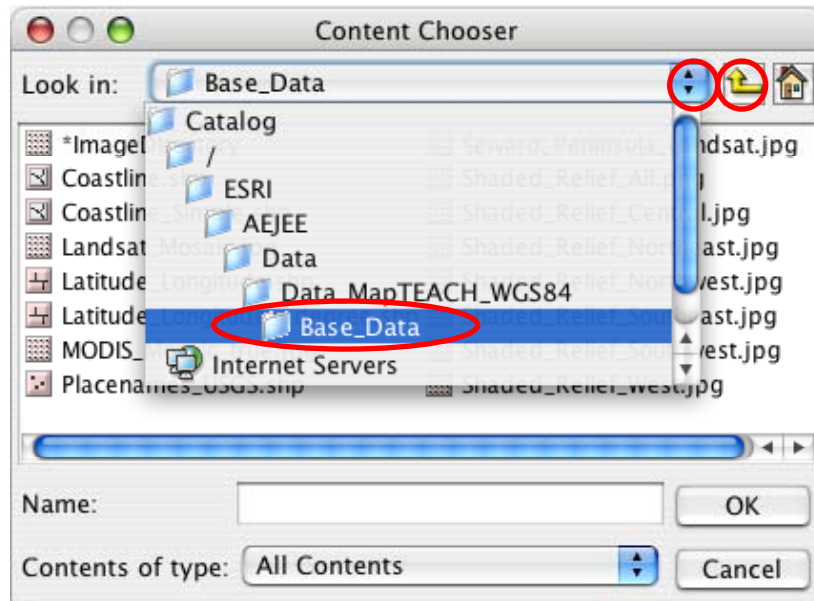
What region is your Project Community in? _____



2. **Start a new AEJEE project.** If you have a previous AEJEE map displayed, you can start a new one by clicking on **"New"** in the **File** menu.



- Use the Content Chooser or Tools/Catalog to **navigate to /ESRI/AEJEE/Data/Data_MapTEACH_WGS84** and choose the **Base_Data** folder.



- In the **Base_Data** folder, use the Content Chooser or Tools/Catalog to **add only** the shaded relief raster layer for your Project Community region:

If your region is **Central**, load **Shaded_Relief_Central.jpg**

If your region is **Northeast**, load **Shaded_Relief_Northeast.jpg**

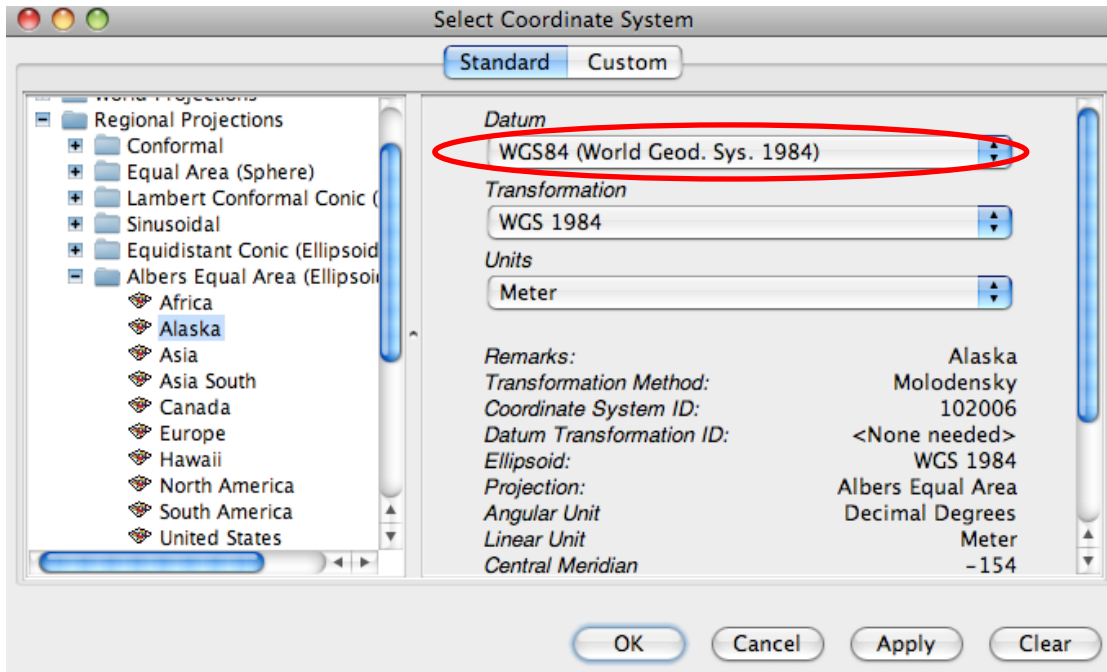
If your region is **Northwest**, load **Shaded_Relief_Northwest.jpg**

