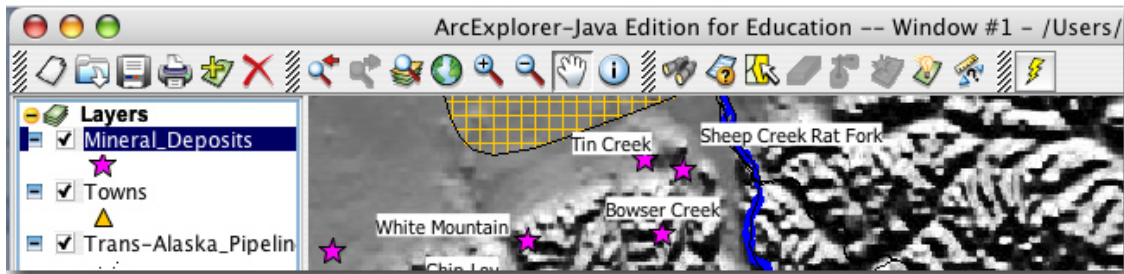


## GIS Lesson 8

### COMMUNITY GIS: NATURAL RESOURCES

#### TEACHER INFORMATION



**Lesson Summary:** Geological resources often play a critical role in the economies of Alaskan communities. During this lesson, students are able to investigate the distribution of resources regionally and locally. The maps students make can help them explore current and potential resource use by their project communities.

**Objectives:** Students will use GIS to map and identify geologic resources near their Project Communities.

**Estimated Time:** 30 minutes

**Correlation to Alaska Standards:**

Geography E-2 Recognize and assess local, regional, and global patterns of resource use.

**BACKGROUND FOR THE TEACHER**

Alaska is known around the world for its wealth of geological resources. Fuels in the form of oil and natural gas, and minerals that include gold and silver are fundamental to the health of the state and local economies. Some resources are less appreciated, like the gravel needed for road and building construction, but are just as essential to communities and commerce. Resources like geothermal energy are just beginning to be tapped.

Students need to learn about the distribution of these natural resources to understand their influence on Alaskan history and their potential for continuing to fuel the state's future. This lesson helps students to visualize the general statewide geography of geological resources and to identify which resources are close to their project communities. GIS tools draw upon scientific mapping data gathered by MapTEACH, but originally made available to the public from state and federal sources (primarily the Alaska State Geospatial Data Clearinghouse).

Some Important Concepts and Tips for Success:

- Community planners promote the best use of a community's land and resources for residential, commercial, institutional, and recreational purposes. They address environmental, economic, and social health issues of a community as it grows and changes.
- If possible, bring in a local expert to talk about their work with geological resources, and the role maps play in it.
- Oil and natural gas are often found together, in fields up to several hundred kilometers across, often dotted by wells that extract these resources. The slow decay of ancient organic matter deep under the Earth's surface creates these fields.
- Coal deposits can also be found in fields covering large areas. This energy resource is extracted from both surface and underground mines.
- A mineral is any substance created through geological processes that is chemically distinct from others, unlike rocks that are a mixture of minerals. Mining minerals for commercial value is an important economic activity in many Alaskan communities. The non-fuel minerals of interest are metals that include: gold, zinc, lead, silver, and copper.
- Placer gold mining, or the extraction of gold concentrated in gravel and sand deposits, takes place in operations that range from very large to very small. Most Alaskans and many visitors have tried their hand at panning for gold.

**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](mailto: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.

### **Gear-up**

- Many students (and teachers!) have spent some amount of time out 'looking for color', and panning for gold is a good practical point of reference for talking about the distribution of geologic resources. Students can describe the kinds of places and general locations that may produce significant amounts of precious metals.

This lesson's topic can also be introduced by asking student where relatives or friends are working in the oil or gas industry, or by talking about recent big finds or developments. The important goal here is to help students correlate their personal and anecdotal knowledge of resources with a systematic mapping of geologic resources based on the work and research of geoscientists.

- Restrict or prevent student access to distracting activities like chat, email or social networking sites.
- Point out to students that this is another activity where they bring their GIS skills 'home'. Encourage them to think ahead to how maps can help their project communities make best use of land and resources.

