Place-Based Geospatial Education for Alaska
Teacher and Student Guide
Grades 6-12

MapTEACH

PLACE-BASED GEOSPATIAL LEARNING AND APPLICATIONS IN ALASKA

Mapping **T**echnology **E**xperiences with **A**laska's **C**ultural **H**eritage

www.mapteach.org

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Minto School
Native Knowledge Network
Nenana Living Center
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Nenana Senior Center
Nenana Tribal Council
Nenana Wellness Coalition
Nome-Beltz High School
Northwest Alaska Career and Technical Center (NACTEC)
Northwest Arctic Borough School District
Old Minto Culture Camp
Sitnasuak Native Corporation
XYZ Club Senior Center
The communities of Fairbanks, Nome, Nenana, and Minto
And many others...

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Digital versions of this Teacher and Student Guide, as well as additional maps, PowerPoint Presentations, Software, and Data are available on DVD or online from MapTEACH at:

www.mapteach.org

MapTEACH: PLACE-BASED GEOSPATIAL LEARNING AND APPLICATIONS IN ALASKA

MapTEACH (Mapping Technology Experiences with Alaska's Cultural Heritage) is an educational curriculum for middle and high school students designed to help them both (1) understand the physical and cultural features of their environment, and (2) use mapping technologies to enhance and portray that new understanding. As such, it emphasizes the integration of three focus areas: geoscience, local landscape knowledge, and geographic information science (GPS, GIS and remotely sensed imagery). MapTEACH gives Alaskan students the opportunity to make a connection between traditional ways of viewing the landscape, scientific ways of making observations about the landscape, and the process of using cutting-edge information technologies to gather and disseminate information about the landscape. At its core, this curriculum is place-based and interdisciplinary in nature, and seeks to connect students, teachers, community members and scientists in an exploration of the local landscape from multiple perspectives. Lessons are organized into the following sections for ease of use:

Section 1: ***Place Names and Landmarks***
These lessons seek to answer the question "How do you know where you are?" by grounding students in an appreciation of their own mental maps and then expanding this to include understanding and documentation of the place names and landscape knowledge of local experts. This work is based on the belief that there are many ways to "know" where you are and that each way of knowing contributes to our overall understanding of the landscape.

Section 2: ***Remote Sensing and Geology***
These hands-on lessons introduce students to remotely sensed imagery by exploring local air photo imagery, stereo pair photographs and topographic maps and by using these maps and imagery to evaluate river erosion and change over time. These lessons are not only interesting and relevant in their own right, but provide a solid introduction to the imagery used in several of the GIS lessons.

Section 3: ***Global Positioning System***
These lessons guide students through the basic uses of handheld Global Positioning System (GPS) units by finding and placing geocaches, documenting waypoints, and downloading location information into a computer in order to create a map of a place or a journey.

Section 4: ***Geographic Information Systems***
These lessons enable students to use GIS mapping technology to enhance and portray their understanding of the world around them by: (1) exploring the fundamental concept that maps are made of layers of data and a computer

allows us to stack these layers in many different ways; and (2) manipulating existing data layers and adding their own data to generate original maps of personal, cultural or scientific interest.

As can be seen in Tables 1 – 4 below, each section has a coherent set of goals and, with a few exceptions, lessons in each section are sequential so that they can be worked through in part or in whole in the order presented. In practice, however, the lessons are intended to be used in a variety of combinations, mixing and matching lessons from several sections to achieve desired learning outcomes and timeframes. Table 5 demonstrates how different elements of this curriculum might be adapted to suit unique classroom needs by describing several potential lesson sequences.

Several of the lessons included in the MapTEACH curriculum involve making digital maps using GPS and other data collected locally by students. Satellite imagery can be a useful and informative base map layer upon which students can display their own data. It is not feasible for MapTEACH to be able to anticipate every possible area that any given student project would need satellite base map data for, therefore we have developed two procedures so teachers (or advanced students) can generate their own image layers for use in their local-area digital mapping projects. These procedures can be found in the Appendix.

We expect and hope that as you become more familiar with this curriculum, you will find new ways to use and adapt these lessons and make them your own. We hope you will share these adaptations with us and also let us know what we might do next to make this curriculum more responsive to your needs.

Table 1 – Place Names and Landmarks Lessons

Lesson Name	Lesson Summary
PNL 1 - Mental Maps	This activity introduces the essential question for the unit: "How do we know where we are?" and sets the stage for the unit through a mental map activity and class discussion.
PNL 2 - Simon Paneak Sketch Maps	Students examine and discuss the sketch maps and life story of Simon Paneak, a Nunamiut hunter from Anaktuvuk Pass, as an example of the extensive landscape knowledge often held by mature Alaska Native hunters and travelers.
PNL 3 - Working with Local Experts	Students become more familiar with local landmarks, place names and stories as they listen to and work with a local landscape expert.
PNL 4 - What's in a Name?	Students study an Inupiaq place names map of the John River area, read the accompanying stories, discuss their significance and then brainstorm a list of place names for their own area.
PNL 5 - Picking Points off a Paper Map	Students identify place names or landmarks on a topographic map and use TopoZone, a web-based mapping program, to determine the latitude and longitude of these sites. These coordinate locations can then be used in digital map-making or way-finding with a GPS.
PNL 6 - Place Names Field Trip	Students complete classroom preparation and go on a field trip to document local place names and landmarks.

Table 2 – Remote Sensing / Geology Lessons

Lesson Name	Lesson Summary
RSG 1 – Air Photo Interpretation	This activity introduces students to color infrared (CIR) air photo interpretation. Students examine a CIR air photo of their community, identify prominent features and interpret what those features might be through use of an air photo key.
RSG 2 - Seeing in Stereo and Route Finding	At stations set up around the room, students view and interpret stereo pair air photos in three dimensions (3-D), compare them with topographic maps of the same area and determine which route is "best." Students also discuss the advantages and disadvantages of each image with regard to finding your way.
RSG 3 – Evaluating Erosion	Students examine several air photos of Alaskan rivers and identify areas of erosion and deposition.
RSG 4 – Change Over Time	Students study a chronological series of images and maps of Fairbanks or Nenana, looking for evidence of changes over time

Table 3 – Global Positioning System Lessons

Lesson Name	Lesson Summary
GPS 1 – Introduction to GIS with Geocaching	Students learn how to use GPS units to perform a variety of tasks. They learn how to: adjust the settings of the units; enter and mark waypoint information; find geocaches; and place a geocache.
GPS 2 – Field Data Collection for GPS Data and Digital Photo Documentation	Students go on a field trip to collect geospatial data and other useful information to document sites of interest they encounter.
GPS 3 – Using Your Own Field Trip Data	Students make GIS maps using data they have collected on a local field trip with their GPS units and digital cameras. They download their photos and GPS waypoints into a CSV file and then make a map of their sites that includes photos they took on their field trip.
GPS 4 – Hotlinking to a Field Trip Data Document	Students create Word documents describing their field trip sites and then learn how to hotlink the points in a GIS project to these Word documents thus creating an interactive map.
GPS 5 – Using Track Log Data	Students make GIS maps using track log /trail data they have collected on a local field trip with their GPS units and digital cameras.

Table 4 – Geographic Information Systems Lessons

Lesson Name	Lesson Summary
GIS 1 – Many Layers Make a Map	Students brainstorm a list of information portrayed on topographic maps sort that information into categories or themes and then trace a few layers onto mylar in imitation of GIS layers/themes.
GIS 2 – Introduction to GIS Using AEJEE	Students are introduced to the use of GIS as a way to make customized maps. Students learn to: add layers, set projection, modify the appearance of the map and label features on it.
GIS 3 – Working with GIS Data: View, Label, Measure and Identify	Students learn some of the key qualities of GIS that make it more dynamic and powerful than paper maps. They learn new ways to view the information held in a GIS, and begin asking questions and solving problems.
GIS 4 – Maps with Raster Images I: Statewide Shaded Relief	Students work with a shaded relief image of Alaska and answer questions about what they can observe.
GIS 5 – Maps with Raster Images II: Local Shaded Relief Base Map	Students use a shaded relief raster layer and several vector layers to make a base map, centered on their community. The base map they construct during this exercise will be used as a starting point for several future GIS lessons.
GIS 6 – Maps with Raster Images III: Satellite Imagery	Students use GIS to load and view true-color and enhanced satellite images of Alaska. Based on their knowledge of Alaskan geography and recent image interpretation experiences, they interpret features found in the satellite images.
GIS 7 – Community GIS: Geologic Hazards	By choosing an Alaskan community as a starting point, students investigate and map geologic hazards that may affect that community directly. In turn, students begin to see how the geology and climate of a place sets the stage for specific hazardous events.
GIS 8 – Community GIS: Natural Resources	Geological resources often play a critical role in the economies of Alaskan communities. During this lesson, students 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.
GIS 9 – Community GIS: Land Management	Who decides what is done with land in Alaska? Using GIS tools and information, the students investigate land ownership and management units and the distribution of resources beginning with their project community and expanding outward. The maps students make can help them explore current and potential resource use by their project communities.

GIS 10 – Good Map – Bad Map	The teacher reviews basic cartographic guidelines, and then shows an example AEJEE map that is cartographically incorrect, incomplete, and poorly designed. Students critique the map. A correct, complete, and attractively designed map is then reviewed for comparison.
GIS 11 – Community GIS: Map Layouts	Beginning with the base map created in GIS 7 -Community GIS: Geologic Hazards, students make map layouts that can be saved and printed as paper maps and used for reports or presentations.
GIS 12 – Adding Coordinate Locations into a GIS	Students use Serpentine Hot Springs on the Seward Peninsula as an example site to learn how to manually add coordinate data into a GIS project by creating a *comma separated values* file (.csv) and importing it into an AEJEE project
GIS 13 - Hotlinking	Students modify the Serpentine Hot Springs csv file created in GIS 12 as an example site to learn how to hotlink data in a GIS project to a website about the hot springs, thus creating an interactive map.
GIS 14 – Change Over Time – Shorefast Sea Ice	Students use GIS to analyze changes in the extent of shorefast sea ice. They extract information from multi-year and single year data and look for trends over time.

Table 5 - Sample MapTEACH Lesson Groupings

Goal	Time (Hours)	Field Work	Equipment	Lessons
Brief introduction to Native place names	3	No	None	PNL 1 – Mental Maps PNL 2 – Simon Paneak Sketch Maps PNL 4 – What's in a Name?
Brief introduction to GPS receivers	3	Yes	• GPS Receivers • Digital Cameras	GPS 1 – Introduction to GPS with Geocaching GPS 2 – Field Data Collection Using a GPS and Digital Camera
Brief introduction to GIS	3	No	Computers*	GIS 1 – Many Layers Make a Map GIS 2 – Introduction to GIS using AEJEE GIS 3 – Working with GIS Data
Landscape change over time	4	No	Computers*	RSG 1 – Air Photo Interpretation RSG 4 – Change Over Time GIS 2 – Introduction to GIS using AEJEE GIS 14 – Change Over Time – Shorefast Ice
Using GIS to create local maps	8+	Yes	• Computers** • GPS Receivers • Digital Cameras	GIS 1 – Many Layers Make a Map GIS 2 - Introduction to GIS using AEJEE GPS 1 – Introduction to GPS with Geocaching GPS 2 – Field Data Collection Using a GPS and Digital Camera GIS 10 – Good Map/Bad Map GPS 3 – Using Your Own Field Trip Data GPS 4 – Hotlinking to a Field Trip Document
Using GIS for community planning	10	No	Computers*	GIS 1 – Many Layers Make a Map GIS 2 - Introduction to GIS using AEJEE GIS 3 – Working with GIS Data GIS 4 – Statewide Shaded Relief GIS 5 – Local Shaded Relief GIS 6 – Satellite Images GIS 7 – Geologic Hazards GIS 8 – Natural Resources GIS 9 – Land Management GIS 10 – Good Map/Bad Map GIS 11 – Map Layouts

* Loaded with AEJEE software and data
** Loaded with AEJEE software and GPS Babel

Goal	Time (Hours)	Field Work	Equipment	Lessons
Using GIS to create local place names maps	15	Yes	•Computers** • GPS Receivers • Digital Cameras	PNL 1 – Mental Maps PNL 2 – Simon Paneak Sketch Maps PNL 3 – Working with Local Experts PNL 4 – What's in a Name? GPS 1 – Introduction to GPS with Geocaching GPS 2 – Field Data Collection Using a GPS and Digital Camera GIS 1 – Many Layers Make a Map GIS 2 – Introduction to GIS using AEJEE PNL 6 – Field Trip Guide GIS 10 – Good Map, Bad Map GPS 3 – Using Your Own Field Trip Data GPS 4 – Hotlinking to a Field Trip Document

MapTEACH:

Place Names and Landmarks (PNL)

PNL Lesson 1
INTRODUCING THE UNIT AND MENTAL MAPS
TEACHER INFORMATION

Lesson Summary: This activity introduces the essential question for the unit: "How do we know where we are?" and sets the stage for the unit through a mental map activity and class discussion.

Objectives: Students will understand that mental maps are "maps of the mind;" and that they are important tools because they are the maps that we think with.

Estimated Time: 45 minutes

Correlation to Alaska Standards:
Geography A Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.

BACKGROUND FOR THE TEACHER
When most of us think of finding our way or knowing where we are, we think of paper maps—the street, topographic and shaded relief maps of our classrooms, or the digital images so prominent on televisions and computers. But when it comes to knowing where you are in the world, we rarely think first of the maps we have in our heads; the mental maps that do the daily and unseen work of helping us know where we are.

Such mental maps are models in our mind—the images and memories of places and events that we carry in our heads. These models enable us to know quite well where we are or in what direction to go without consulting a physical map. We have mental maps of our room, the local store, our town, other places we have visited and even places we have never been to but about which we have acquired information. Mental maps are important geographic and cultural tools because they are one way that we make sense of the world. They help us store and recover information and connect with places, events, environments and people. They are the maps we think with.

Mental maps help individuals navigate but can also be shared with others to communicate the location of something: "It's directly across the street from the general store." This relational system works well as long as the landmark descriptions are distinct and sufficient for the listener to navigate. Landmarks can be as prominent a feature as a mountain or river, or as common as a stop sign or a building of particular color. Landmarks can also be places of historical, aesthetic or cultural importance.

It is important to note that when students sketch their mental maps, they are attempting to capture a rich, varied and multi-dimensional set of images on paper. Depending upon their prior experience with maps, their sketches may or may not be accurate to scale, location and cardinal direction. That's okay. The point of this lesson is simply to help them become aware of their mental maps and to realize how valuable they are. As map work proceeds, their knowledge of place will change and they may want to re-draw their mental maps several times to reflect this evolving understanding.

MATERIALS

- Pencils
- Writing and drawing paper
- Erasers
- Tape

INSTRUCTIONAL PROCEDURES

Gear-Up

- Ask students: “How do you know where you are? If you were going from your bedroom to your neighbor's house, how would you find your way?” Ask them to picture the route in their mind and then listen as a few others explain their routes.
- Ask as many questions and do as much probing as necessary to get students discussing what they see in their mind. Don't accept “I just know” for an answer. Listen for landmarks, spatial references and descriptions. Then explain that geographers call these internal images “mental maps,” and explain what a mental map is.
- Expand the distance of this imaginary trip to something a little more complicated but still within their reach (for example, from school to the store, the store to home and then home to church) and explain that their job is to explain to outsiders how to get to there. They can either draw a map or write written directions that explain the route.

Explore

Provide each student with a pencil and with writing or drawing paper. If they choose to draw, explain that this is not about creating a beautiful map, but about trying to show how to get from here to there.

Generalize

- Ask student volunteers to either read their directions or show their maps to the class (and tape maps to the wall next to one another for comparison in the next step).
- As students are sharing, start a large class list of landmarks used (houses, stop signs, streets, stores, mountains, rivers, etc.).

- After volunteers have shared their directions and/or maps, guide students in a comparison of maps asking questions such as:
  - How are these maps alike (area and features shown, detail, spatial arrangement)?
  - How are these maps different?
  - What places were chosen most frequently as landmarks or references and why?
  - Were the written directions or drawn maps more helpful and why do you think so?
- Reinforce the idea that we generally know where we are because we have mental maps to think and navigate, and that these mental maps are:
  - Formed from our experience
  - Contain useful geographic and cultural information
  - Needn't be standardized to be valuable.

Apply/Assess Options

Journal entry prompt: Think of someone you know who travels your area extensively for hunting, fishing, trapping, etc. What do you think their mental map might look like? What kinds of landmarks might they use? How might their map be different from yours and why do you think so?

MORE EXPLORATIONS

- Narrow or enlarge the mental map area (for example, the classroom, school yard, state of Alaska) or ask all students to draw a mental map of the area you are about to study. For either of these extensions— and before students start drawing, —have them make a list of the places and things that they want to include on the map. Have them think about places they usually go, places where friends or relatives live and favorite places. How do they get to these places (roads, paths, trails, shortcuts)? What kinds of things do they see along the way? What kinds of reference points (landmarks) do they use for orientation?
- Create a large, classroom mental map, including important landmarks that have been identified. (Note: classroom negotiation of a common map can be very interesting and also very time-consuming.)
- Provide time throughout the unit for students to enhance/change their sketch maps to reflect new understanding.
- Invite in a local expert who has traveled your area extensively to share his/her mental map and stories.

TEACHER REFERENCES

University of Waterloo. 2003. “The Nature of Maps.” Available online at:
http://www.fes.uwaterloo.ca/crs/geog165/maps.htm#Recommended%20Readings

PNL Lesson 2
SIMON PANEAK'S SKETCH MAPS
TEACHER INFORMATION

Lesson Summary: Students examine and discuss the sketch maps and life story of Simon Paneak, a Nunamiut hunter from Anaktuvuk Pass, as an example of the extensive landscape knowledge often held by mature Alaska Native hunters and travelers.

Objectives: Students will understand that mental maps can be highly detailed and sophisticated images of the landscape that aid in navigation and reflect a sense of who people are in relationship to place.

Estimated Time: 1 hour

Correlation to Alaska Standards:

Cultural E-2	Understand the ecology and geography of the bioregion they inhabit.
Geography A	Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.
Geography B	Utilize analyze, and explain information about human and physical features of places and regions.

BACKGROUND FOR THE TEACHER

Alaska Native people have navigated the land for thousands of years using extensive mental maps. Such travel was necessary in order to secure food and other resources, and it demanded not only an intimate knowledge of the terrain, but knowledge of when and where to go in order to be most successful.

Productive travel required the sharing of information between hunters and family groups, with the result that a rather astonishing array of places, trails and landscape features had names. These names were learned through personal experiences and stories and helped people orient themselves with regard to landmarks, served as guides for travel, marked resource areas or places of human activity, commemorated historical events, and forged a permanent and identifiable bond with the land. With this travel and attentiveness to the landscape, came an ability not only to know where you are and how to travel safely on the land, but a sense of who you are in relationship to the land.

As you can see by reading the handout *About Simon Paneak* and by looking at his maps, Simon Paneak exemplified the landscape knowledge necessary for a Nunamuit hunter to provide food for his family and to survive in a harsh environment. He was unusual because he could both read and write English and because he worked closely with scientists and social scientists. He drew many of these maps to illustrate written stories of his travels. These stories and maps are compiled in books by John M. Campbell (see Teacher References). We use his maps and story because they are extraordinary examples, but also because they are published and accessible. If you have access to similar maps or landscape experts in your community, please work with them instead.

MATERIALS

- Class list of landmarks from PNL Lesson 1
- Copies of five different Simon Paneak maps grouped in packets such as: Packet 1 - Maps 1, 2 and 3; Packet 2 - Maps 1, 3 and 4; Packet 3 - Maps 1, 4 and 5; and Packet 4 - Maps 1, 2 and 5
- Copies of handout *About Simon Paneak*
- Copies of Student Exercise Sheet
- List of class landmarks from PNL Lesson 1 and/or composite map of local community if created in PNL Lesson 1
- Chart paper
- Wall map of Alaska
- Copies of topographic maps *Simon Paneak East* and *Simon Paneak West*. These are large (~ 2' x 2') composite topographic maps of the area encompassed by Paneak's sketches. JPEG images of these maps are in the appendix of the MapTEACH DVD or available for download from our website but require a large format printer or plotter. The following USGS 1:250,000 quadrangle maps may be used instead of the MapTEACH composite maps:

  Killik River, Survey Pass, Wiseman and Chandler Lake. These USGS maps may be obtained from:

  Map Office, Geophysical Institute
  University of Alaska Fairbanks
  903 Koyukuk Dr.
  P.O. Box 757320
  Fairbanks, AK 99775-7320
  (907) 474-7598

INSTRUCTIONAL PROCEDURES

Gear-Up

- Review the class list of landmarks and ask students to share their journal entries from PNL Lesson 1. ("Think of someone you know who travels your area extensively for hunting, fishing, trapping, etc. What do you think their mental map might look like? What kinds of landmarks might they use? How might their map be different than yours and why do think so?")