If your region is **Southeast**, load **Shaded_Relief_Southeast.jpg**

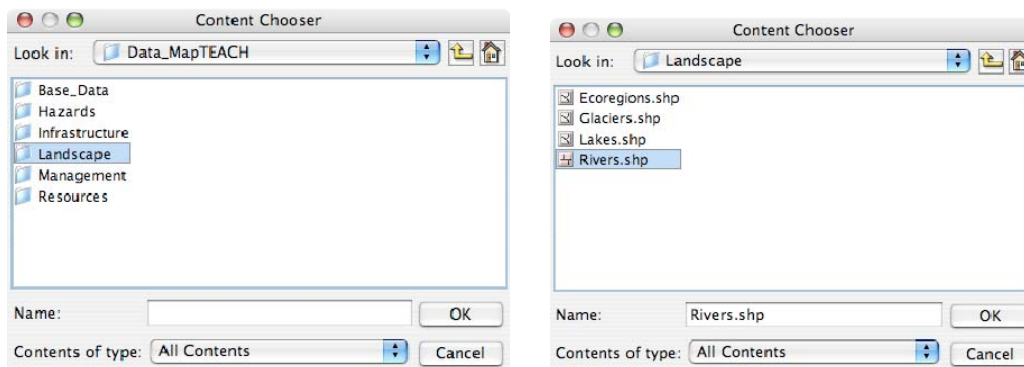
If your region is **Southwest**, load **Shaded_Relief_Southwest.jpg**

If your region is **West**, load **Shaded_Relief_West.jpg**

- Use **Tools/Projection** to open the **Select Coordinate Systems** window to set your projection to **Regional Projections/Albers Equal Area (Ellipsoid)/Alaska**, and change the "Datum" to "WGS84 (World Geod. Sys. 1984)."