## **TEACHER RESOURCES**

Secondary level education resources identified or developed by the US Geological Survey can be found at <http://education.usgs.gov/secondary.html#geology>

## **RESOURCES FOR STUDENTS OR TEACHERS**

Guide to Alaska Geologic and Mineral Information (2004) states that it is "intended to be a jumping-off point for basic and specialized research into the geology of Alaska, and the resources and issues involved in exploration for metallic mineral deposits in Alaska. It is designed to give users a broad overview of the many resources available to them—from library facilities and holdings to State and Federal agencies that publish research and oversee mining and exploration activities to online databases, publications, and catalogs."

<http://www.dggs.dnr.state.ak.us/pubs/pubs?reqtype=citation&ID=3318>

Alaskan Oil and Gas Studies website at the US Geological Survey lays out an overview of several energy-related efforts currently under way in Alaska. Geographically, these range from the Alaska Peninsula to the North Slope. Several are collaborative efforts with Federal and State agencies and Alaska Native villages. Links to GIS data are included.

<http://energy.usgs.gov/RegionalStudies/Alaska.aspx>

Alaska's North Slope is an online interactive map from National Geographic (Sep. 2006). Some see Alaska's North Slope as a lush ecosystem that needs more protecting. Others see it as a storehouse of oil—up to 48 billion barrels—waiting to be tapped, and needed for economic development and national security. The Arctic National Wildlife Refuge has been at the center of the debate, but leases have spread westward on the North Slope.

<http://ngm.nationalgeographic.com/ngm/0605/feature1/map.html>

The Alaska Science Center site leads to a comprehensive overview of natural resources (including geological) issues and natural hazards assessments in Alaska and circumpolar regions. See their interactive map portal for information and reports about places in Alaska. <http://alaska.usgs.gov/index.php>

To learn more about Coal Resources, which account for more than 50% of the nation's electrical energy, start at the USGS site.

<http://energy.usgs.gov/Coal.aspx>

USGS Mineral Resources Data System (MRDS) describes metallic and nonmetallic mineral resources throughout the world and a smaller data set for North America, including Alaska. Included are deposit name, location, commodity, deposit description, geologic characteristics, production, reserves, resources, and references. Can download as shapefiles or Google Earth KML.

<http://tin.er.usgs.gov/mrds/>

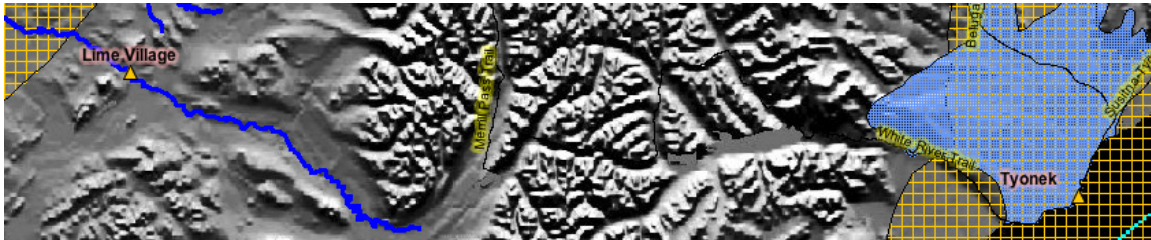
The Planning and Land Management Section for the state Division of Community and Regional Affairs includes links to Community Profile Maps. Requires installation of Mr. SID format viewer.

<http://commerce.alaska.gov/dca/profiles/profile-maps.htm>

Name: \_\_\_\_\_

Project Community: \_\_\_\_\_

**GIS Lesson 8**  
**COMMUNITY GIS: NATURAL RESOURCES**  
**STUDENT EXERCISE**



**Objectives:** Students will use GIS to map and identify natural resources near their Project Communities.

**Estimated Time:** 30 minutes

Natural resources are an important factor for community planners. Resources can contribute to a community's wealth and job pool. Resource development can also have impacts on a community's lifestyle because development usually requires more roads and other infrastructure.

In this lesson, you will map and explore GIS data about some different kinds of geologic natural resources to answer questions about resources that may be available to provide income for your Project Community.