- Explain that students are about to study some sketch maps drawn by Simon Paneak, a Nunamiut hunter from Anaktuvuk Pass, and point out Anaktuvuk Pass on a map. Explain that their job will be to make some observations of his sketch maps and to try to generally figure out what the maps represent; then to think about what these maps reveal about Simon Paneak.
- Group students in pairs and provide each pair with a map packet. As a class, guide students through observations/inferences of Map 1 using the questions in each column below.

Map Number	**Features** (What kinds of features are shown on the map? Name at least five.)	**Map Orientation** (What clues are on the map that help you understand direction?)	**Map Theme** (What is the big idea that Simon Paneak wants to show?)
#1	• Hills • Rivers and creeks • Lakes • Fishing spots • Old trees • Anaktuvuk Village • Bluff	• Creeks flow vertically between top and bottom of page (dendritic pattern indicates creeks flow from top to bottom of page)	Places to fish!

- Give each student pair a data sheet and ask them to carefully examine the maps; paying attention to what kinds of features are shown, how places are named, and what the maps reveal about the landscape and about he man who drew them. Ask students to record their observations and write down specific examples to support their analysis.

Explore

Provide time for students to carefully study the two maps and record information. (If time permits, allow students to trade maps and analyze more than two.)

Generalize

- Ask volunteers from each group to share their observations and inferences about each of the maps and record them on chart paper. (Make sure that each group has a chance to contribute their observations.)
- Help students resolve some of their questions by referring to the class topographic map of the area. (For example, which way is north on this map? Which way is the water flowing? What kind of country is this? What is a continental divide? Etc.) Or, if time permits, provide student pairs with a topographic map of the area and ask them to resolve their questions.
- Discuss what these maps reveal about Simon Paneak. Who do students suppose he was? What was his life like? How did he come to be able to draw such detailed maps?

- Explain who Simon Paneak was (or ask students to read "About Simon Paneak"). Refer to the class topographic map to show and talk about the amount of country represented by these maps.
- Talk about how much people are traveling today. By what means? What might our mental maps be like today in comparison to the old days?
- Post the class landmark map (from PNL Lesson 1) and ask if, after looking at Paneak's maps, there are any landmarks or features they would now like to add to the class list?

Apply/Assess Options

Journal entry prompt: What was the most interesting thing that you learned about Simon Paneak's maps? Why was it interesting?

MORE EXPLORATIONS

- Provide students with USGS Topographic Maps (1:250,000) and have them find and trace or label Paneak's landmarks and sketch map routes on the topographic map. (Note: some places will not be identified on the topographic map and spellings may be different.) Discuss. (Relevant USGS 1:250,000 maps are: Killik River, Alaska; Survey Pass, Alaska; Wiseman, Alaska; and Chandler Lake, Alaska.)
- Maps 4 and 5 used in this lesson are illustrations from "Story About Traveling Back in 1940," written by Simon Paneak (Campbell, 2004, pp. 85-97). Reading this story would help students better understand the significance of the maps and of Simon Paneak's remarkable life.

TEACHER REFERENCES

University of Waterloo. 2003. "The Nature of Maps." Available online at:
http://www.fes.uwaterloo.ca/crs/geog165/maps.htm#Recommended%20Readings

Campbell, John Martin. 1998. *North Alaska Chronicle: Notes from the End of Time, The Simon Paneak Drawings.* Santa Fe: Museum of New Mexico Press.

Campbell, John Martin. 2004. *In A Hungry Country*, *Essays by Simon Paneak.* Fairbanks: University of Alaska Press.

Name: ____________________

Lesson 2
SIMON PANEAK'S SKETCH MAPS
STUDENT EXERCISE

Carefully observe at least two of the maps drawn by Simon Paneak. For each map, answer the following questions.

Map Number	**Features** (What kinds of features are shown on the map? Name at least five.)	**Map Orientation** (What clues are on the map that help you understand direction?)	**Map Theme** (What is the big idea that Simon Paneak wants to show?)
#1	• Hills • Rivers and creeks • Lakes • Fishing spots • Old trees • Anaktuvuk Village • Bluff	• Creeks flow vertically between top and bottom of page	Places to fish!

What can you infer about Simon Paneak from these maps?

____

____

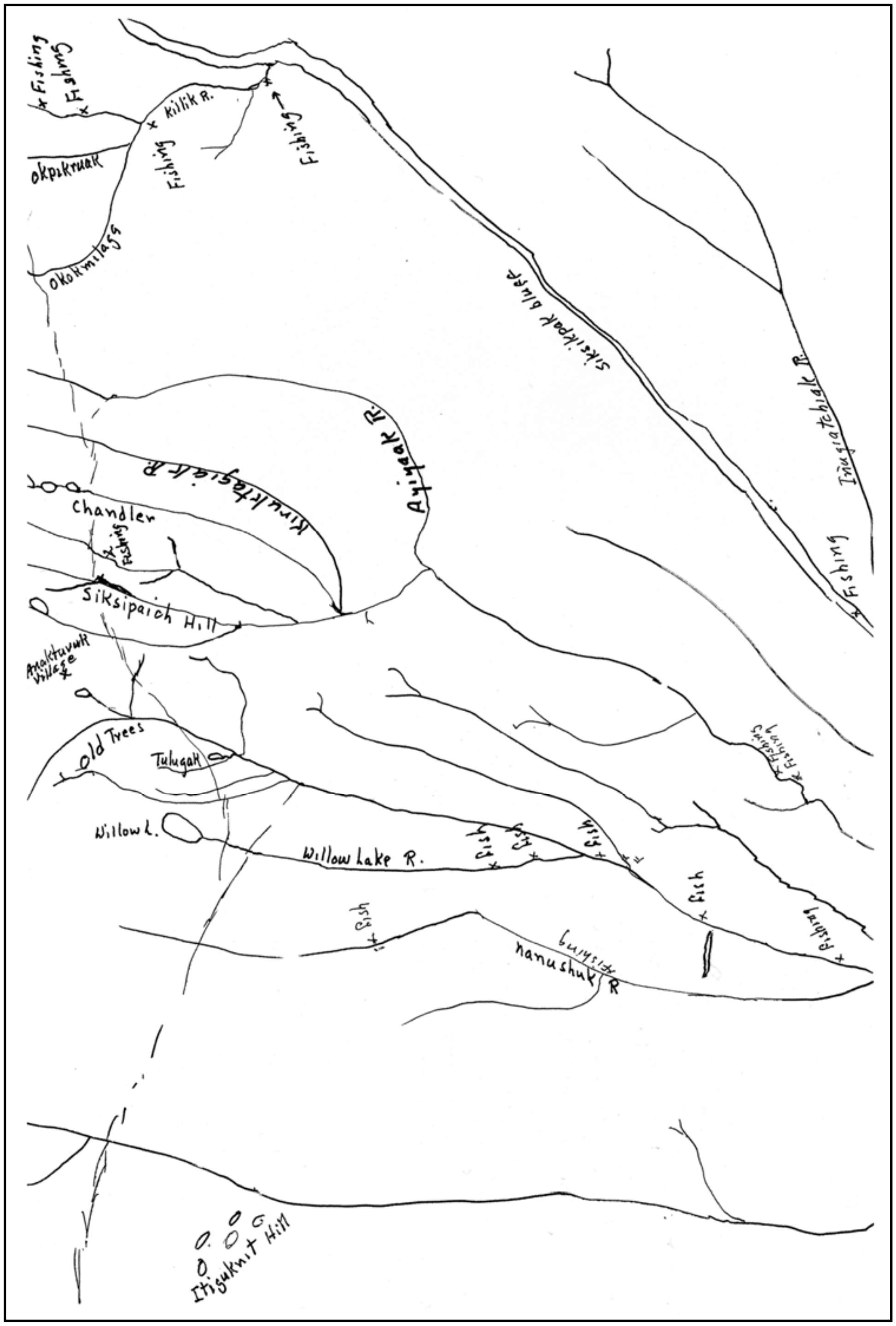
If you could ask him one question about these maps, what would it be? What do *you* wonder about when you look at them?

____

____

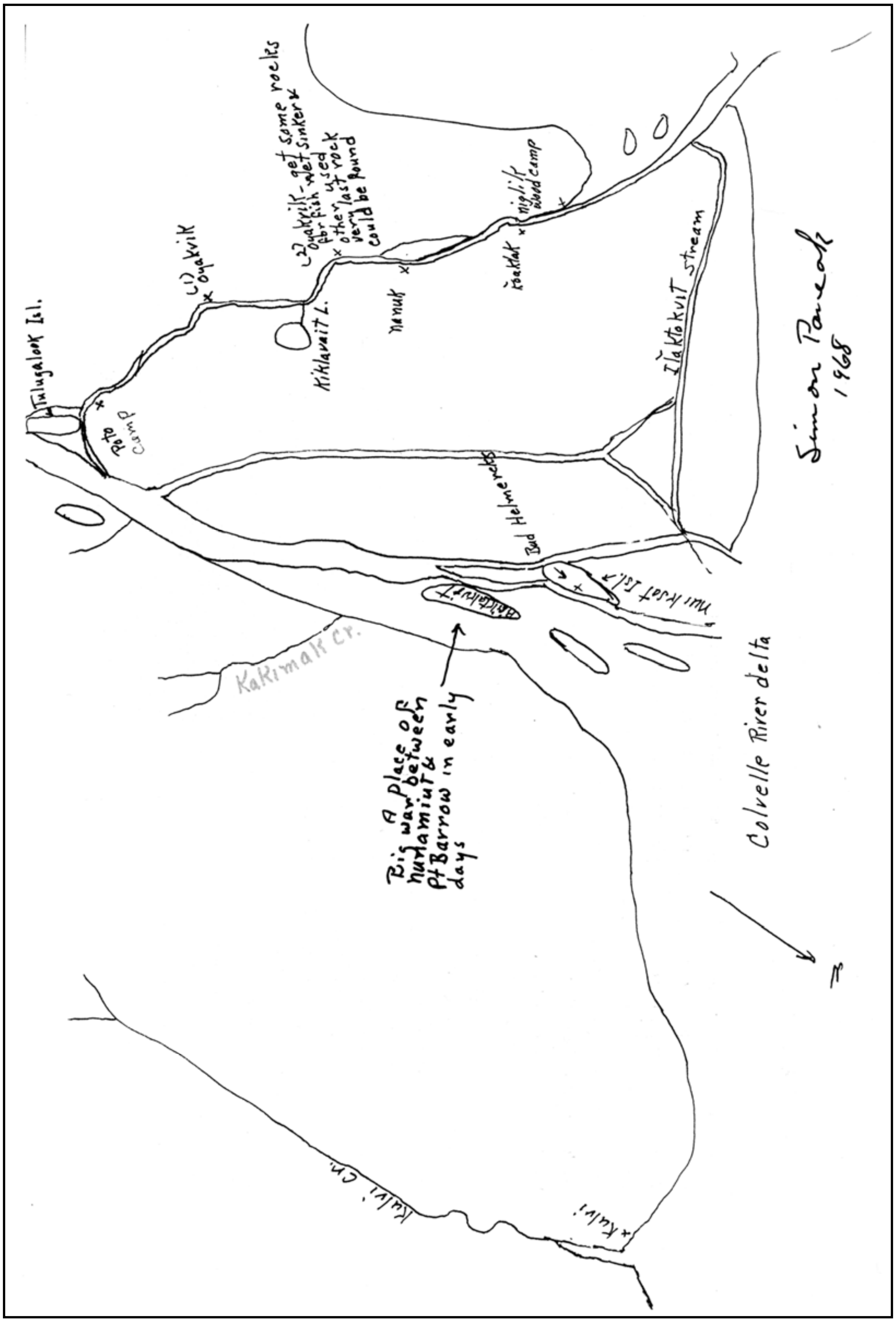
Map 1

Courtesy of John M. Campbell (1998) Plate 32Plate 59

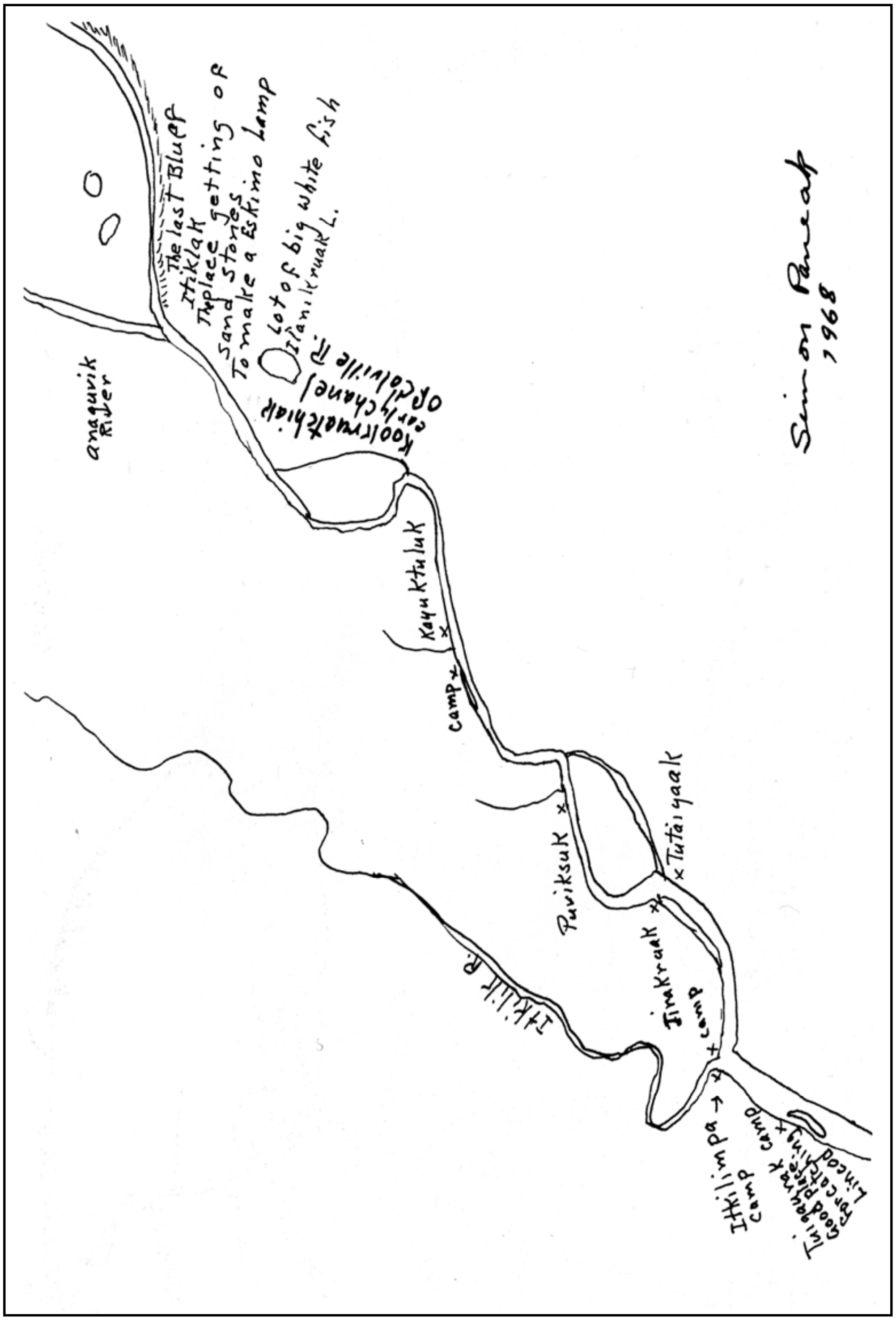


Map 2

Courtesy of John M. Campbell (1998) Plate 59



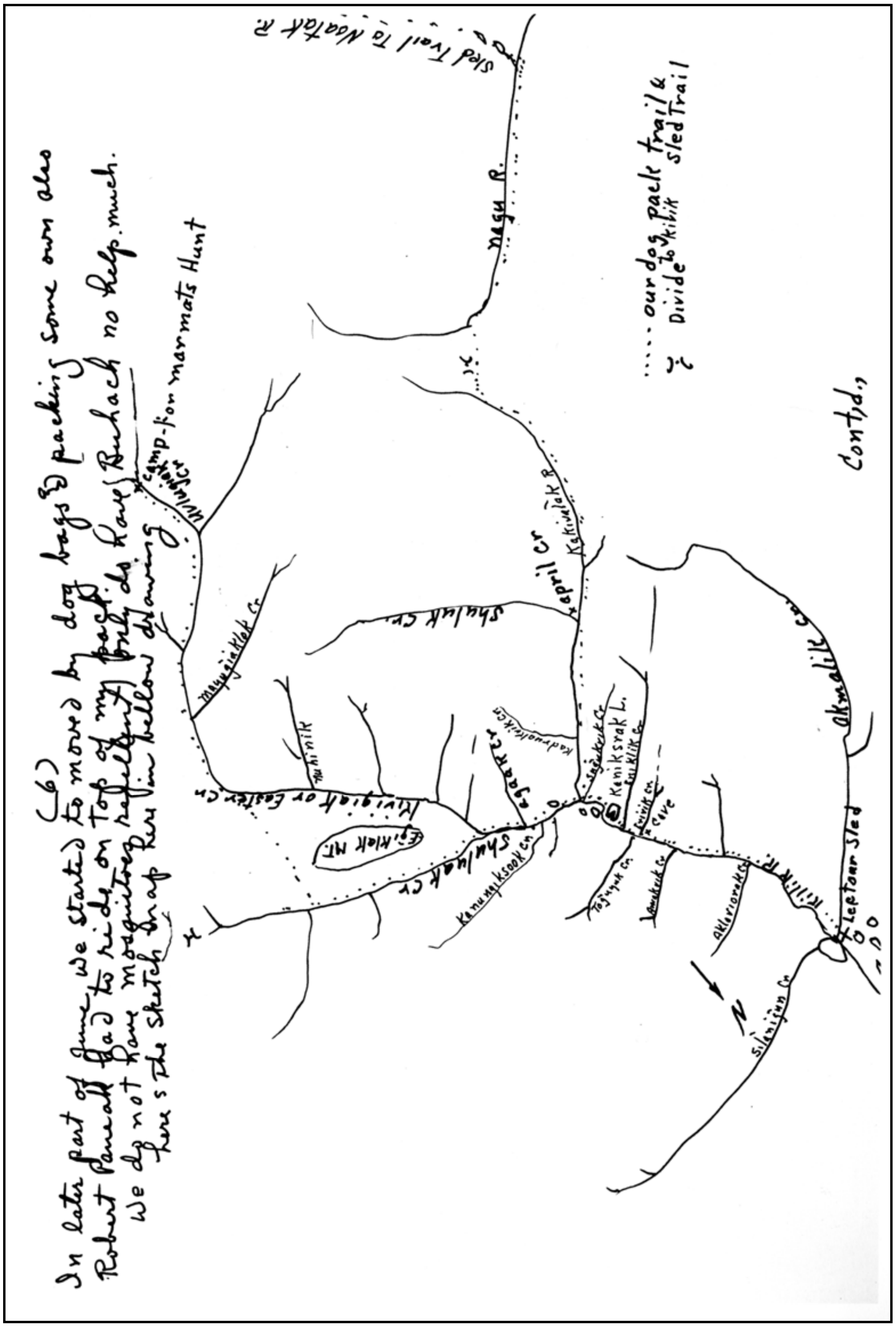
Map 3



Courtesy of John M. Campbell (1998) Plate 60

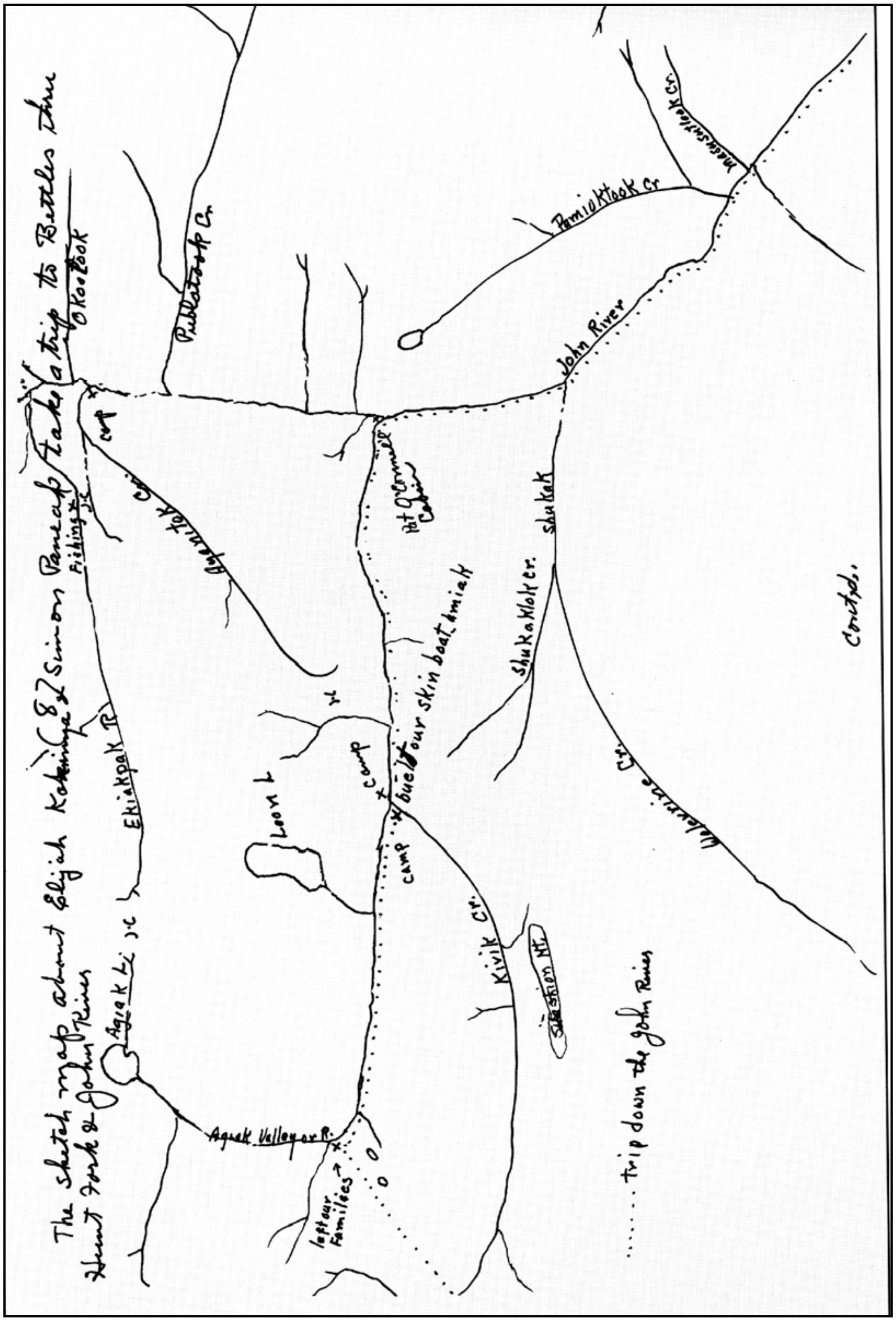
Map 4

Courtesy of John M. Campbell (1998) Plate 61 or (2004) Figure 37



Map 5

Courtesy of John M. Campbell (2004) Figure 38



About Simon Paneak (Panniaq)