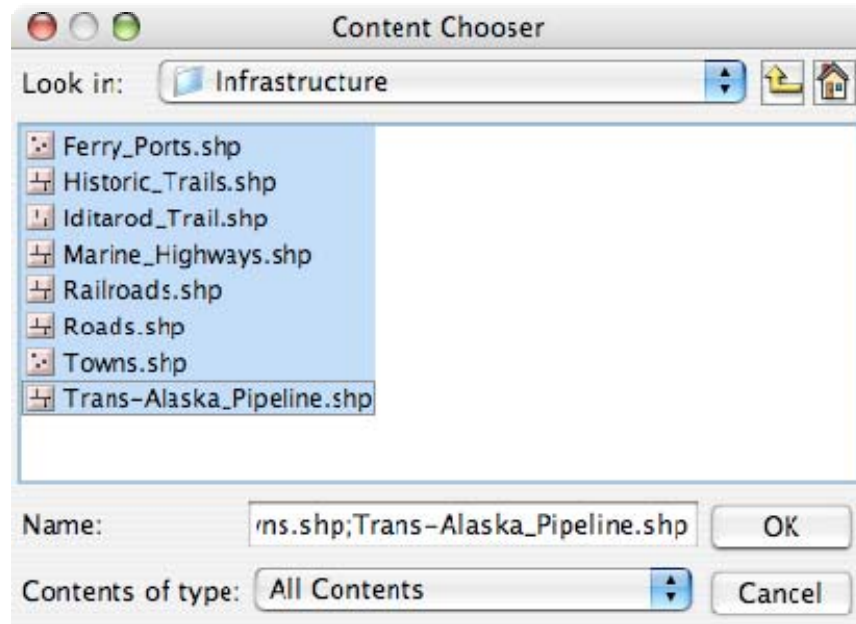


6. Click "OK" and wait patiently until the map redraws.
7. Now, add more layers to your map by clicking on the "Add Data" button for the Content Chooser window or use Tools/Catalog.
8. Navigate to the *Data_MapTEACH_WGS84* folder, find the *Landscape* folder, and load the *Rivers* shapefile.



9. Add multiple layers at the same time by navigating to the *Infrastructure* folder and selecting all the shapefiles.

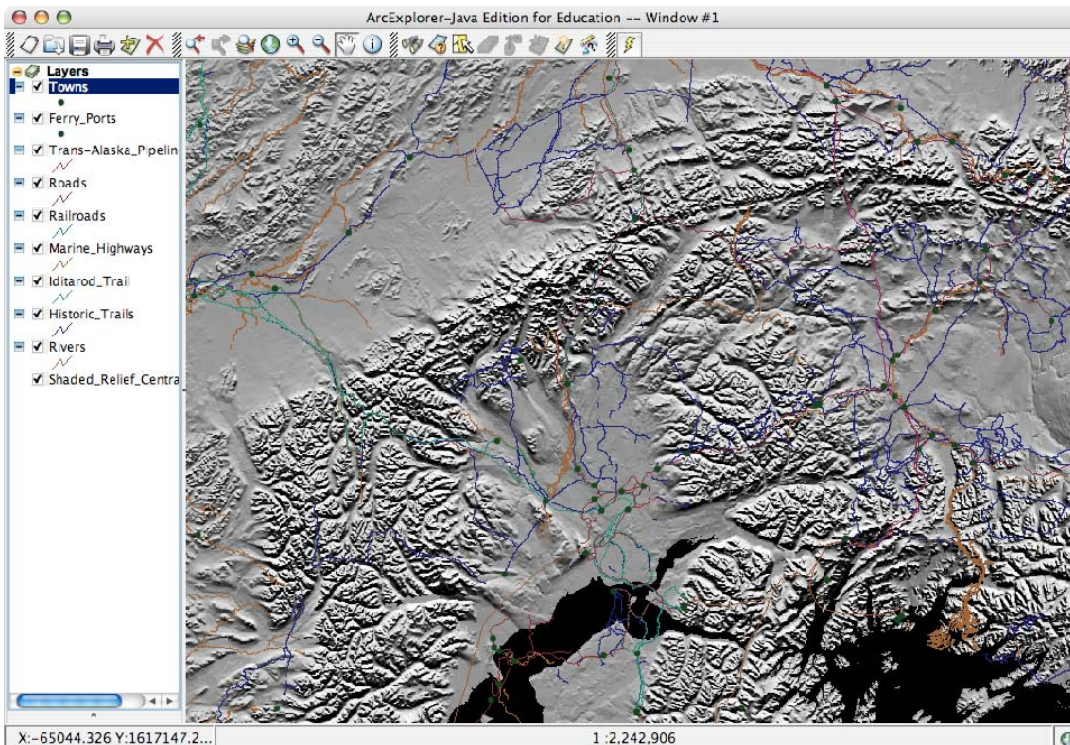
A quick way to do this is to click on the first shapefile in the list, then shift-click on the last name in the list. This will highlight all the shapefiles in the list.



Click "OK" and wait for the layers to load.

10. **Move** the **shaded relief** layer to the **bottom**. (Remember to ctrl-click on the layer, and select "Move Layer" and "Move Layer to Bottom".)