**Explore: Community Natural Resources**

First, **start up ArcExplorer-Java Edition for Education (AEJEE)**

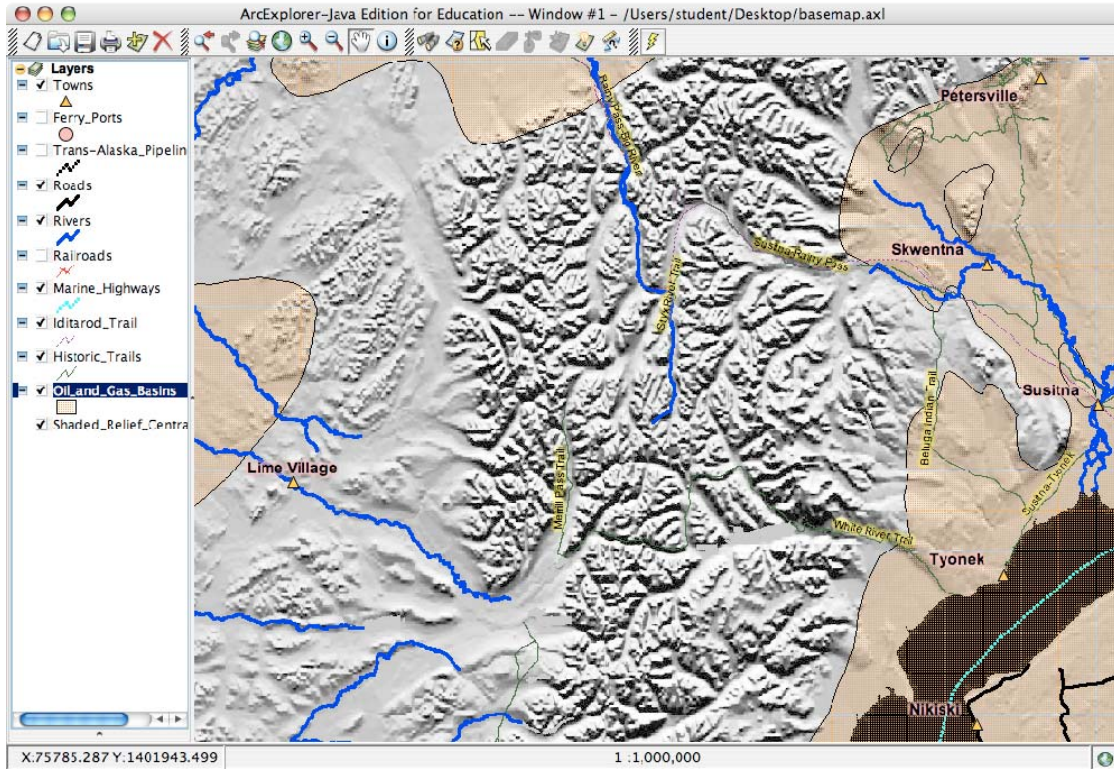
**Make your window bigger** by clicking on the green button in the top left of the window.

**Open your project base map:**

- **Click** on **"File"** in the Menu Bar
- Select **"Open"**
- **Navigate** to the **student/MapTEACH\_Work** folder
- **Click** on the file name **firstname\_lastname\_projectbase.axl** and **click "Open"**
- Wait a few minutes while your map re-loads

1. **Add *Oil\_and\_Gas\_Basins*** from the **Resources** folder. This polygon layer shows Alaskan oil and gas deposits.
  - **Move *Oil\_and\_Gas\_Basins*** so it is on top of the shaded relief layer.
  - **Symbolize** the oil and gas layer any way you like so it looks good on your map – since this is a polygon layer, you may want to use a pattern instead of a solid color so you can see the shaded relief that is underneath it.

Your map might look something like this:



Is your Project Community located in an oil and gas basin? \_\_\_\_\_

How far away is the nearest oil and gas basin? \_\_\_\_\_ miles  
(Use the Measure tool.)

Do you think that oil and gas are potential resources for your Project Community?