Courtesy of Simon Paneak Museum
http://www.north-slope.org/NSB/55.htm

Simon Paneak (Panniaq)
1900-1975

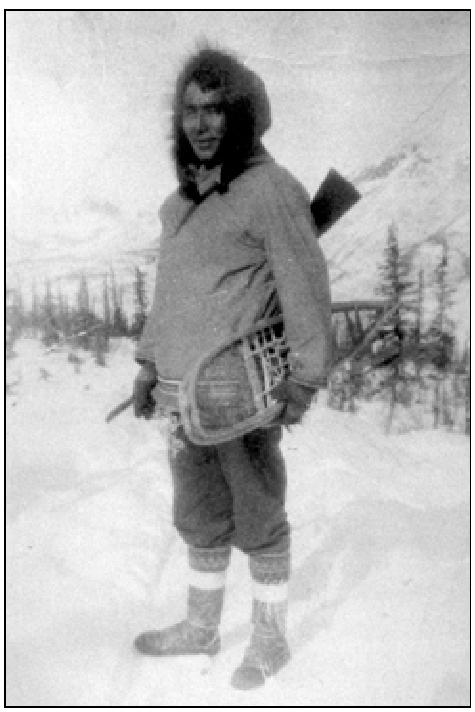
Simon Paneak was born in the spring of 1900 near the Killiq River valley of the north central Brooks Range, a mere 15 years after the very first outside explorers reached the area in the winter of 1885. He was the youngest of 6 children raised by his parents Tunganna and Kiktugiaq, to be a Nunamiut hunter, an inland Eskimo, born into the tradition of a highly mobile big game hunting society based upon the taking of caribou.

As a young boy, Simon found himself caught up in a torrent of social and historic events that eventually swept his family and his people from their mountain homeland and cast them upon the shores of the Arctic Ocean as refugees from starvation and disease. At the age of 6 or 7 he witnessed the unraveling of an ancient way of life as the caribou herds upon which his people depended failed, bringing repeated years of famine while waves of newly introduced diseases killed many others.

Driven by hunger and the need to seek relief, most surviving Nunamiut families moved coastward where they had access to trading posts and, occasionally, jobs. Over the next 20 years and more, while living along the arctic coast Simon grew into an active and robust hunter, even learning to read, write, and speak English. These were years when people largely supported themselves by trapping, at the height of the Arctic Fur Trapping Industry. With the collapse of this livelihood in the wake of the great depression, Simon, now in his thirties, became part of a movement of highly motivated and traditionally oriented families who determined to return inland to resume their old way of life. It was a return made possible by the recovery of the caribou herds upon which they were dependant.

1943 saw first air contact with the Nunamiut when pioneer bush pilot Sig Wein encountered several families at Chandler Lake. Over the next few years Wein periodically re-supplied the Nunamiut and was instrumental in convincing the Chandler Lake and Killiq River families to relocate to the broad, open Anaktuvuk Valley where he could guarantee regular air service. Once air service was established, visiting scientists from many different fields began making their way to the Nunamiut people to study them and to learn from them. It was through his involvement with these researchers that Simon became well known to the outside world.

For nearly the next 30 years he worked with many scientists; among them botanists, biologists, geologists anthropologists and archaeologists who quickly came to recognize that he was a very bright and capable man. Simon's ability with the English language and his obvious intelligence vaulted him to prominence among the scientific community. So much so that many first rank and prominent scientists such as the noted Arctic Biologist Laurence Irving, quickly came to depend upon the experience, insight and judgment of this man. As Irving keenly appreciated Simon's knowledge, understanding and mastery of the natural world in which he lived, rivaled, if not exceeded, in some respects, that of professional biologists.



Simon the active young hunter.

Simon working with Nicholas J. Gubser, foremost ethnographer of the Nunamiut.

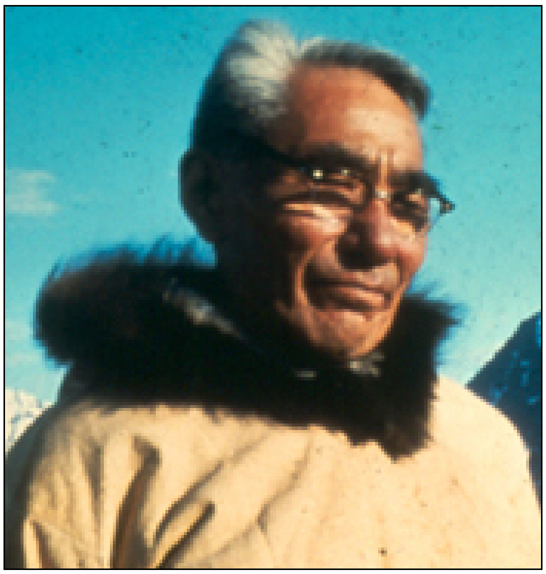
Nevertheless, it bears noting that within his own community, and among his own people, this level of knowledge and competency was, of necessity, commonplace. It was in fact, but a portion of what a mature Nunamiut hunter was expected to know and master in order to survive and support his family in the arctic environment. Several other Nunamiut elders, men a generation senior to Simon knew all of this and more, had they been asked, but Simon's facility with English was key in his attaining prominence.

In addition to the world of nature, Simon was also keenly interested in the history and traditions of his own people. He deliberately and actively sought out knowledgeable elders across northern Alaska to learn from them and in the process became an important source for anthropologists and archaeologists alike who came to work among his people. Interestingly, Simon, who was in the direct line of receipt and succession of those word of mouth stories also represents a transitional figure in the process of rendering them from oral to written history. He was instrumental in passing them along in both forms, orally on tape, which others like author Helge Ingstad and archaeologist Jack Campbell then rendered into written English, but also through his own numerous letters and written journals.

Simon remained a key source of information for many researchers up until his death in 1975, leaving behind a large family who took great pride in their father's accomplishments as a hunter, trapper, storyteller and historian.

In anticipation of the opening of this museum in 1986 the community of Anaktuvuk Pass voted to name the museum after Simon and it has been known as the Simon Paneak Memorial Museum ever since.

As part of a testament to Simon's importance to researchers, we offer this list of publications compiled by the late Laurence Irving highlighting many of Simons accomplishments and contributions to the world of knowledge and science.



Publications in which Simon Paneak was co-author

Irving, L. and S. Paneak. 1952. *On the weight and nutritional state of birds at the arctic terminus of migration*. Proc. 3rd Ak. Sci. Conf. p.212.

Irving, L. and S. Paneak. 1954. *Biological reconnaissance along the Ahlasuruk River west of Howard Pass, Brooks Range, Alaska, with notes on the avifauna.* J. Wash. Acad. Sci. 44(7):201-211.

Irving, L., G. C. West, L. J. Peyton and S. Paneak. 1967. *Migration of Willow Ptarmigan (Lagopus lagopus) in Arctic Alaska*. Arctic. 20(2):77-85.

A Partial list of publications to which Simon Paneak was acknowledged an important source of information. .

Irving, L. 1953. *The naming of birds by Nunamiut Eskimo*. Arctic 6(1)-35-43.

Irving, L. and J. Krog. 1954. *Body temperatures of arctic and subarctic birds and mammals*. J Appl. Phys. 6(11):667-680

Ingstad, H. M. 1954. *Nunamiut: among Alaska's inland Eskimos*. New York. W. W. Norton.

Irving, L. and J. Krog. 1955. *Temperature-of skin in the arctic as a regulator of heat*. J. Appl. Phys. 7:355-364.

Irving, L. and J. Krog. 1956. *Temperature during the development of birds in arctic nests.* Physiol. Zool. 29:195-205.

Irving, L. 1958*. On the naming of birds by Eskimos*. Anthropological Papers of the University of Alaska 6(2):61-77.

Feinstein, B. 1958. *A new gray-crowned rosy finch from northern Alaska.* Proc. Biol. Soc. Wash. 71:11-12.

Irving, L. 1960. *The birds of Anaktuvuk Pass, Kobuk and Old Crow.* Bull. U.S. Nat. Mus. 217.

Irving, L. 1964. *Terrestrial animals in cold: birds and mammals in Handbook of Physiology, Adaptation to Environment.* Washington, D.C., American Physiological Society, 1964. Sec.4, pp.361-377.

Gubser, N. J. 1965. *Nunamiut Eskimos, hunters of caribou*. New Haven. . Yale University Press.

Irving, L., G. C. West and L. J. Peyton. *Winter feeding program of Alaskan willow ptarmigan shown by crop contents.* Condor 69:69-77.

Irving, L. 1969. *Arctic Life of Birds- and Mammals, including Man*. Zoophysiology and Ecology Series. Springer Verlag.

PNL Lesson 3
WORKING WITH LOCAL EXPERTS -MENTAL MAPS
TEACHER INFORMATION

Lesson Summary: Students become more familiar with local landmarks, place names and stories as they listen to and work with a local landscape expert.

Objectives: Students will begin to name, locate and think about key places and landmarks in their area and about what these landmarks reveal about the history and culture of an area.

Estimated Time: 1 hour for initial classroom visit but time could be expanded to multiple visits.

Correlation to Alaska Standards:

Cultural D-4	Gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance.
Cultural E-2	Understand the ecology and geography of the bioregion they inhabit.
Geography A	Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.
Geography B	Utilize analyze, and explain information about human and physical features of places and regions.

BACKGROUND FOR THE TEACHER

This lesson is the local equivalent of PNL Lesson 2, Simon Paneak's Sketch Maps, and the background section from PNL Lesson 2 applies here as well.

MATERIALS

(Depends upon the local situation)

- Chart paper
- Brainstormed class list of landmarks
- 1:250,00 or 1:63,360 topographic maps of area
- Place names map work already done for area
- Simon Paneak Sketch Maps (from PNL Lesson 1)

INSTRUCTIONAL PROCEDURES

Getting Ready

Although the Simon Paneak sketch maps (PNL Lesson 2) are extraordinary examples of the kind of landscape knowledge held by traditional hunters, many communities in Alaska today have landscape experts who have similar knowledge and who might be willing to work with students and share his or her mental map of the area. Such an expert might be an Elder with traditional knowledge, a riverboat skipper, a hunter, trapper or berry picker who travels the land, or someone with a keen interest in trails and old places. Is there a person who is known for his or her landscape knowledge; who knows where shortcuts and river crossings are; or who knows where hunting camps or trails are or used to be? Is this person also known as a teacher or a storyteller or someone who is willing to share their landscape knowledge with others?

Seek this person out and explain that you want your students to begin to learn about important local landmarks, trails and places and why they are important. Show them some Simon Paneak sketch maps and explain what you've been working on in class so far. Find out if they would be comfortable sketching their own mental map and then sharing stories about trips or talking about places important in your community. (Generally speaking, the more clear you can be about what you and your students need, the easier it will be for a local expert to respond.) If producing a place names map is the project goal, then explain the project as specifically as you can, possibly bringing along the *Trip to Puvlatuuq* map (PNL Lesson 4) or the *My Own Trail* map by Howard Luke (PNL Lesson 5) to help them get a better idea about where the work is headed. Explain that in order to make maps like these, students need a lot of help learning about important places and trails in your area.

Before work begins, talk with this person to better understand what they know and want to share. Ideally, such a person would be willing to come to class and work with students both initially on this lesson, sharing mental maps and stories, and then later to actually help with site documentation. In any case, the critical thing is to arrange an exchange between the landscape expert and students in a way that is comfortable and meaningful for all.

Gear-up

Remind students of their own mental maps and the Simon Paneak maps and explain that your visitor is going to share his or her mental map with the class today. Ask students to predict how the visitor's mental map will be similar to or different from theirs and ask students to explain why they think so. Explain that their job is to listen to this expert and to remember the stories and places he or she talks about so that this information can be used in their map project.

Explore

Expert shares and discusses mental maps of the area.

Generalize

- Give students some time to reflect on what was shared by the visitor. Ask them to record their thoughts using words, pictures or diagrams in as much detail as possible. What did the expert talk about or explain? What stories did he/she tell? What places did he/she talk about? What would you especially like to remember? What do you wonder about now?
- Ask students to discuss some of this information with the class.
- Post the class landmark list or map (from PNL Lesson 1) and ask if, after listening to the expert, there are any landmarks or features they would like to add?

(Note: The goal here is to help students think about not only place names and landmark information, but also about what the expert focused on and seemed to regard as important, gradually building an understanding of landscape that is more than just places on a map. Depending upon the situation, this might well reveal a whole new perspective on landscape including ways of observing, navigating and interacting with the landscape as well as the aesthetic regard for the land.)

Apply/Assess

- Refine and use this information for PNL Lesson 5: Picking Points or PNL Lesson 6: Place Names Field Trip.
- Journal prompts:
  - How was the expert's mental map different from yours and why do you think so?
  - What was the most interesting thing that you learned and why?

MORE EXPLORATIONS

- Provide students with USGS Topographic Maps of the area (1:250,000 or 1:63,360) and have them find and trace the local expert's mental map spots on the topographic map.

PNL Lesson 4
WHAT'S IN A NAME?
TEACHER INFORMATION

Lesson Summary: Students study a place-names map, read the accompanying stories, discuss their significance and then brainstorm a list of place names for their own area.

Objectives: Students will begin to understand the importance of place names and will begin to name, locate and explain the significance of specific landmarks in their area.

Estimated Time: 1 hour

Correlation to Alaska Standards:

Cultural D-4	Gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance.
Cultural E-2	Understand the ecology and geography of the bioregion they inhabit.
Geography A	Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.
Geography B	Utilize analyze, and explain information about human and physical features of places and regions.

BACKGROUND FOR THE TEACHER

"There's no need for a place to have a name if you don't have a good reason to remember it." [1]

Alaska's geographic place names have evolved over time and reflect the diversity of Alaska's history and the languages of the people who have explored or successively inhabited a region. Consequently, many Alaskan places were named by explorers for political or territorial reasons, and often without the explorers even setting foot on the land itself. Examples of such place names and the explorer's country of origin are: Kotzebue (Russia), Norton Sound (England), or Valdez (Spain). Other names, such as Anchorage, Fairbanks or Fort Yukon reflect American exploration and settlement. And still others, such as Nenana, Anaktuvuk Pass, or Unalakleet are accurate Alaska Native language names or are native names that have been changed or altered in some way as a result of adjusting to another language like English. These place names generally reflect present-day local usage, help people orient themselves geographically and serve

[1] Marino (2005) p. 57.

as landmarks or guides for travel. They conform to the principles of the U.S. Board on Geographic names for use on government maps and other publications and are clearly identified through the use of geographic coordinates.

While there is no doubt that such a standardized system of naming and mapping is essential, this system has effectively overlooked thousands of Alaska Native place names—names known well to the traditional inhabitants of a region and considered important for geographic, linguistic and cultural reasons. Alaska Native elders today are concerned that these names are being lost and that young people no longer know the traditional place names or landmarks of their area. Elders worry that without this knowledge, youth will not know how to travel safely on the land, and will lose the sense of place that is afforded by such travel and understanding.

Because of these concerns, there has been and continues to be an increased interest by both communities and researchers in the documentation of Native place names and their stories (see Teacher Resources). Such projects reveal that Native place names are an invaluable resource for storing information about past events and passing it on to future generations as part of an oral history. Scholarly attention to native place names is undergoing resurgence. This has resulted in several categorization schemes for Native place names, adapted for this lesson as follows:

- **Descriptive** place names describe features or physical land descriptions. A name such as *Qakjubuk*, meaning 'deep place in river,' would fit into this category; as would *Niiqjupaaq*, meaning 'northern most one, mouth of a river."[2] Descriptive names might also refer to a landform that is named after something it resembles. Examples of this are *Quluchuukiik*, meaning 'woman's chest/breast,' and *Akubvik*, meaning 'place that looks like a ladies' skirt' or 'parka hem.'[3]
- **Historical** place names mark an event that happened in the past. *Abnatquksrat*, meaning 'old women', refers to an island where two old women were said to have passed away one day while picking berries.[4]
- **Resource** place names mark areas that are good for animal or plant harvesting.
- **Human Activity** place names describe places where human activity occurs, such as camping or subsistence activities. An example is *Nachirvik*, meaning 'place to look out.' This refers to a strategic hill where members of the tribe could scout game or enemies.[5]

[2] Marino, E. (2005) p. 53.
[3] Ibid.
[4] Ibid.
[5] Ibid.

- **Mythological or Spiritual** place names describe where mythological characters acted and moved about the land or where spiritual practices occurred.

While this lesson would undoubtedly be most meaningful if students used maps from their own area, we use *A Trip to Puvlatuuq* by the North Slope Borough School District, Alaska Native Education Program because it does a wonderful job of telling the stories behind place names and because it is published and accessible. If you have access to similar maps or place name experts in your community, please work with them instead. Please also check the Teacher Resources section at the end of this activity in order to find sources that might apply to your community.

MATERIALS

- Overhead of Simon Paneak Map 2, (from PNL Lesson 2)
- Completed Place Names and Landmarks (PNL Lesson 2: Student Exercise Sheets)
- Wall map of Alaska showing Anaktuvuk Pass and the John River
- Copies of handout *A Trip to Puvlatuuq*
- Overhead of maps from *A Trip to Puvlatuuq*
- Student Exercise Sheets
- Chart paper replica of blank data sheet

Optional Materials or Materials for Extension Activities:

- Complete copy of the book *Immiugniq Winter Sources of Drinking Water*, by the North Slope Borough School District, available online at http://www.nsbsd.org/anep/public/index.cfm/14,html.
- 1:250,000 USGS map of Wiseman (enough copies for student pairs)
- Removable sticky arrows

INSTRUCTIONAL PROCEDURES

Gear-Up

- Remind students of their work with the Simon Paneak sketch maps, noting that his drawings not only conveyed information about rivers, creeks and trails but about historic events, hunting, fishing and camping spots as well. Ask students if they think that there is any other information conveyed by these maps that we might be missing?
- Show overhead of Simon Paneak Map 2. Call attention to the Inupiaq place names and ask students if they think these names might be significant in any way. If so, how?
- Explain that while we don't have explanations or stories for all of the place names on the Simon Paneak maps, we do have a place names map and stories about a trip down the John River from Anaktuvuk Pass (show area on wall map).

- Show overhead of the first map in *A Trip to Puvlatuuq* and pass out copies of *A Trip to Puvlatuuq* story and worksheet to students. Explain that this map is part of a story written by the North Slope Borough School district using information from Inupiaq elders. Review the categories for place names and do the first few place names as an example with the class using the overhead.