Your map might look something like this:



11. **Save** your map project:

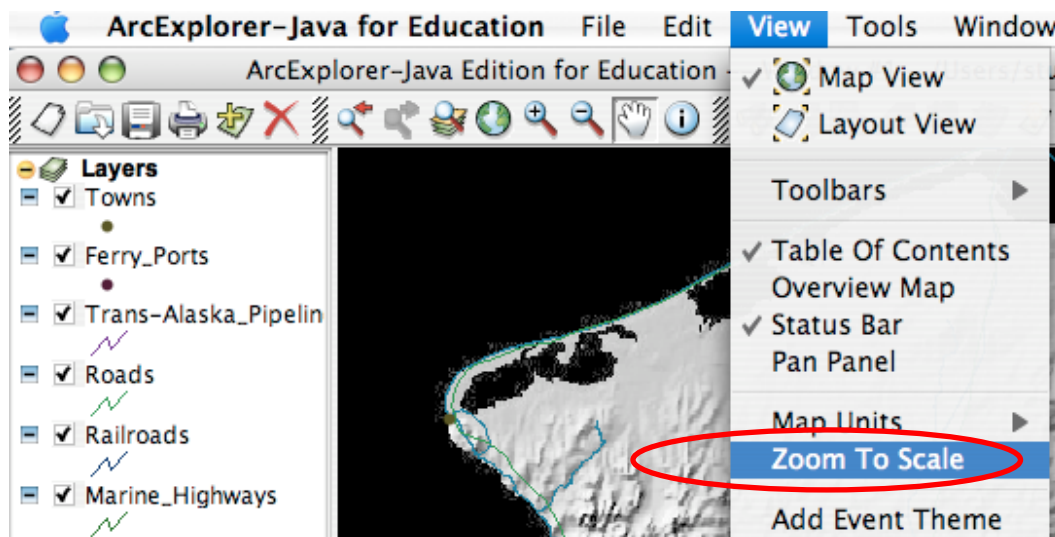
- Select **“Save As”** from the **File Menu**
- **Navigate** to the **student/MapTEACH_Work** folder
- **Name the project** using your full name followed by “projectbase”:
firstname_lastname_projectbase
- Click **“Save”**

Show your map to a teacher.

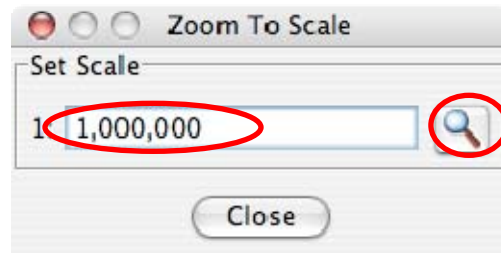
Teacher sign-off: _____
(Check to see that the raster and vector data layers line up)

Explore 2: Improve the Appearance of Your Map

1. **Zoom** in to a scale of 1:1,000,000 by clicking **“Zoom To Scale”** in the **View** menu. This scale is a good scale to see the shaded relief and to show the regional setting of your Project Community.



2. Type in "1,000,000" in the **Set Scale** box and **click on the magnifying glass icon**.



3. **Pan** around until your Project Community is near the center of your map. If you chose a coastal community, you may want to pan the map to include more land than water.
4. Now rearrange and **symbolize your layers so the map looks the way you want it**. Make sure that it is clear and legible so someone else can read it and see what you are showing. Remember that it helps to **turn off raster layers to speed up redrawing** while you work on symbols and labels for the vector data layers. You can turn them on again when finished.