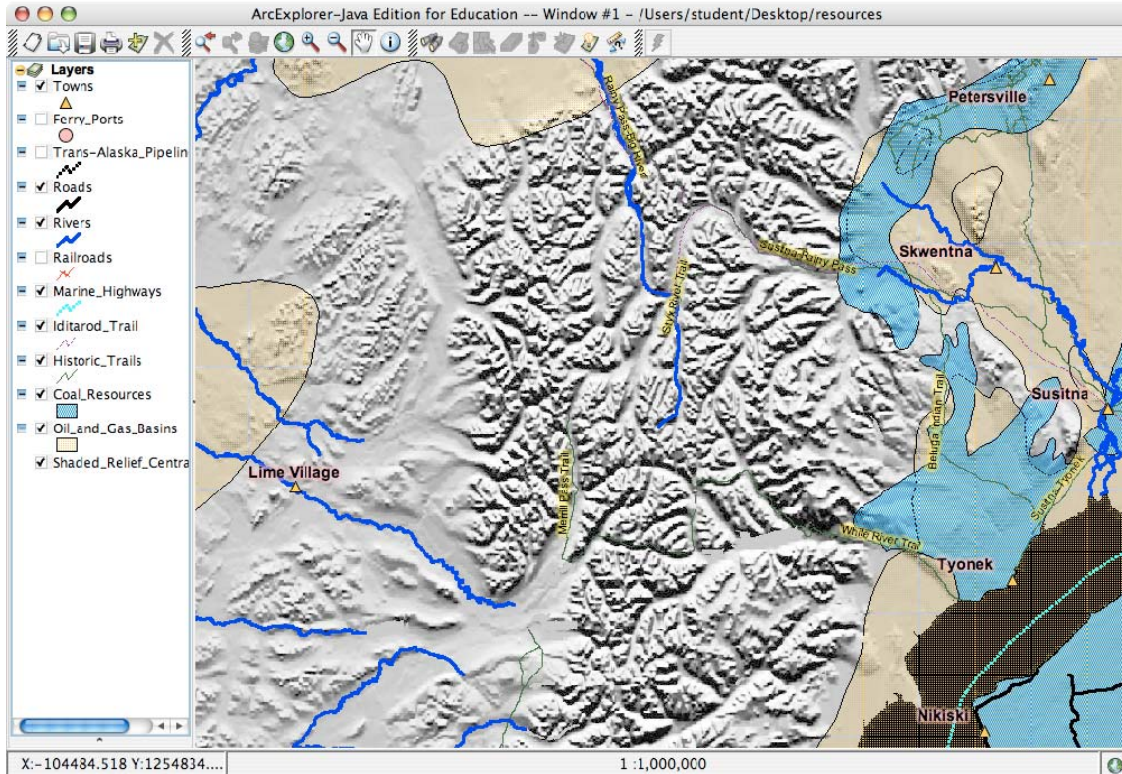
\_\_\_\_\_

Why or why not? \_\_\_\_\_

\_\_\_\_\_

2. **Add *Coal\_Resources*** from the ***Resources*** folder. This polygon layer shows Alaskan coal deposits.
  - Make sure ***Coal\_Resources*** is on top of the shaded relief layer and **symbolize** it any way you like so it looks good on your map – again, since this is a polygon layer, you may want to use a pattern instead of a solid color.

Your map may look something like this:



Is your Project Community located on a coal deposit? \_\_\_\_\_

How far away is the nearest coal deposit? \_\_\_\_\_ miles  
(Use the Measure tool.)

Do you think that coal is a potential resource for your Project Community?