Place Name		Story	Descriptive	Historical	Resource	Human Activity	Other
1.	***Anaktuvuk Pass***	No story given	X		X		
2.	***Inukpak* or Giant Creek**	A big, tall skinny rock that looks like a giant man. Good for hunting.	X		X		
3.	***Ppiquniq***	Not a traditional place name but a place where they stopped to learn about a piquniq or large bump of ice	X				
4.	***Paluqtaq or Beaver***	A place where a "crazy" beaver built his house in the 1950's.		X			

Explore

Ask students to work in pairs and provide each student with a copy of *the A Trip to Puvlatuuq* handout. Ask students to look at the map, read the descriptions of the places described on the trip and record information on Student Exercise Sheets. (Note: The categories students choose are not as important as getting them to focus on the place names and the richness of their meanings.) Students can divide the work if time is short.

Alternatively, simply have the students read the story and follow the map, picking out five places that are of interest to them.

Generalize

- Ask students to share the kinds of information conveyed through the place names on *A Trip to Puvlatuuq* and record on a blank wall chart.
- Ask how this information helped people know where they were.
- Discuss why this information was not only helpful but also critical for Nunamiut survival. Ask if students think that the information is still important today.
- Discuss the question, "What do place names tell us about a place?"
- Discuss the importance of place names and the rise in efforts around the state to document these names.

- Ask if any of the students are aware of place names work in their own areas and discuss. Ask if students have suggestions about map resources or people who might help us think about the important place names and stories for your area.

Apply/Assess

Journal Prompt: Ask students to think of their home community and to list the names of at least three important place names/landmarks (the names can be in any language). Ask them to describe why those places are important. What are the stories behind them? Encourage students to ask their parents and grandparents about these places. Are these place names on maps and does it matter if they are or aren't? If students struggle with this, want to do more, or if time permits, let them work with the *Dictionary of Alaska Place Names* by Donald Orth (see Teacher Resources) or peruse place name websites listed in the Resources section.

MORE EXPLORATIONS

- Provide student pairs with USGS 1:250,000 topographic maps of Wiseman, Alaska and ask them to identify as many of the *Trip to Puvlatuuq* place names as they can on this map. Have them label the places with a sticky note and record what they found on a data sheet like this:

"A Trip to Puvlatuuq" place name	Name on USGS Map
#1 Anaktuvuk Pass village	Anaktuvuk Pass
#2 Inukpak Creek	Inukpasugruk Creek
#9 Qalutagiak Creek	Kollutarak Creek
#10 Ikiaqpak Creek	Ekopuk Creek
#11 Uquuluk	Till Creek
#16 Puvlatuuq	Publituk Creek
#20 Hunt Fork	Hunt Fork

- As students report what they found, ask and discuss why some spellings might be different. Ask why they think that only seven of the 20 names can be found on the USGS map and ask what they think might happen to those names if not listed on USGS maps. Share either the web or the book version of Orth's Alaska Place Names Dictionary. Discuss how place names reflect not only the history and culture of a place in time but also reflect the experience and bias of the mapmaker.

- Read and discuss "Athabaskan Place names for Rivers in Alaska" in Pearson, R.W. and Hermans, M. (2001), *Alaska in Maps: A Thematic Atlas.* University of Alaska Fairbanks, pp. 95 and 95.

TEACHER RESOURCES

Alaska Native Knowledge Network, "Oral Tradition and Cultural Atlases." Available online at http://www.ankn.uaf.edu/NPE/oral.html.

North Slope Borough School District. *Immiugniq Winter Sources of Drinking Water.* Available online at http://www.nsbsd.org/anep/public/index.cfm/14,html.

Bright, William. 2004. *Native American Place Names of the US.* Norman: University of Oklahoma Press.

Luke, Howard. 1998. *My Own Trail.* University of Alaska Fairbanks: Alaska Native Knowledge Network.

Pearson, Roger W. and M. Hermans (2001) *Alaska in Maps: A Thematic Atlas.* University of Alaska Fairbanks.

"Project Jukebox: Oral History Program." University of Alaska Fairbanks. Available online at http://uaf-db.uaf.edu/jukebox/PJWeb/pjhome.htm
(This site contains over 35 projects from throughout Alaska that integrate oral history recordings with associated photographs, maps and text.)

USGS. "Geographic Names Information System." Available online at http://geonames.usgs.gov/pls/gnispublic

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PNL Lesson 4
WHAT'S IN A NAME?
Student Exercise Sheet

1. Record the place name and briefly describe the meaning of the name.
2. Decide what kind of information is contained in the place name:
   - Descriptive - describes features of physical landscape or describes something that the landscape resembles
   - Historical - place names that mark an event that happened in the past
   - Resource - place names that mark areas that are good for animal, plant or other kinds of harvesting
   - Human activity - places where camping or subsistence activities occur

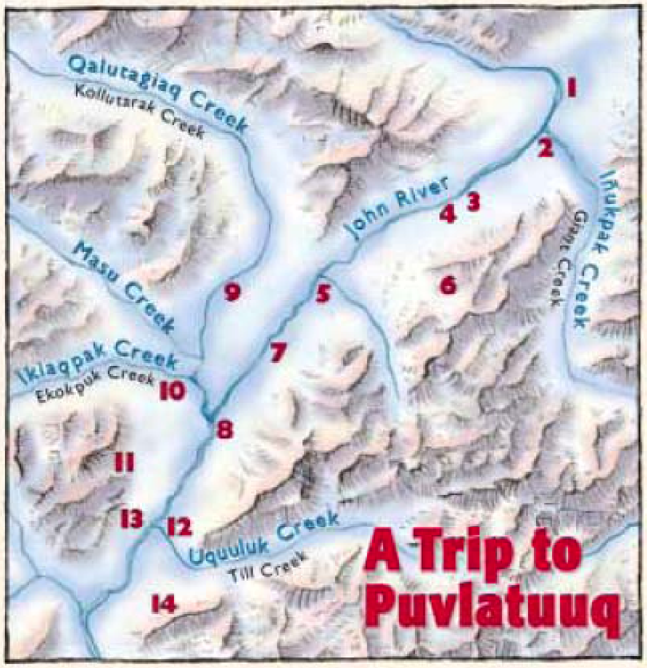
	Place Name	Story	Descriptive	Historical	Resource	Human Activity	Other
1.	*Anaktuvuk Pass*						
2.	*Inukpak* or Giant Creek	A big, tall skinny rock that looks like a giant man. Good for hunting.	X		X		
3.							
4.							
5.							

	Place Name	Story	Descriptive	Historical	Resource	Human Activity	Other
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							

	Place Name	Story	Descriptive	Historical	Resource	Human Activity	Other
15.							
16.							
17.							
18.							
19.							
20.							

A Trip to Puvlatuuq

Source: North Slope Borough School District (2003).
IMMIUGNIQ: Winter Sources of Drinking Water. Alaska Native Education Program, North Slope Borough School District, Barrow, Alaska. Pages 34-37.



1 Anaktuvuk Pass village

2 Iñukpak, or Giant Creek: As the family set out from the village on their way south to tree line, they first had to cross a broad patch of overflow ice. This icy area forms every winter, from underground springs and water flowing out of nearby Giant Creek into the headwaters of the John River.

Ataata explained its name: "Giant Creek, the white man calls it. We say Iñukpak. Look up there near the mouth of the creek. See that big, tall, skinny rock? Must be 12-15 feet high? Looks like a giant man standing there, doesn't it? That's how it got that name, Giant Creek, Iñukpak. Good country for hunting. Close to home too. Really good for old men like me."

3 About piquniq: This is where they stopped on the way home and learned about the piquniq. On the way out to camp, they got on the main trail that cuts across many of the looping meanders of the river channel. Sometimes the trail is on the ice, and sometimes on the snow-covered ground. Usually the river ice was nice and smooth, but every once in a while there was a large bump of ice, a piquniq.

4 Paluqtaq, or "Beaver": Not much further along they came to a small ice-covered pond near the river. "Back in the 1950s some crazy beaver came all the way up here to build his house in that little lake. Must have been lost, that guy. 20 miles north of the trees!" Ataata remembered.

5 Qalutaq, where the family stopped for tea on the way to camp Saturday morning.

Ataata told them, "It is an old, old camping place for our people; we have used it for many generations, because of the shelter of those willows and the good hunting nearby. It has lots of ptarmigan, and rabbits too, sometimes. Those are important animals to keep people alive if caribou or sheep are hard to find."

6 Alugvik: Standing near the willows at Qalutaq, Ataata pointed to the mountains. "Up there on the mountainside is what we call an Alugvik. Mountain sheep like to come there every morning, early, and sometimes late in the evening to lick the salt. People have always hunted sheep there. We still do today. But you have to get up early to get them. Can't be lazy and hope to eat sheep meat," he said with a twinkle in his eye.

7 Kiññaagvak: From Qalutaq for another couple of miles is an area called Kiññaagvak, which means "really freeze your face" because in winter, during a north wind, the wind is extra strong and cold there. "You really have to be careful about this place. You could get frostbite really easy," the children were warned.

8 Kayyaak: This is a place where a river, called Qalutagiaq, flows in from the west, cutting through a gap in an old river terrace on the right-hand side of the John River. "We call this place Kayyaak: where two rivers meet and one flows into the other."

9 Qalutagiaq: The creek's name means "the way to Qalutaq." "If you keep to the right it will take you all the way over to Chandler Lake, a good place to fish. But you have to be careful. Every winter, a big crack of water opens up across the ice, from one side of the lake to the other. If you aren't careful you can fall in and drown," Ataata warned.

10 Iktaqpak: If you turn right at Kayyaak and start to follow Qalutagiaq to the first fork to the left, just a mile or so up the stream, that leads to Iktaqpak Creek and valley, which means "something big is split lengthwise."

About four miles in is a big overflow glacier, like the one at Iñukpak (#2 on the map). But at Iktaqpak there is also a sikusuilaq, where people like to fish sometimes. The family did not take this fork, so the children did not see this sikusuilaq.

11 Qikiqtaq: "You see that big mountain over there?" Ataata asked, pointing to the southwest. "See how it stands alone, separate from all the other mountains? We call that mountain Qikiqtaq. That means 'an island' because that lonely old mountain is just like an island in a lake, all by itself."

–35–

12 Uquuluk: In the old days people used to set up snares along this creek to catch caribou in the willows. Today, the origin and exact meaning of this name is not clear, however it may stem from a root word that means something sheltered. On the map this creek is called Till Creek.

13 Tulugaiyaat: The river gets very narrow and rocky and there are steep cliffs on either side. People are careful not to travel too fast through here because they might tip over and get hurt. Midway up the cliffs on the right is a raven's nest. It has been there for at least a generation, maybe even longer. Tulugaiyaat means "the little ravens."

14 Taŋmigiagvik: This is a big mountain on the south side of Uquuluk, or Till Creek. In the old days, usually during the spring caribou migration, people would chase the animals up the gently-sloping back side of the mountain, then over the top, and down the front to drive them into the snares hidden in the willows below.

People used to "taŋmigiaq" (slide down) the north face of the mountain on their snowshoes, using their walking sticks like a rudder and a brake to slide safely down the mountain. "I better not catch you kids trying that," Ataata laughed. "You might get hurt. Takes a lot of practice to do that right."

15 Napaaqtuq: The spruce forest starts here. Some are small and scattered and others, like those at Puvlatuuq, are tall and grow in thick bunches. When they saw the first spruce tree, Ataata laughed, "Kinda scrawny and short isn't it? Not much of a tree at all, but it is a tree all right, Napaaqtuq, a spruce tree." Before long, however, the spruce grow thickly along the banks of the river.

16 Puvlatuuq, the campsite: Ataata had searched the river bank until he found a faint old trail. "Took me a minute to find the old trail. I haven't been here for so long and the brush has kinda grown up some. But I got it now. This is Puvlatuuq. Your grandma and me and your daddy and auntie used to live here when they were small. Good old Puvlatuuq.

"See that framework over there made of spruce poles? It's almost all fallen down now, but that's what is left of our old house. Spruce tree frame, covered with moss to keep us warm. Real good house. That old house of ours, you know what we covered the walls and roof with? Moss. Ivruq. Plain old moss. That's why we call that kind of house an ivrulik, after the moss we used to cover it with.

"Only problem is you gotta find it first. Come here I'll show you how. Stand over here, now bounce gently up

and down on the snow." The children obeyed, but didn't feel anything unusual. "That's because there isn't any moss underneath," Ataata explained. He pointed to a different spot. Uluġġaq and Masu tried bounding there. "Hey, it's different! It's kind of springy!" Ataata smiled. "That's how you find moss for building a house in the winter, even if you can't see it!"

A few minutes later, after digging down through the snowdrifts, sure enough, there was the moss underneath.

17 O'Connell's trapping cabin and winter trading post: Pat O'Connell was the first trader to live with the Nunamiut and he set this up many years ago, back in the 1950s. After he left in the early 1960s, people used it as a trapping cabin for several years until it eventually burned down.

18 Doris Creek: Pat O'Connell named Doris and Molly Creeks, across the river from his cabin, after two very pretty sisters. Apparently he was interested in marrying one of them, but neither one would have him.

19 Molly Creek: Also known as Kunnaana Creek.

20 Hunt Fork: The site of a sikusuilaq. It used to have good lingcod and grayling fishing, but not in recent years.

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PNL Lesson 5
PICKING POINTS OFF A PAPER MAP
TEACHER INFORMATION

Lesson Summary: Students identify place names or landmarks on a topographic map and use TopoZone, a web-based mapping program, to determine the latitude and longitude of these sites. These coordinate locations can then be used in digital map-making or way-finding with a GPS.

Objectives: Students will be able to pick coordinate points off a topographic map. (It is assumed that students have done the preceding PNL lessons and GIS Lesson 10, "Adding Coordinate Locations into a GIS.")

Estimated Time: 1 hour

Correlation to Alaska Standards:

Cultural D-4	Gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance.
Cultural E-2	Understand the ecology and geography of the bioregion they inhabit.
Geography A	Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.
Geography B	Utilize analyze, and explain information about human and physical features of places and regions.

BACKGROUND FOR THE TEACHER

There are two primary reasons for learning to pick coordinate locations from a topographic map. One reason is that you might want to convert a paper place names map to a digital map. As was mentioned in PNL Lesson 4 - What's in a Name? there has been and continues to be tremendous interest in the documentation of historic place names and their stories. Individual community members, village and regional corporations, governmental agencies and academic researchers have all played a role in such documentation. This research has resulted in a range of resources stored or documented in a range of places (such as under grandpa's bed, in library archives and everywhere in between.) Early documentation was often done on topographic maps accompanied by copious note taking, (and sometimes audio recordings), and is a rich source of historical information that preceded digital technology. With effort, many of these resources could be accessible to classrooms for conversion to digital maps.

A second reason for picking coordinates off a map is that you might want to select and plan a travel route beginning with a topographic map and then programming those points into your GPS.

In both of these cases, it is necessary to estimate the latitude and longitude of a waypoint with more accuracy than you would get by simply estimating that point on a topographic map. Use of Internet programs such as TopoZone, allow students to pick points with up to four decimal degrees of accuracy which is enough to get within a reasonable range for these purposes.

In this example, we work with *My Own Trail*, Howard Luke's published book and place names map. *My Own Trail* (book with one map included) and ordering instructions are described on the Alaska Native Knowledge wesbite at http://www.ankn.uaf.edu/publications/.
Multiple copies of the map itself can be ordered by contacting: publications@ankn.uaf.edu. If you lack this resource or if you have local landmarks already marked on either sketch maps or topographic maps, please work with them instead. (Be aware that working with local maps will require modification of the TopoZone student directions because existing directions are specific to the Luke map)

MATERIALS
For each student group using *My Own Trail*:
- Copy of *My Own Trail* map
- Copy of “Life Along the River” section of Howard Luke's book, *My Own Trail*
- Copy of handout *Place Name Assignment Sheet*
- Computers with internet access to TopoZone
- Copy of Tanana Necktie Maps (Available as JPEG images in the appendix of the MapTEACH DVD or available for download from our website but require a large format printer or plotter.) The following USGS 1:63,360 quadrangle maps may be used instead: Fairbanks C-3 and D-2 and are available from:

  Map Office, Geophysical Institute
  University of Alaska Fairbanks
  903 Koyukuk Dr.
  P.O. Box 757320
  Fairbanks, AK 99775-7320
  (907) 474-7598

Alternatively, for each student group using local community material
- Sketch or topographic map of area with place names marked
- 1:63,360 topographic maps of area covered
- Computers with internet access to TopoZone

INSTRUCTIONAL PROCEDURES

Gear-Up

- Pass out copies of *My Own Trail* map to each group and ask students to spend some time reading and discussing the map and getting oriented. Ask students what they notice about the map and how it is alike and different from the *Trip to Puvlatuuq* map they worked with in PNL Lesson 4. Discuss the fact that *My Own Trail* is a place names map, rich with information, but that it looks more like an artistic rendering than a shaded relief map.
- Now ask them to suppose that their grandfather or grandmother had made a map like this and that they wanted to convert it to a GIS map. What would you need in order to mark these place names on a GIS map? (Note that coordinates are necessary for accuracy here.)
- Explain that the process for finding coordinates takes two steps:
  - First, each group will be assigned certain place names. Students then must compare Howard's map to the topographic map to locate and mark Howard's points on the topographic map.
  - Second, after all student groups have completed this task, they will use their marked topographic map to determine the site coordinates using TopoZone on the computer.
- Demonstrate the place names/topographic map comparison. Hand out worksheet, place name assignments and topographic maps to student groups.

Explore 1

Student groups mark places on the topographic map.

Generalize

- Discuss the challenges of transferring points from an artistic rendering to a topographic map.
- Discuss the pros/cons of each type of map.

Explore 2

Follow worksheet instructions to determine and record coordinates.

Generalize 2

Discuss issues of coordinate accuracy and how close is close enough.

Apply/Assess

Students use coordinates in GIS mapping or to create waypoints for travel.

TEACHER RESOURCES

Alaska & Polar Regions, Elmer E. Rasmuson Library
310 Tanana Loop, PO Box 756808
Fairbanks, Alaska USA 99775-6800
Phone: (907) 474-7261 Email: fyapr@uaf.edu

Alaska Native Knowledge Network, "Oral Tradition and Cultural Atlases." Available online at http://www.ankn.uaf.edu/NPE/oral.html. (This site contains a comprehensive list of resources about oral tradition and the creation of cultural atlases and place names maps. The resources at this site provide examples and guidance about ways in which the rich oral traditions of Native people can be drawn upon in support of the school curriculum.)

Kari, James and Fall, J. A. (2003) *Shem Pete's Alaska*. University of Alaska Press: Fairbanks

Luke, Howard (1998) *My Own Trail.* Alaska Native Knowledge Network, Fairbanks, Alaska. Order at http://www.ankn.uaf.edu/publications/

"Project Jukebox: Oral History Program." University of Alaska Fairbanks. Available online at http://uaf-db.uaf.edu/jukebox/PJWeb/pjhome.htm (This site contains over 35 projects from throughout Alaska which integrate oral history recordings with associated photographs, maps and text.)

Name: ____________________

PNL Lesson 5
PICKING COORDINATES FROM PAPER MAPS
STUDENT EXERCISE

By the end of this lesson, you will be able to determine the coordinates of points on a paper map which you can then use to create points in a GIS project or use to enter as waypoints into a GPS. You do this in two steps:

- Marking points on a topographic map
- Determining the coordinates of those points on a computer

Step 1: Marking Points on a Topographic Map

1. Spend some time reading and looking at Howard Luke's map, *My Own Trail* and think about how it is alike or different from other maps you have seen. Record some of your observations here:

____

____

____

2. Record the place names assigned to you in the table below.

3. On Howard's map, find the first place that has been assigned to you and read what Howard has to say about it.

4. Find that same place on the topographic map and mark its location on the topographic map using the site number.

5. Do the same thing for all of the points assigned to your group.

WAIT to fill in the latitude and longitude until the computer lab.