- **Towns Layer**

- make the **symbols** a **style, color**, and **size** you like
- **label** the towns with a **font style, color** and **size** you like

- **Ferry_Ports Layer**

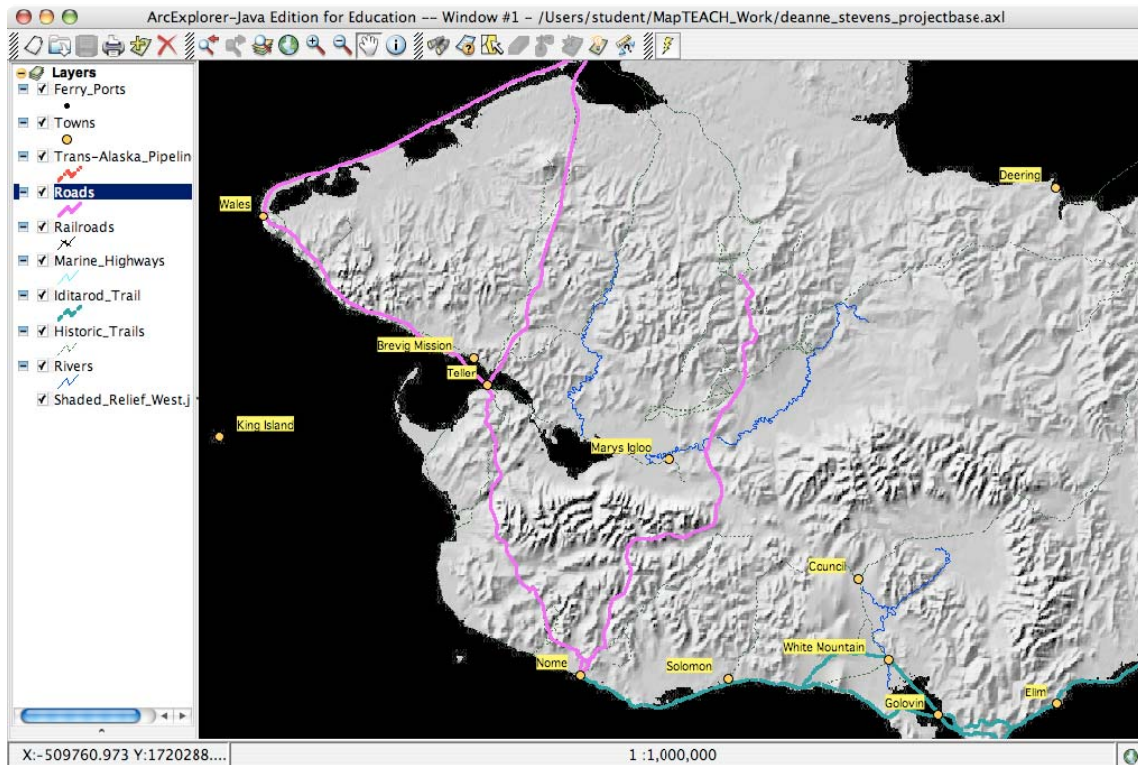
- make the **symbol** a **style, size** and **color** that you like
- choose a symbol you can see underneath or on top of the *Towns* symbol

- **Remaining Layers**

- **Rivers**
- **Trans-Alaska Pipeline**
- **Roads**
- **Railroads**
- **Marine_Highways**
- **Iditarod_Trail**
- **Historic_Trails**

Choose line styles/colors that help each feature stand out from the rest of the map.

Your map might look something like this, but showing a different part of Alaska:



Summarize the Geography of your Project Community

Project Community Name: _____

What is the nearest town to your Project Community? _____

How far away is the nearest town? _____ miles
(Use the **Measure** tool)

Are there any roads into your Project Community _____

Is your Project Community a ferry port? _____

How far away is the Trans-Alaska Pipeline from your Community? _____ miles
(Use the **Measure** tool) [Hint: You may have to zoom way out.]

Are there any marine highways or railroads near your Project Community? _____

Does the Iditarod Trail go through your Project Community? _____

Use the **Identify** tool to name two historic trails that go nearest to your Project Community:

Trail (TRAIL_NAME): _____

Trail (TRAIL_NAME): _____

Look at the shaded relief base map and describe the physical setting of your Project Community:

(For example: My Project Community is right next to a big river in a valley with mountains to the north and flatter land to the south. The valley runs north-south at this town. The river my Project Community is next to starts in mountains to the north and ends in the ocean to the west.)

Save your community base map.

Teacher sign-off: _____