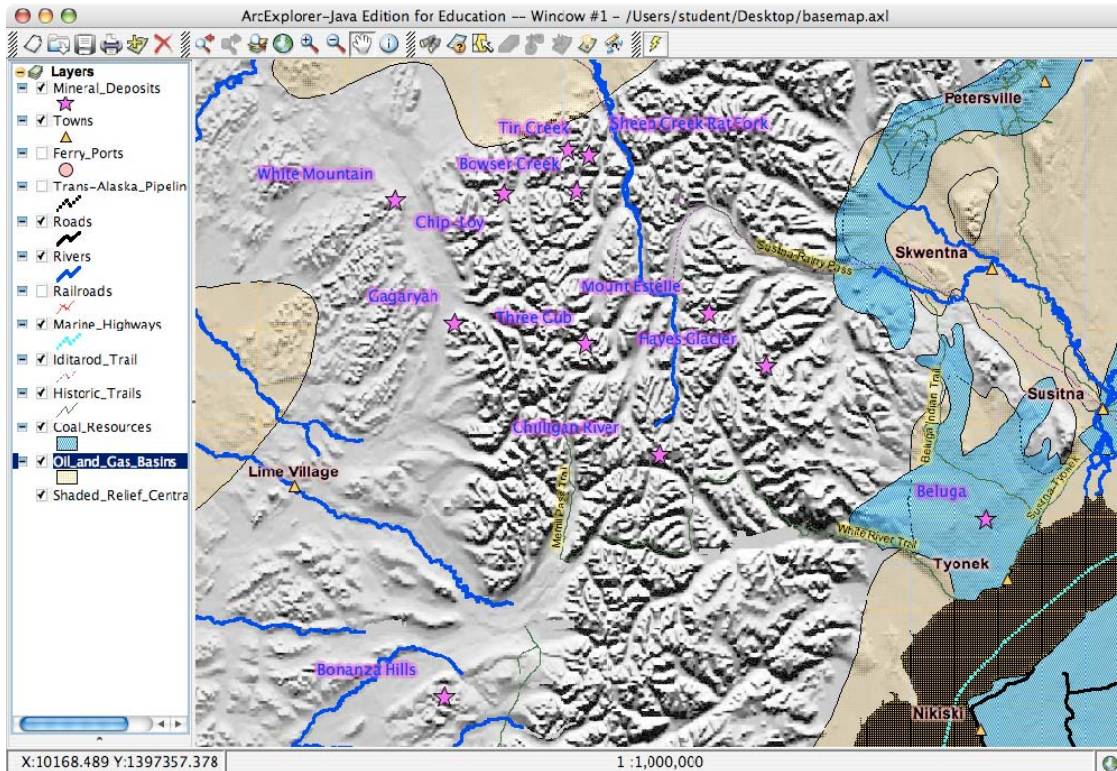
\_\_\_\_\_

Why or why not? \_\_\_\_\_

\_\_\_\_\_

3. **Add *Mineral\_Deposits*** from the ***Resources*** folder. This point layer shows Alaskan valuable mineral deposits.
  - Make sure ***Mineral\_Deposits*** is on top of the shaded relief layer and **symbolize** it any way you like so it looks good on your map. You can even label the points representing mineral deposits with names or commodities (the type of mineral resource), if you like.

Your map may look something like this:



Is your Project Community located near any mineral deposits? \_\_\_\_\_

How far away is the nearest mineral deposit? \_\_\_\_\_ miles  
(Use the Measure tool.)

What is the name of the nearest deposit (NAME)? \_\_\_\_\_  
(Use the Identify tool.)

What valuable mineral resources are present in that deposit (COMMODITY)?  
\_\_\_\_\_  
\_\_\_\_\_



Use this list of most of the industrial minerals found in Alaska to help answer the question above. A complete, official list of Mineral Map Symbols can be found by searching on the USGS site at <http://minerals.usgs.gov/minerals/pubs/country/maps/mapkey.html>

Silver	Ag	Carbonatite	C	Jade	J	Tin	Sn
Aluminum	Al	Calcium Carbonate	CaCO3	Molybdenum	Mo	Tantalum	Ta
Arsenic	As	Coal	Coal	Niobium	Nb	Thorium	Th
Asbestos	Asb	Chromium	Cr	Nickel	Ni	Titanium	Ti
Gold	Au	Copper	Cu	Lead	Pb	Uranium	U
Barite	Ba	Iron	Fe	Platinum Group Elements*	PGE	Vanadium	V
Beryllium	Be	Fluorine	Fl	Rare Earth Elements**	REE	Tungsten	W
Bismuth	Bi	Mercury	Hg	Antimony	Sb	Zinc	Zn

\*The six platinum group metallic elements are Platinum (Pt), Palladium (Pa), Iridium (Ir), Osmium (Os), Rhodium (Rh), and Ruthenium (Ru).

\*\*Rare Earth Elements include thirty elements in the Lanthanide and Actinide Series.

You can learn more about the worldwide supply, demand, and flow of minerals and materials essential to the U.S. economy, national security, and protection of the environment by starting at <http://minerals.usgs.gov/minerals/pubs/commodity/> and by searching online.

Do you think that mineral deposits are potential resources for your Project Community?

\_\_\_\_\_

Why or why not? \_\_\_\_\_

\_\_\_\_\_

This GIS lesson has dealt only with geologic natural resources. Based on your knowledge about Alaska and your Project Community, what other kinds of natural resources do you think might be available for your community?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Do you think these other types of natural resources could be mapped using GIS?

\_\_\_\_\_

4. **Save** your map project:

- **Click** on **"File"** in the Menu Bar
- Select **"Save As"**
- **Navigate** to the **student/MapTEACH\_Work** folder
- **Name the project** using your full name followed by "resources":  
**firstname\_lastname\_resources**

You now have a project that contains all the resources layers. If you decide you want to make a geologic natural resources map of your Project Community for your final project, this is the GIS project file that you can use to start with.

**Have your teacher review your work.**

**Teacher sign-off:** \_\_\_\_\_

***(REMEMBER TO SAVE YOUR PROJECT!!)***