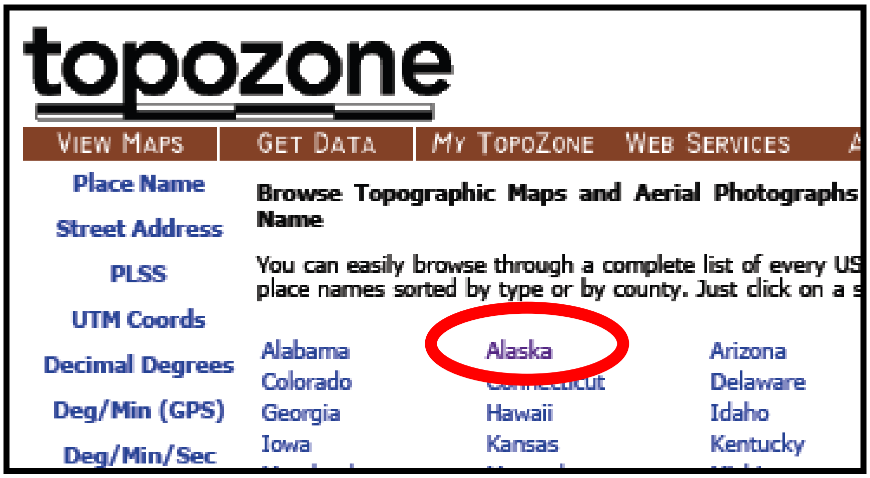
Site #	Site Name	Latitude	Longitude

Step 2: Finding the Coordinates

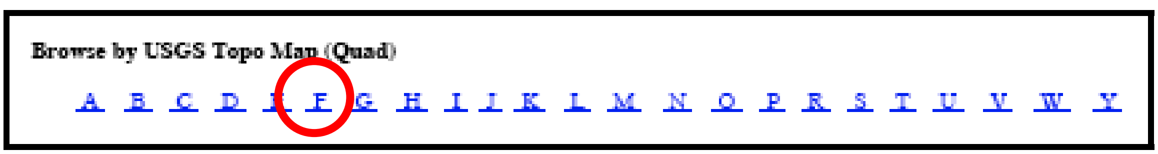
1. Bring the marked topographic map to the computer lab.

2. Open an internet browser and go to TopoZone at:
   http://www.topozone.com/states/Alaska.asp

3. Click on "Alaska."



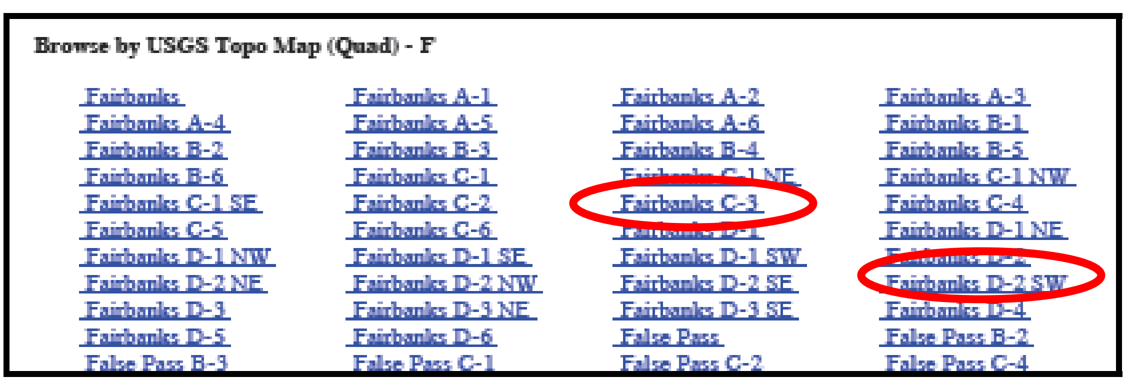
4. Click on Browse by US Topo Map (Quad) "F."



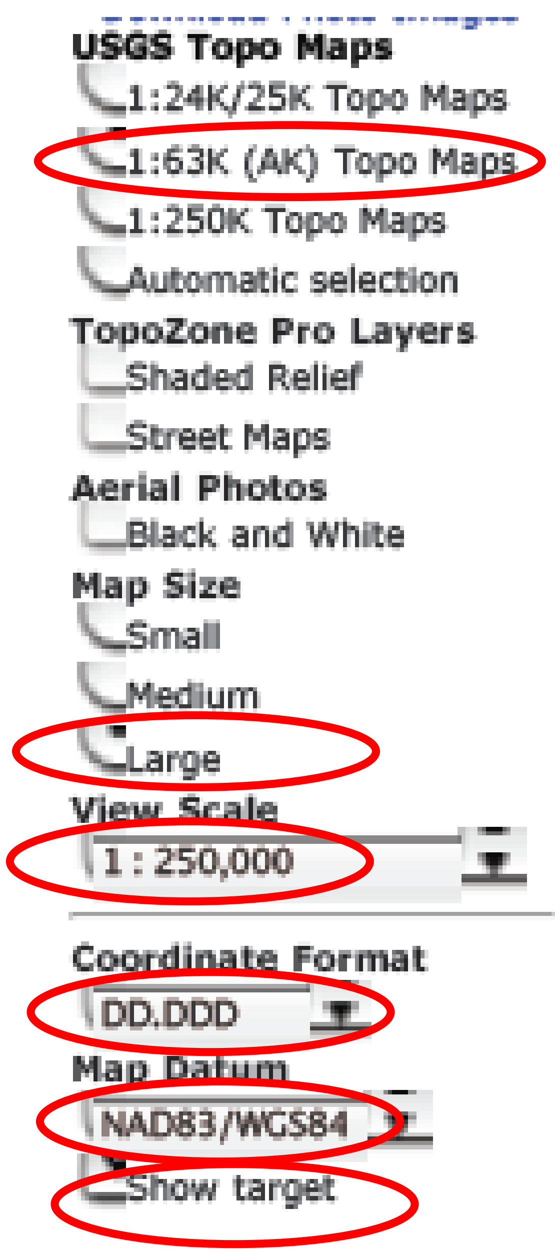
5. Select "Fairbanks D-2 SW" if your points include or are located NW of Crybaby Hill

OR

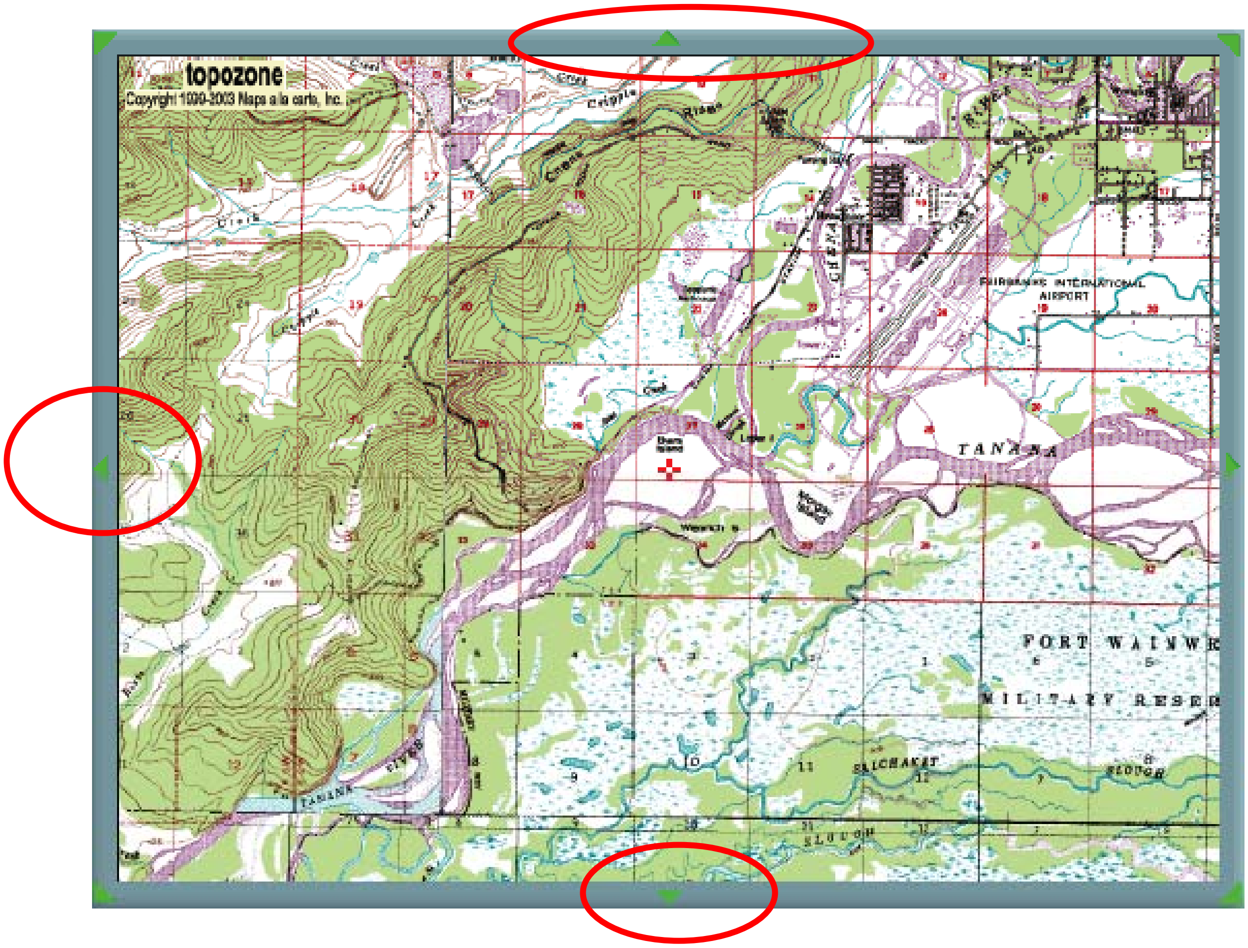
Select "Fairbanks C-3" if your points are located SW of Crybaby Hill.



6. Select:
   - USGS Topo Maps: “1:63K (AK) Topo Maps”
   - Map Size: “Large”
   - View Scale: “1:250,000”
   - Coordinate Format: “DD.DDD”
   - Map Datum: “NAD 83/WGS 84”
   - Check: “Show target”

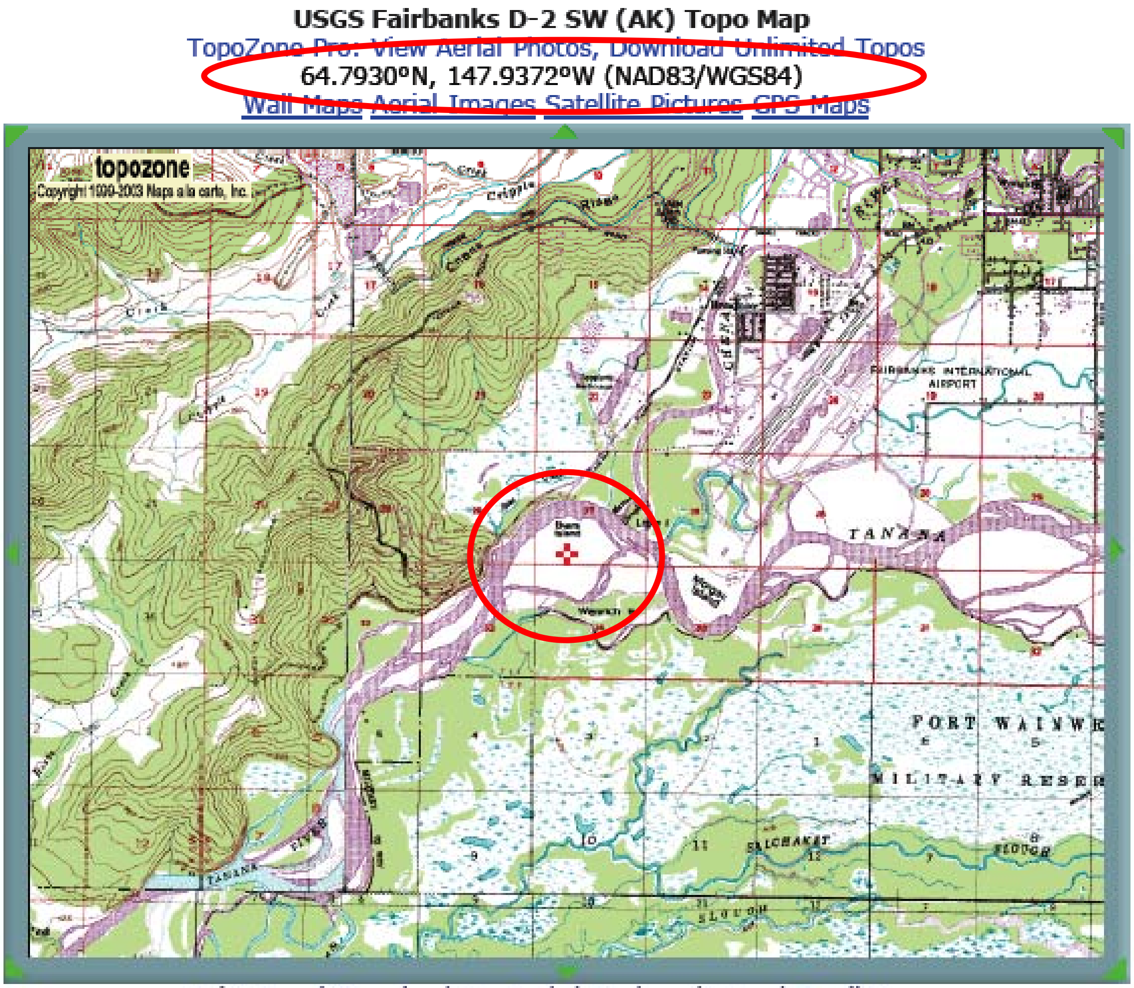


7. Use the green arrows to scroll and find the places you have marked on the topographic map.



You can also get a better look by going back to “View Scale” described in step 6 and changing the ratio.

8. As you move the cursor, you will notice a moving symbol with crosshairs. Hover the crosshairs over the point you have selected and click. A red cross will appear and coordinates will be shown in text at top of map, as indicated.



9. Record these coordinates in your table on page one of these instructions.

10. Repeat steps 7 to 9 for each place name on your sheet.

PLACE NAME ASSIGNMENT SHEET

Site #	**Place Name**	**Described on Map?**	**Book Index Pages**
	Group 1		
1	• Chena Town	No	39-41, 69,99
5	• Pfeiffer	No	46, 52, 54-57, 75
8	• Too Netkum No' (Rosie Creek)	Yes	47

	Group 2		
2	• Ch'eno' Xudochaget (Old Chena Village)	Yes	xii-xiii, 33, 34, 41, 99,
6	• Hadley	Yes, related to Hadley Island	46
11	• Norman Hadley Island	"	"

	Group 3		
3	• Luke Slough	Yes	79
9	• Bughu Tr'etreghee (Crybaby Hill)	Yes	No
12	• Lost Creek	Yes	no

	Group 4		
4	• Kuth Tsoola (Tsoela?) (Long-Necked Willows)	No	xii, 33
7	• Andrews	Yes	47-48
10	• Sam Charley Slough and Island	Yes	33

PNL Lesson 6
FIELD TRIP GUIDE
TEACHER INFORMATION

Lesson Summary: Students complete classroom preparation and go on a field trip to document local place names and landmarks.

Objectives: Students will understand the importance and location of local landmarks using field notes, GPS receivers and digital cameras. (It is assumed that students have done GPS Lesson 1 and, optionally, GPS Lesson 2.)

Estimated Time: Depends upon the circumstances; but half- to full-day field trips often work best.

Correlation to Alaska Standards:

Cultural D-4	Gather oral and written history information from the local community and provide an appropriate interpretation of its cultural meaning and significance.
Cultural E-2	Understand the ecology and geography of the bioregion they inhabit.
Geography A	Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.
Geography B	Utilize analyze, and explain information about human and physical features of places and regions.

BACKGROUND FOR THE TEACHER

This field trip is intended as a follow-up to classroom work on local landmarks. It differs from GPS Lesson 2 Field Data Collection Using a GPS and Digital Camera in that: (1) students will have researched landmark sites ahead of time, perhaps through books, talks with local landscape experts and/or use of TopoZone; and (2) hopefully a landscape expert will accompany students on this trip, shedding light on the places they visit.

If your class plans on traveling with a local expert, take care that the technological gadgets are off and out of use when the expert is talking. It generally works well to stop at a landmark, have the students listen and take written notes while the expert talks, and then use the GPS receivers and cameras for documentation.

Make sure that the GPS receivers and cameras are ready:
- Check batteries on both the GPS receivers and cameras
- Clear camera memory cards
- Clear waypoints and track logs from the GPS units
- Check time/date settings on the cameras
- Make sure that the cameras and GPS units are labeled

INSTRUCTIONAL PROCEDURES
In class, assign landmark sites to student teams and ask each team to fill out the "Classroom Work" sections of their Field Trip Planning and Observation Sheet. Explain that each team will be the classroom expert for the sites that they are assigned. If you did PNL Lesson 5, "Picking Points," you can also ask each team to program their GPS with the waypoints they determined for their assigned sites.

Remind students of the field protocols for respectful treatment of guests and use of equipment as follows:
- If an expert is traveling with you, allow the expert to share whatever stories and information they have when you first reach a site. Take written notes first, followed by GPS and camera documentation when the visitor has finished talking.
- Group roles are as follows: recorder, GPS operator and photographer.
- Roles should be rotated amongst the group so that everyone has a chance.
- It is the recorder's job to make sure that all information is written on the data sheet, but the whole group is responsible for helping collect the information.

Group Name: ______________________________ Date: ____________________

Group Members: ____

GPS number: ______________________________ Camera number: __________

Field Trip Planning and Field Observation Sheet

Site # _______

Classroom Work

English Name: ____

Alaska Native Name: ____

Story: ____

____

____

____

Field Data

Photo #:_____________________ Photographer:________________________

Waypoint #:__________________ GPS Operator:________________________

GPS Accuracy: _______________ Comments: ___________________________

____

____

Field Trip Planning and Field Observation Sheet

Site # _______

Classroom Work

English Name: ____

Alaska Native Name: ______________________________________

Story: ____

____

____

____

Field Data

Photo #:____________________ Photographer:_____________________

Waypoint #:_________________ GPS Operator:____________________

GPS Accuracy: ______________ Comments: _______________________

____

____

Field Trip Planning and Field Observation Sheet

Site # _______

Classroom Work

English Name: ____

Alaska Native Name: ______________________________________

Story: ____

____

____

____

Field Data

Photo #:____________________ Photographer:____________________

Waypoint #:_________________ GPS Operator:____________________

GPS Accuracy: ______________ Comments: _______________________

____

____

Field Trip Planning and Field Observation Sheet

Site # _______

Classroom Work

English Name: ____

Alaska Native Name: ______________________________________

Story: ____

____

____

____

Field Data

Photo #:____________________ Photographer:______________________

Waypoint #:_________________ GPS Operator:______________________

GPS Accuracy: ______________ Comments: _________________________

____

____

MapTEACH:

Remote Sensing / Geology (RSG)

RSG Lesson 1
AIR PHOTO INTERPRETATION
TEACHER INFORMATION

Lesson Summary: This activity introduces students to color infrared (CIR) air photo interpretation. Students examine a CIR air photo of their community, identify prominent features and interpret what those features might be through use of an air photo key.

Objectives: Students will begin to identify and interpret prominent landscape features in CIR air photos.

Estimated Time: 1 hour

Correlation to Alaska Standards:

Cultural E-2	Understand the ecology and geography of the bioregion they inhabit.
Geography A	Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.
Science A-1	Develop an understanding of the processes of science.

BACKGROUND FOR THE TEACHER

Like maps, aerial photos and satellite images provide a bird's eye view of the Earth, but unlike maps, photos are direct images of the Earth and convey firsthand information. Low-flying airplanes and more-distant satellites record everything “indiscriminately.” Subtleties such as color variation, tone, texture, size and shape reveal patterns and features of the Earth that can't be seen in any other way. Such images portray not only roads or coastlines, but features not always noted on maps such as mountains, volcanoes, vegetation, sediment in water, sand dunes, sea ice extent and more.

Air photos are generally of two types: true color or color-infrared. True color photos capture the reflectance of visible light and portray the landscape in the blues, browns and greens we associate with the Earth. CIR photos capture the reflectance of the invisible infrared spectrum and portray the Earth in shades of red, blue, purple and other colors. This lesson uses photos in the CIR spectrum because although true color photos are more familiar looking, CIR photos reveal landscape features in much more detail. (See More Explorations and Teacher Resources for links to understanding light.)

True color image of Nome, Alaska

Color-infrared image of Nome, Alaska

Air photo interpretation involves recognizing and describing objects by key characteristics, many of which can also be helpful when viewing satellite images. Skillful interpretation of air photos is an art acquired only after considerable experience, but beginning students can comprehend common features in air photos with some basic instruction and time to practice. Some of the most common air photo features are described in the paragraphs and illustrations below.

Alaskan CIR air photos for this lesson can be obtained through the GeoData Center at the University of Alaska Fairbanks at the following address:

GeoData Center, Geophysical Institute
University of Alaska Fairbanks
903 Koyukuk Dr.
P.O. Box 757320
Fairbanks, AK 99775-7320
(907) 474-7598

MATERIALS

- Large (3' x 3') CIR image of community
- Color printer
- For each student:
    - 1 (8” x 8”) laminated CIR print of community
    - Copies of Student Exercise and *Air Photo Key*
    - Fine-tip Sharpie
    - Mylar overlay
    - Paperclips

INSTRUCTIONAL PROCEDURES

Gear-Up

1. Ask students "How might air photos and satellite images help you know where you are?"
2. Point to the CIR wall poster and ask what students notice first about it (the funny colors). Ask if anyone has seen this kind of image before and what they might know about what CIR is and why it is preferred for image interpretation? (Briefly explain what/why CIR is used.)
3. Examine CIR wall poster. Ask for observations and generally discuss image as a warm-up to lesson.
4. Explain/model the student activity for the day using the wall CIR and sample portion of worksheet to demonstrate the steps:
   - Examine wall CIR closely to get oriented and get a sense of all the variation in color, tone, pattern and texture that there is in the photo.
   - Secure and register mylar overlay to the wall CIR photo.
   - Find a feature of interest and outline it on the mylar using a fine tip Sharpie.
   - Spend some time exploring how to describe features and how to make inferences about what students see on the CIR wall photo.

Feature #	Describe what it looks like	What do you think it is?
Example	Long, straight, grayish line leading into Nenana	Railroad
#1		
#2		

5. Model observations of more subtle differences in color, tone, texture etc. (without "naming" the feature). Explain that interpretation of air photos requires close attention to differences; that if something looks different, it probably is different.
6. Emphasize that although the key is accurate, the colors in their own community photo may look a bit different and they will have to use what they know about where they live in order to interpret the photo.

Explore

Students work to identify and interpret features.

Generalize

- Have students exchange their worksheets and photos and check to see if students agree on the selections and interpretation.
- Alternatively, debrief activity by asking student volunteers to circle selected features on the wall CIR photo and explain their interpretations.
- Ask students to share questions and examples of disagreement and discuss the feature as a class to try and reach a consensus.
- Discuss why having a complete photo for reference is important.
- Ask again how air photos can help you know where you are.

Apply / Assess

See RSG Lesson 2 “Seeing in Stereo and Route Finding.”

MORE EXPLORATIONS

- Have students create a key for the CIR image of their community by viewing it on their computer and taking screen shots to create the key.

TEACHER RESOURCES

University of Colorado at Boulder. “Aerial Photography and Remote Sensing”. Available online at http://www.colorado.edu/geography/gcraft/notes/remote/remote_f.html

Aspen Global Change Institute. 1992. “Ground Truth Studies Teacher Handbook.” Aspen, Colorado. Available for purchase online at http://www.agci.org/publications/publications.html.

National Aeronautics and Space Administration. IMAGERS. “Lesson 5, Interpreting Satellite Imagery.” Available online at http://imagers.gsfc.nasa.gov/teachersite/RS5.htm
(An interactive web site and teacher guide for grades 5–8 that can introduce students to remote sensing.)

National Aeronautics and Space Administration. Landsat 7 Teacher's Kit. Lesson 2, “Image Interpretation.” Available online at http://landsat.gsfc.nasa.gov/education/teacherkit/html/lesson2.html.

Biodiversity Informatics Facility at the American Museum of Natural History. “Remote Sensing Resources.” Available online at http://biodiversityinformatics.amnh.org/index.php?section_id=31.

RSG Lesson 1
AIR PHOTO INTERPRETATION
STUDENT EXERCISE

1. Examine the photo closely to get oriented and to get a sense of all the variation of color, tone, pattern and texture in the photo.

2. Secure the mylar to your photo using paperclips and "register" the photo by using your Sharpie to mark photo corners and large/distinctive landmarks such as a road or lake.

3. Find at least three features that you recognize. Outline and number them on the mylar layer and then describe and interpret them below.

Feature #	Describe what it looks like	What do you think it is?
Example	Long, straight, grayish line leading into Nenana	Railroad
#1		
#2		
#3		

4. Look more closely at your photo and select and number at least four more features that look interesting or distinctive. Use the key to help you figure out what they are and describe and interpret them below.

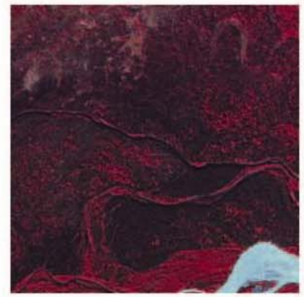
Feature #	Describe what it looks like	What do you think it is?
#4		
#5		
#6		
#7		

Air Photo Key

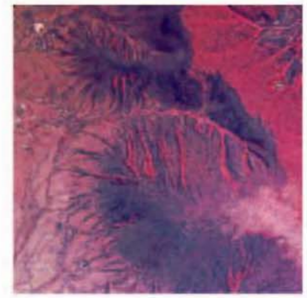
Vegetation Types

a. Tundra showing drainage pattern.

b. Deciduous or "leafy" vegetation (red).

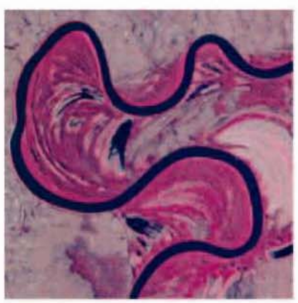


c. Spruce forest (black) with some deciduous (red) trees.



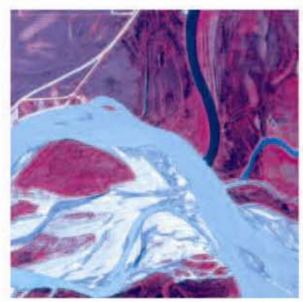
d. Mixed spruce (dark) and deciduous (red) forest on hillside with tundra (light) in valley bottom.

Water

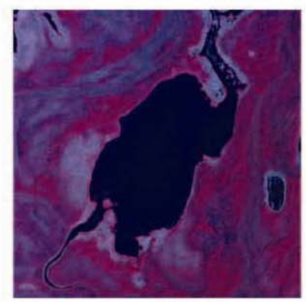


e. Clear river meandering through lowlands. Curved patterns near the river bends show former river channels.

f. Silty river flowing through deciduous forest.

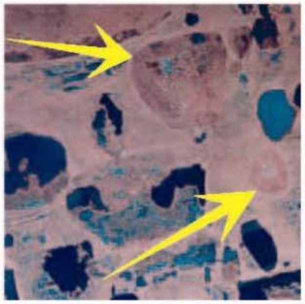


g. Small clear river (dark) flowing into big silty river with sloughs (light blue).

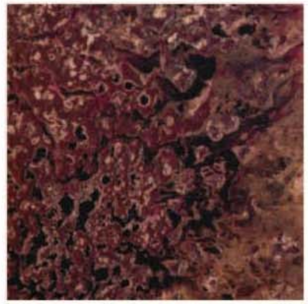


h. Big clear lake in flats.

Wetland ______________________

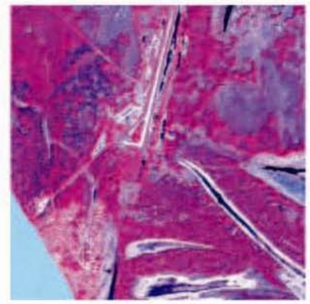


i. Lakes and tundra. Old lakes (yellow arrows) have grown in and look brownish and round.

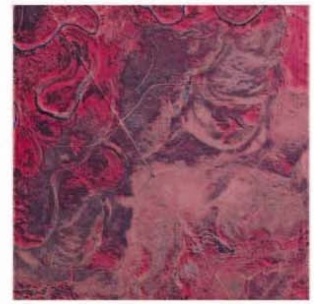


j. Marshy tundra with many small ponds.

Villages and Trails ______________________

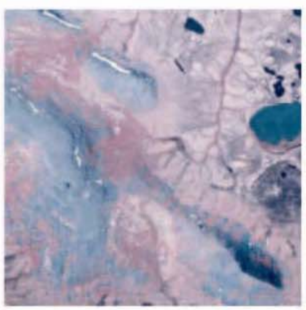


k. Village and airstrip (white-gray). Trail from airstrip is a light pink line.



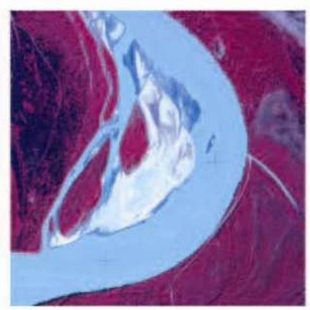
l. Straight trail running diagonally through varied landscapes. Another trail intersects with the straight trail in spruce forest.

Rocks and Gravel ______________________



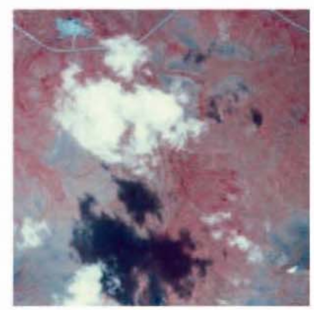
m. Bare rounded mountains (blue) surrounded by tundra and lakes. Snow (white) near ridge top occurs in linear patches or dots.

n. Narrow white gravel beach and spit on coast. The sediment plume in the water makes it look lighter in some places.



o. Islands with large gravel bars and smaller vegetated areas.

Clouds __________



p. White clouds casting black shadows on tundra.

RSG Lesson 2
SEEING IN STEREO AND ROUTE FINDING
TEACHER INFORMATION

Lesson Summary: At stations set up around the room, students view and interpret stereo pair air photos in three dimensions (3-D), compare them with topographic maps of the same area and determine which route is "best." Students also discuss the advantages and disadvantages of each image with regard to finding your way.

Objectives: Students will be able to interpret basic landscape features using topographic maps and stereo pair air photos and will select optimum travel routes based on this interpretation.

Estimated Time: 1 hour

Correlation to Alaska Standards:

Cultural E-2 — Understand the ecology and geography of the bioregion they inhabit.

Geography A — Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.

BACKGROUND FOR THE TEACHER

One of the great things about some aerial photographs is that the photos can be taken as "pairs" so that the areas shown in each photo overlap with areas in adjacent photos. With the use of stereoscopes and with training and practice, we can see the area of overlap in three dimensions—where valleys appear low and mountains appear to stick up off the surface of the photo (like seeing a 3-D movie). This 3-D effect works by getting your left eye to see only the left photo and your right eye to see only the right photo. Your brain then puts the two images together and you get 3-D. When you first try to see in stereo, it can sometimes be difficult to let your eye muscles relax and view images in 3-D. If you are patient though, you should be able to see in stereo after a few tries.

Viewing stereo pairs in this way is a critical skill for geologists because it allows them to look at the landscape and interpret what might be there, even before they visit that place for fieldwork and mapping projects.

MATERIALS

- Copies of *Air Photo Pairs* (Six air photo pairs)
- Copies of Route Finding Maps (Six different topographic maps that match the air photo pairs and show possible routes)
- Six stereoscopes

- Laminated (3' x 3') CIR air photo of local region or overhead transparency of the same
- Washable pen
- Copies of the Student Exercise
- Masking tape
- Overhead transparencies or Power Point of RSG 2B air photo and topographic map images

INSTRUCTIONAL PROCEDURES:

Getting Ready

Before class, follow the directions below to set up the stereoscope stations around the classroom by positioning the stereo pairs in 3-D view and taping the photos to the desk so they don't move out of 3-D.

Tips for setting up stereo viewing

- Work in good light (near a window or lamp).
- Keep mirrors clean; don't touch them with your fingers.
- Aerial photos are labeled right and left (if you switch them around, you will see negative relief).

To get a stereo view

1. Place aerial photos under stereoscope wide apart as shown in Figure 1.

Figure 1 – Stereoscope Set-up

2. Find an obvious feature that is visible and distinct in both air photos (lots of contrast in terms of color, brightness or shape). Lakes, gravel pits, bends in roads or rivers, mountains and islands can work well.
3. Place your left index finger on the contrasting point in the left image and your right index finger on the same point in the right image as shown Figure 2.

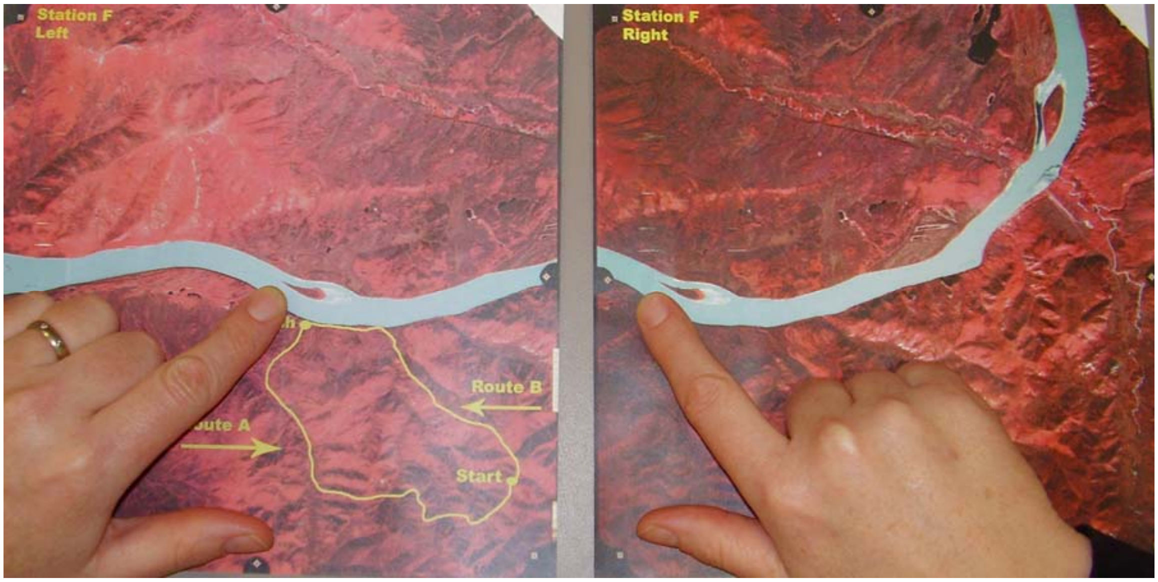


Figure 2 – Selecting distinct features

4. Look through the stereoscope and raise your index fingers up and down one at a time so that you can see where you view your left and right fingers.
5. If your fingers appear to overlap as in Figure 3, the image should "pop" into 3-D. If it hasn't, focus on the contrasting point that you picked. Do you see one or two of the points? If you see two, try to move the images together slightly.

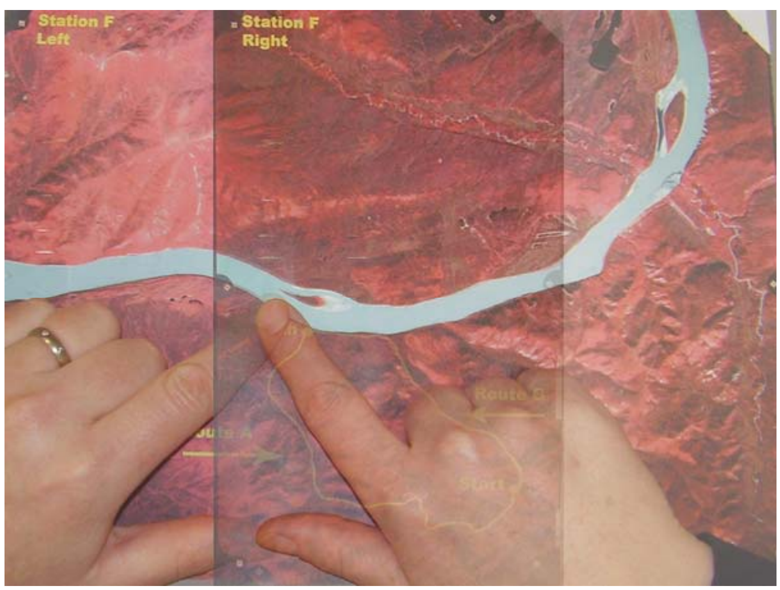


Figure 3 – Overlapping fingers

6. If you bring the photos too close together your fingers will appear to be crossed like those in Figure 4.

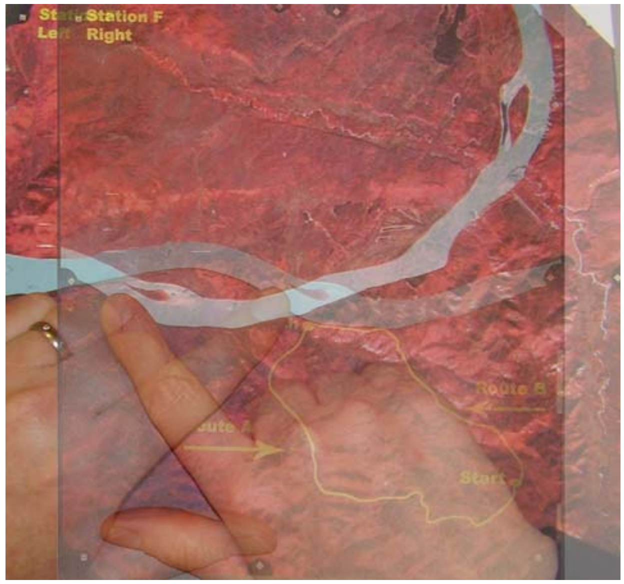


Figure 4 – Crossed fingers

7. If your fingers appear to be crossed, slide the images apart until your index fingers appear to overlap as shown in Figure 3.
8. If your fingers appear to be spread apart, slide the images together until your index fingers appear to overlap. (If this doesn't work, try again. It takes practice.)

Gear-Up

- Ask students if any of them have ever seen a 3-D movie and if so, ask them to describe what it was like. Explain that today's lesson will allow them to see air photos in 3-D. In other words, not only will students be able to get some ideas about the landscape from the air photo clues they learned in Air Photo Lesson 1, but they will be able to see the topography of the area in 3-D.
- Direct student attention to the large CIR (overhead or wall photo) and ask for a volunteer to use an erasable marker to draw the "best" route from point A to point B. Discuss the kind of terrain crossed and whether everyone agrees that this is the "best" route. Discuss that "best" might mean different things to different people.
- Explain that the student's job now is to rotate to each of the stations set up around the classroom where they are to view and interpret the stereo pair, compare it with the topographic map, and decide which of the marked routes would be "best" for travel using their worksheet as a guide.
- Emphasize precautions with regard to use of the stereoscopes.

Explore

Provide students with the Student Exercise sheet. Encourage them to make focused observations and to note their questions.

Generalize

- After students have visited each station, re-group the class to discuss the photos and maps. Show overhead transparency or Power Point slide of each photo/map, asking students first for their observations and inferences about the terrain and then asking them to discuss which route is best and why. Encourage students to add notes to their worksheets.
- Lead a discussion of the advantages and disadvantages of air photos and topographic maps by asking questions such as “If you were a martin trapper, which type of map would you want to look at before planning your trail and why?”

Apply / Assess

Provide each student or student pair with a copy of an air photo and a topographic map (or use stereo pairs if you have them). Ask students: “If you were going to create a snow machine trail from point A to point B, how might you use each of these images to help you decide the best route? Look carefully at each image, draw the route you might take and write a letter to your family describing the trail. Use lots of details and describe the plants, animals and other things you might see.

TEACHER RESOURCES

National Aeronautic and Space Administration. IMAGERS. “Lesson 5, Interpreting Satellite Imagery.” Available online at http://science.hq.nasa.gov/kids/imagers/teachersite/RS5.htm (An interactive web site and teacher guide for grades 5–8 that can introduce students to remote sensing.)

National Aeronautic and Space Administration. Landsat 7 Teacher's Kit. Lesson 2, “Image Interpretation.” Available online at http://landsat.gsfc.nasa.gov/education/teacherkit/html/lesson2.html.

Biodiversity Informatics Facility at the American Museum of Natural History “Remote Sensing Resources.” Available online at http://biodiversityinformatics.amnh.org/index.php?section_id=31.

RSG Lesson 2
SEEING IN STEREO AND ROUTE FINDING
STUDENT EXERCISE

1. Look at the air photos through the stereoscope to see the image in three dimensions.

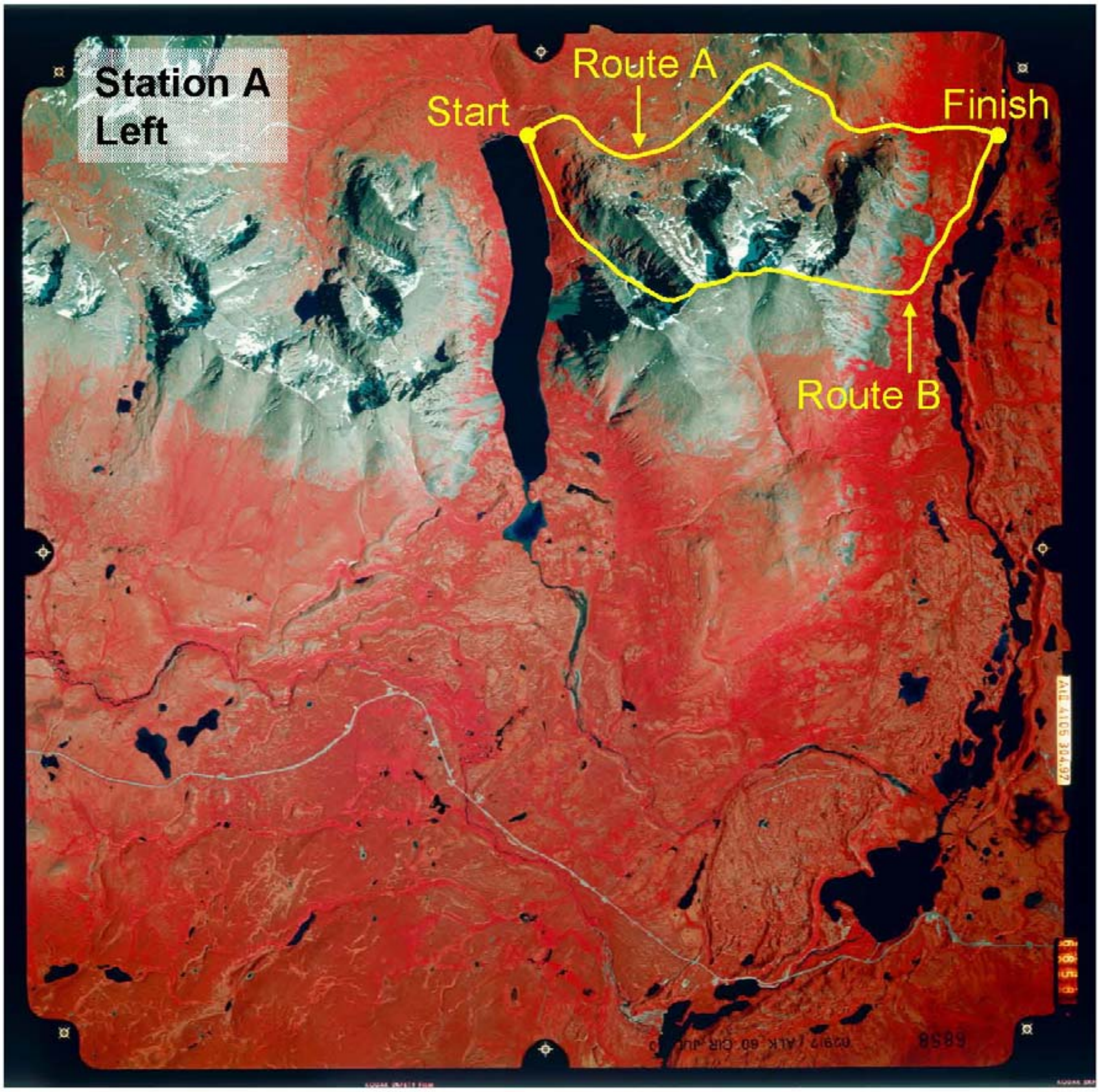
   DO NOT TOUCH THE MIRRORS OR MOVE THE PHOTOS from their taped positions.

   If you have trouble seeing the air photos in 3-D ask for help.

   Make sure that everyone in the group takes a turn looking at the image in 3-D.

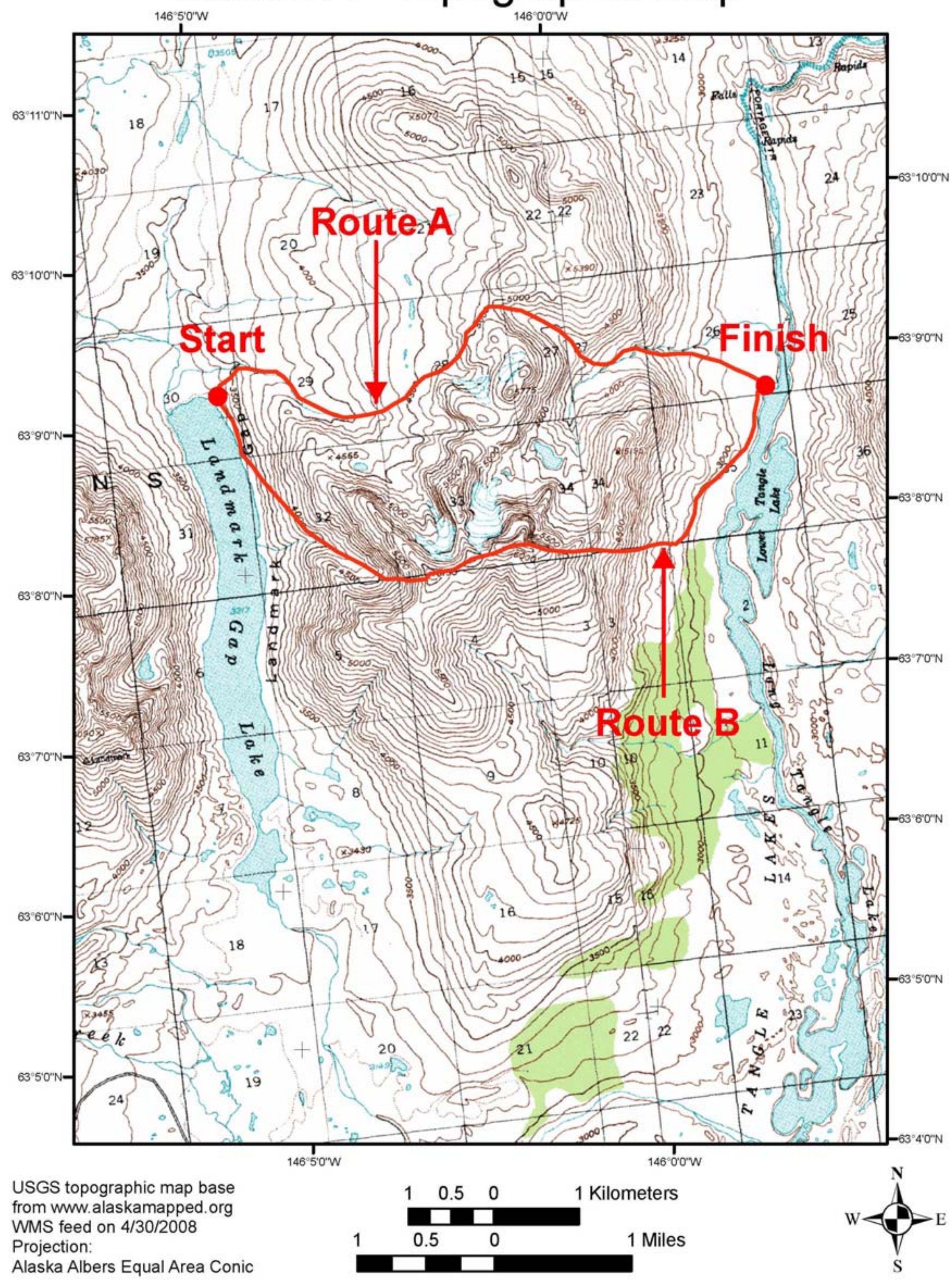
2. Look carefully at the landscape and at the routes drawn on the photos. Which route seems like the best way to travel (Route A or Route B)? Why do you think so?
3. Record your choice and reasons in the table below.

Station Letter	Which Route is Best?	Why do you think so?
A		
B		
C		
D		
E		
F		

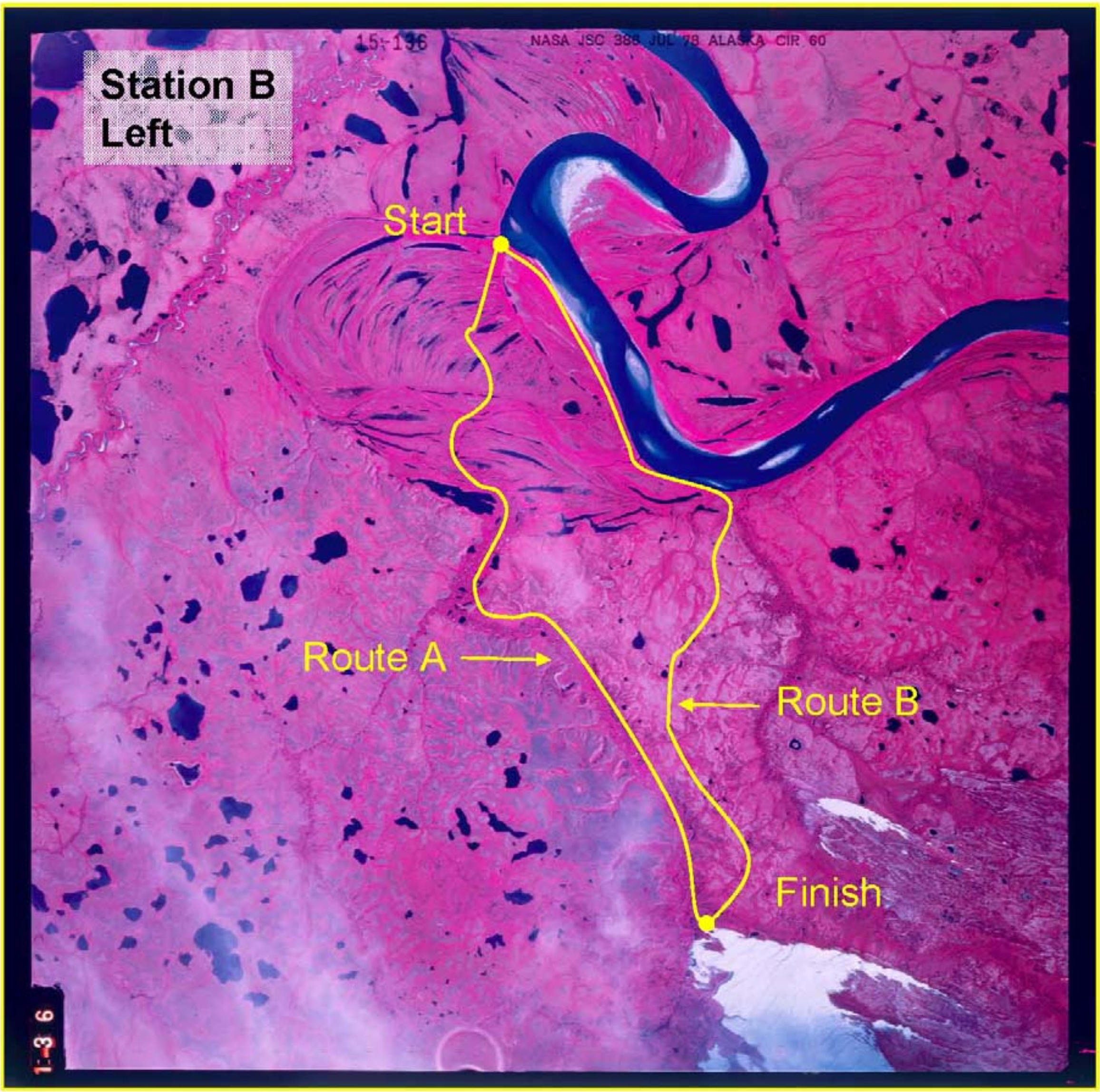

Station A
Left
Start
Route A
Finish
Route B


Station A
Right

Station A - Topographic Map

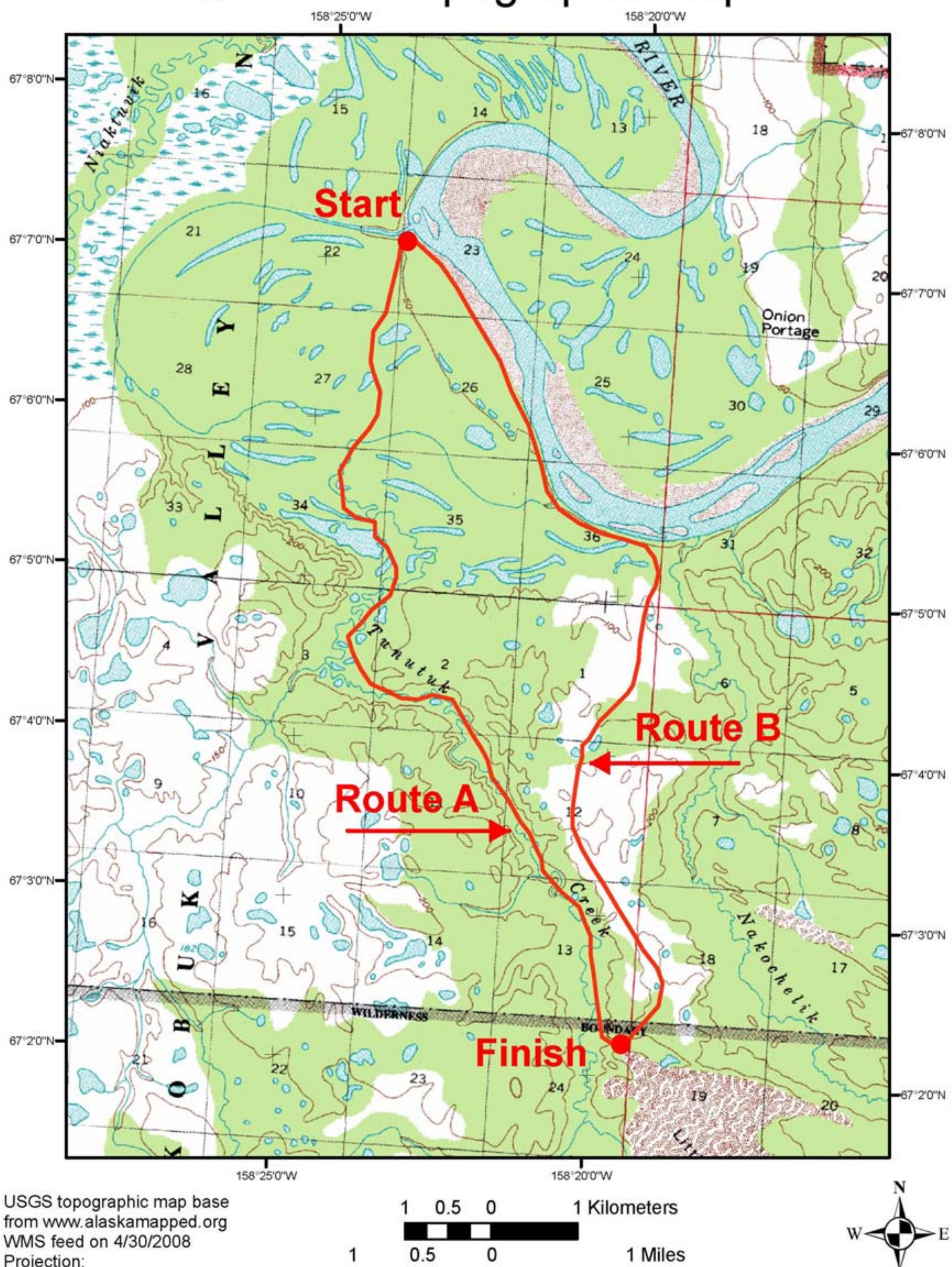


USGS topographic map base
from www.alaskamapped.org
WMS feed on 4/30/2008
Projection:
Alaska Albers Equal Area Conic


Station B
Left
15-136
NASA JSC 388 JUL 78 ALASKA CIR 60
Start
Route A
Route B
Finish
1-3 6


15-137
Station B
Right

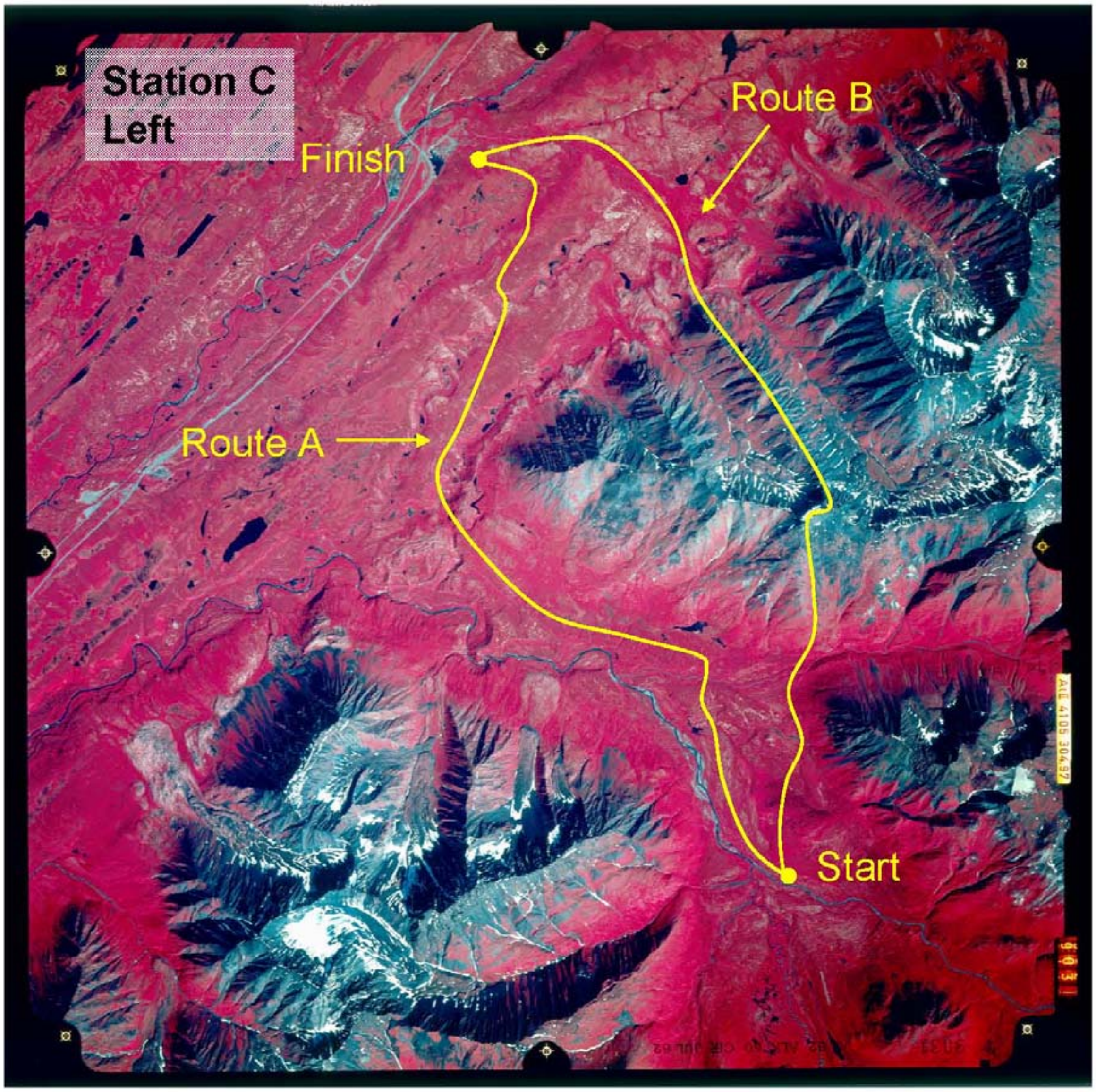
Station B - Topographic Map

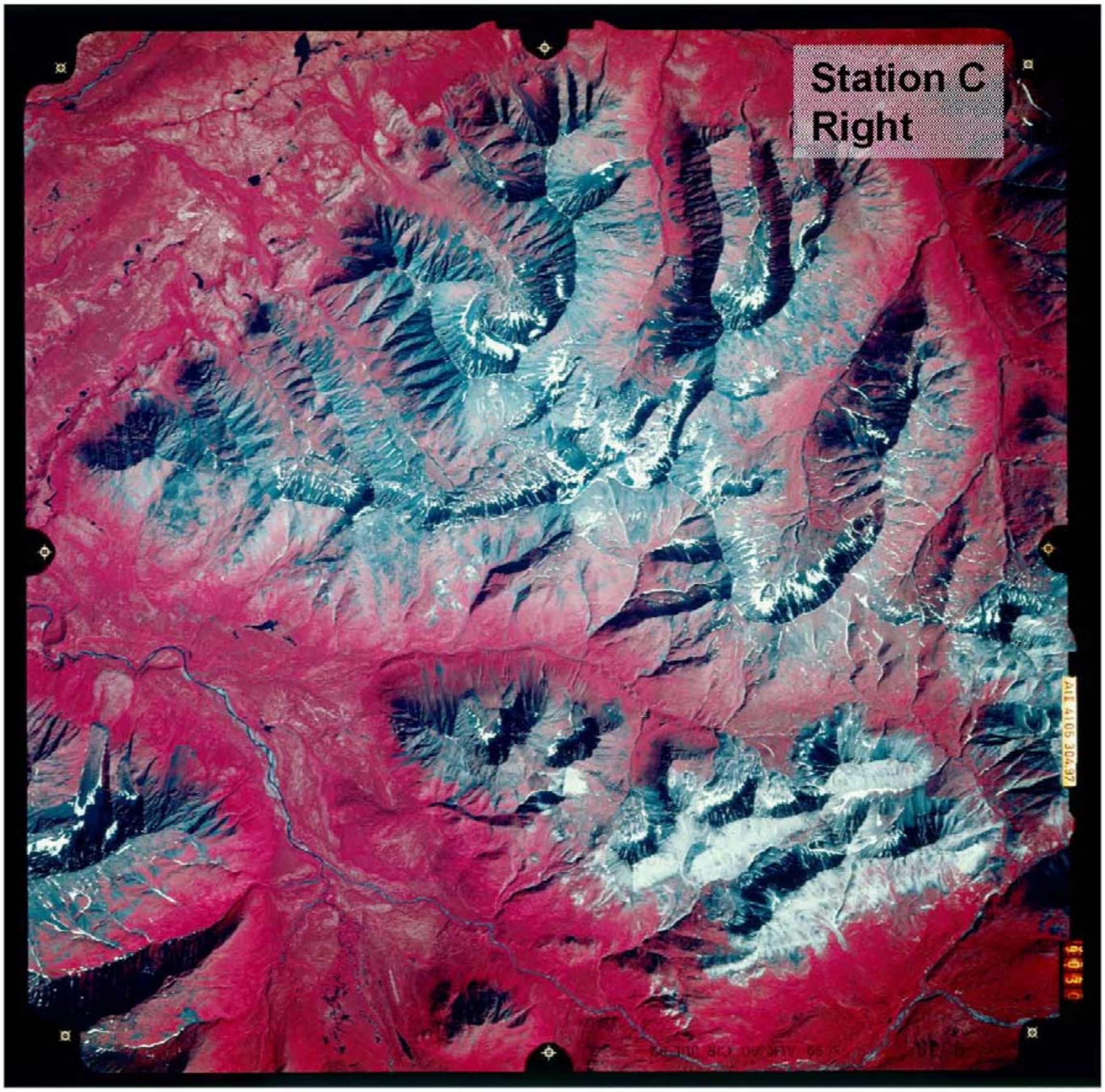


USGS topographic map base
from www.alaskamapped.org
WMS feed on 4/30/2008
Projection:
Alaska Albers Equal Area Conic

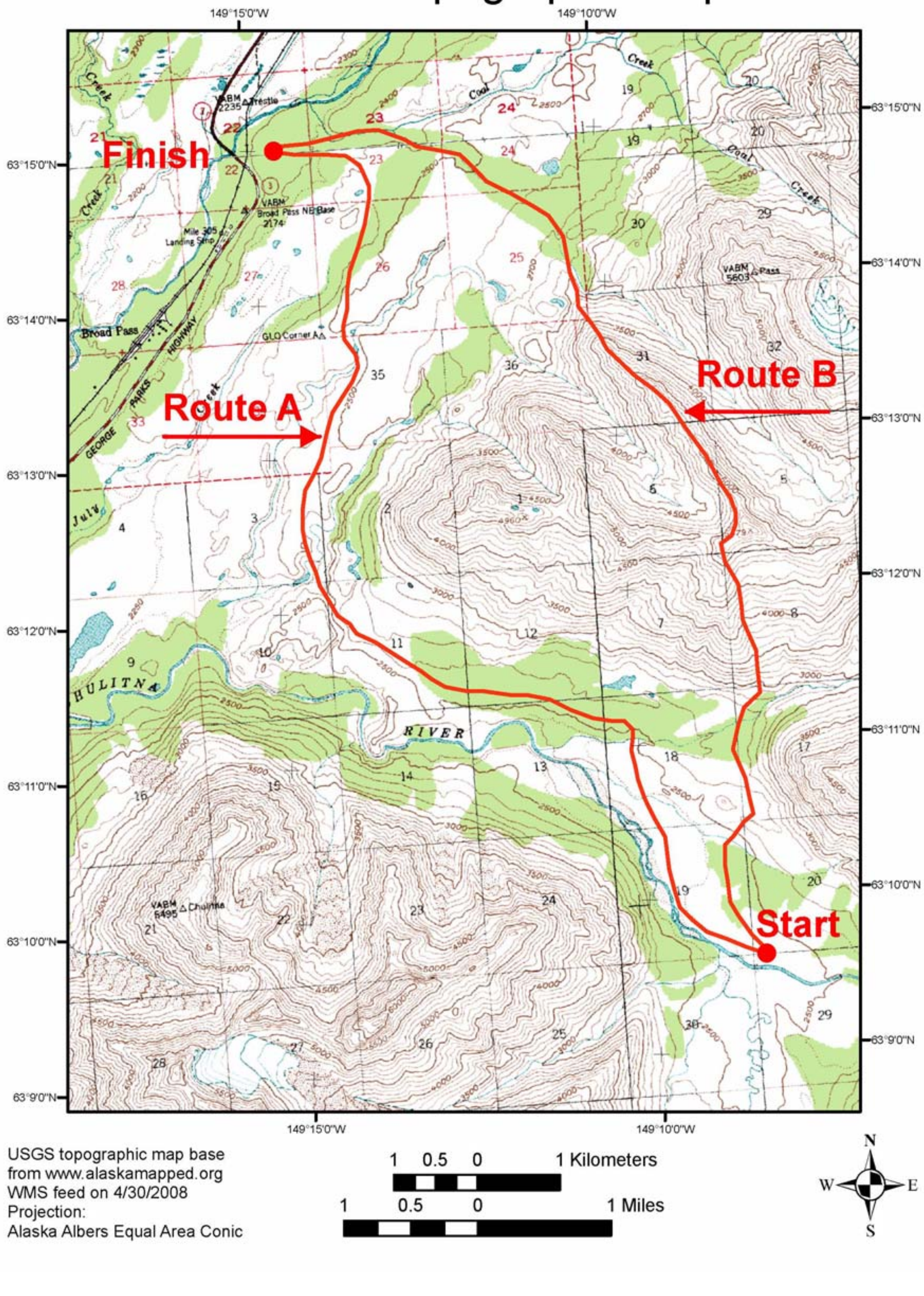
1 0.5 0 1 Kilometers

1 0.5 0 1 Miles

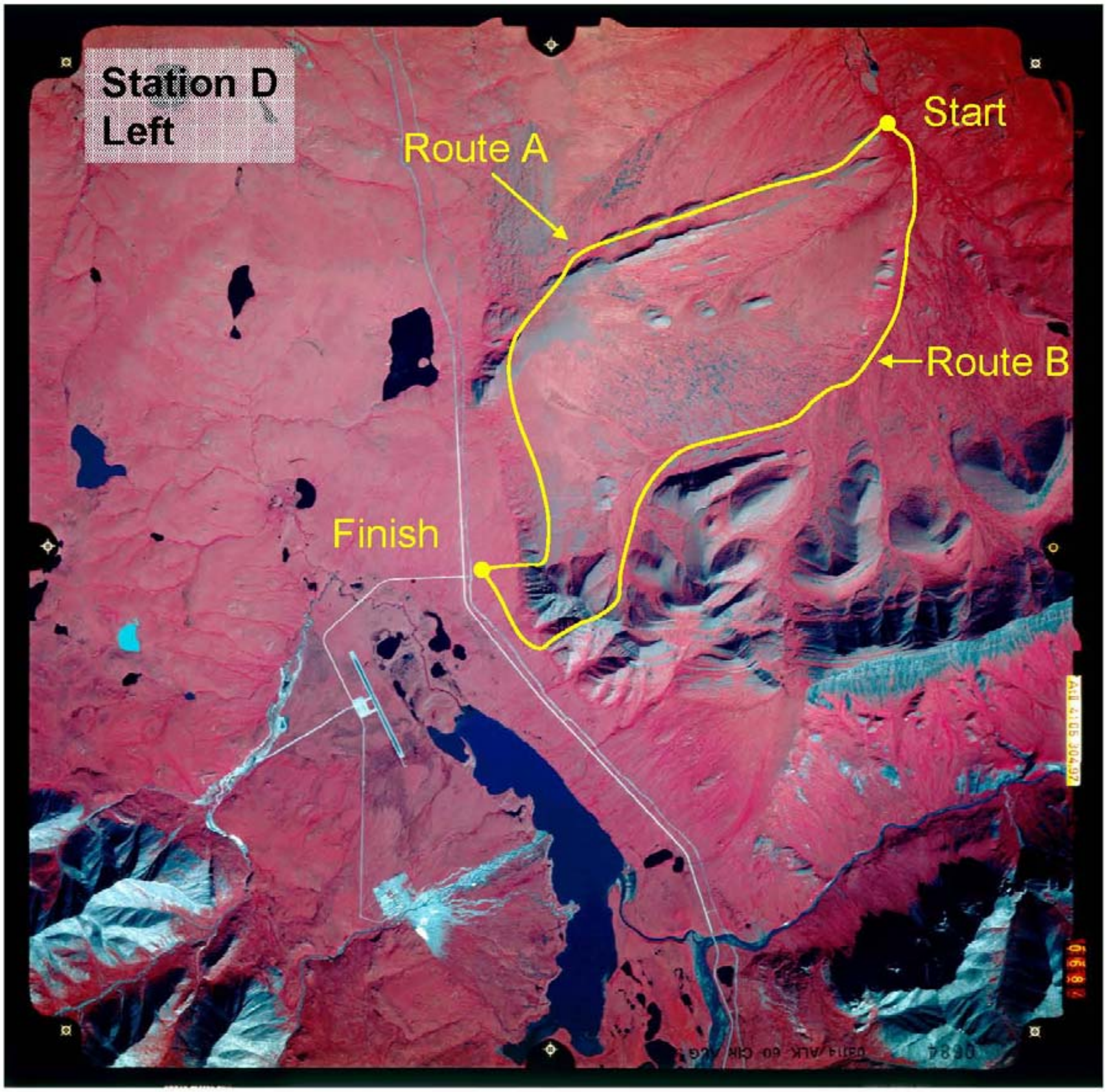

Station C
Left
Finish
Route B
Route A
Start


Station C
Right

Station C - Topographic Map

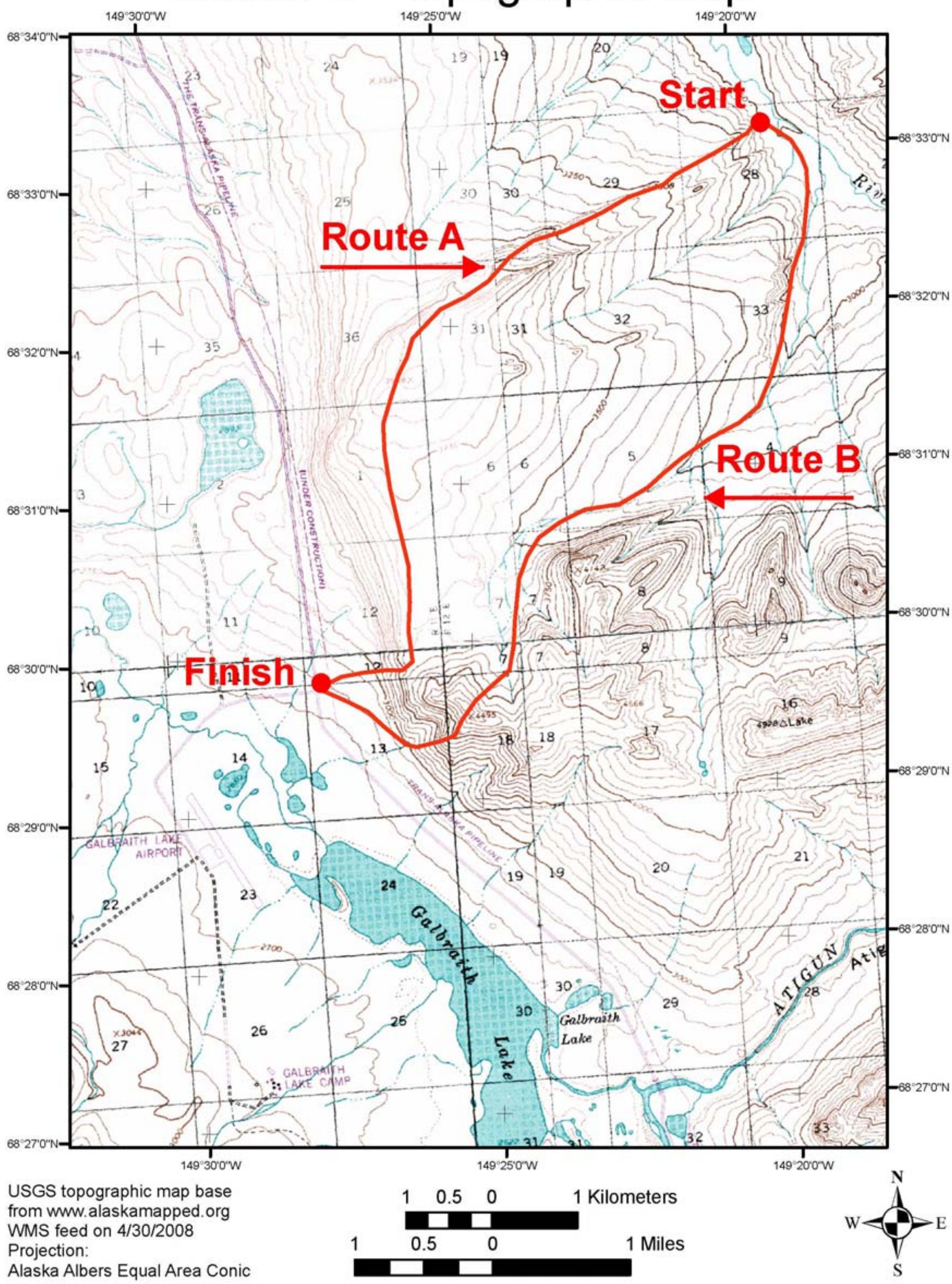


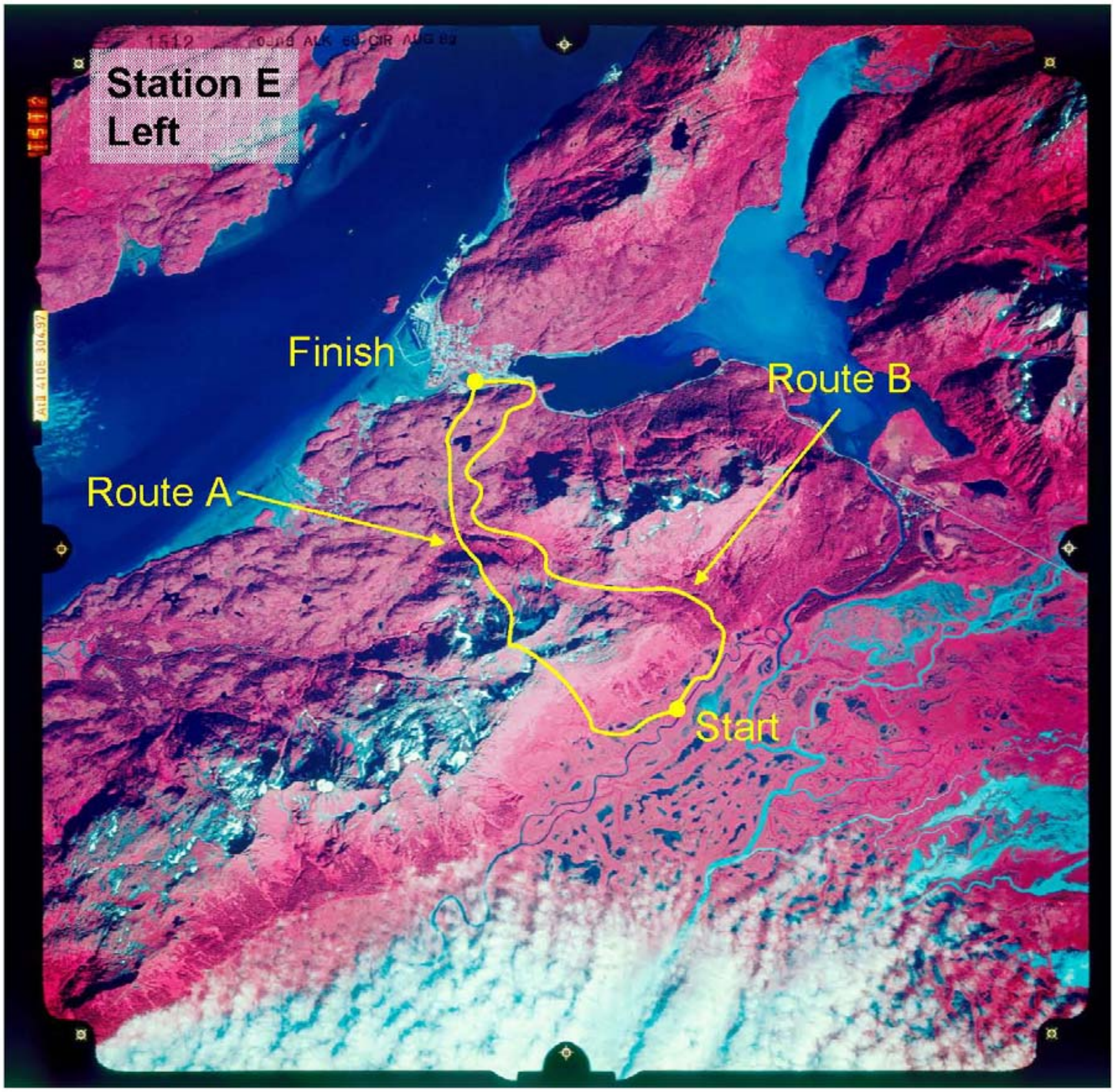
USGS topographic map base
from www.alaskamapped.org
WMS feed on 4/30/2008
Projection:
Alaska Albers Equal Area Conic

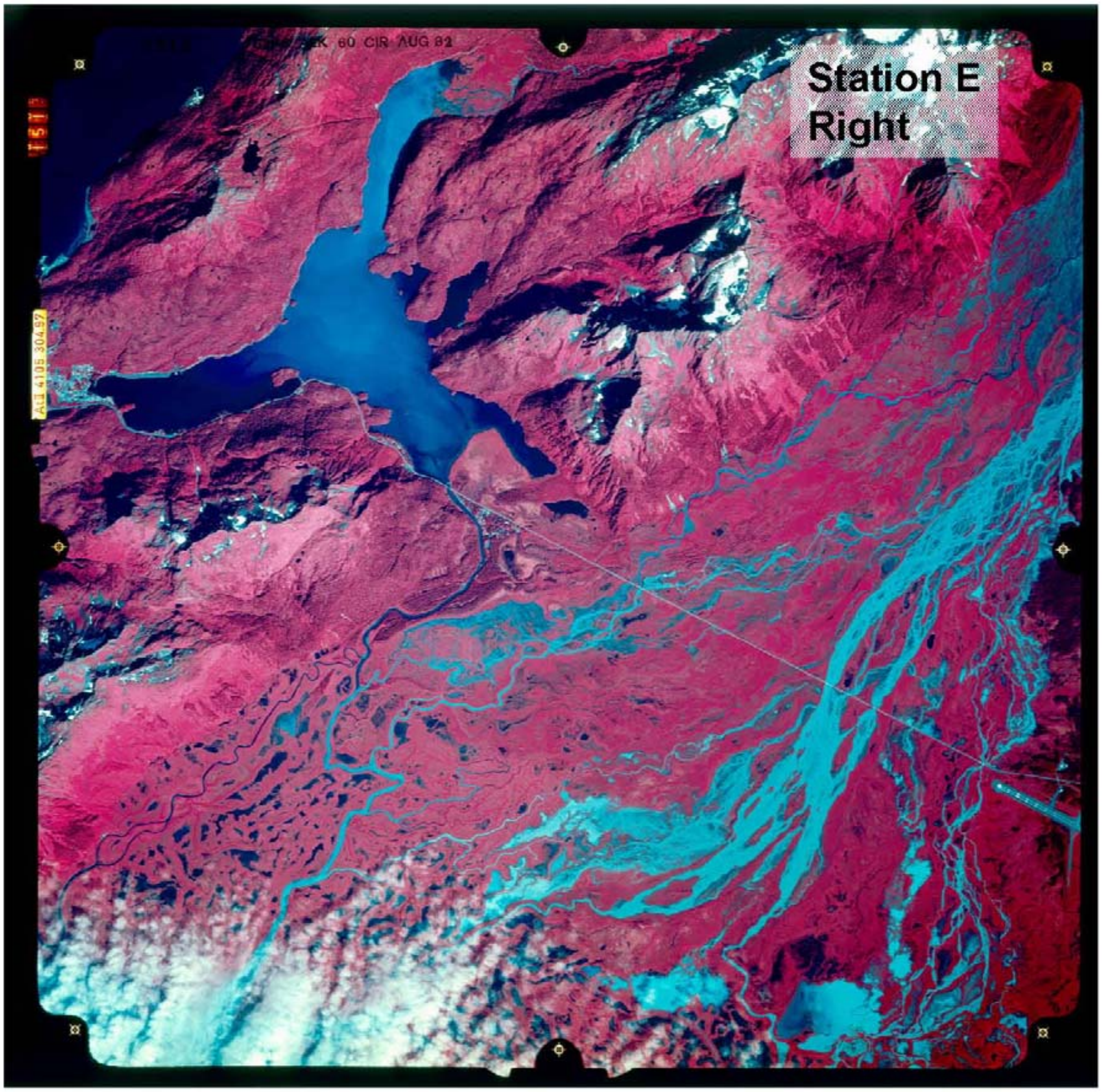

Station D
Left
Route A
Start
Route B
Finish


Station D
Right

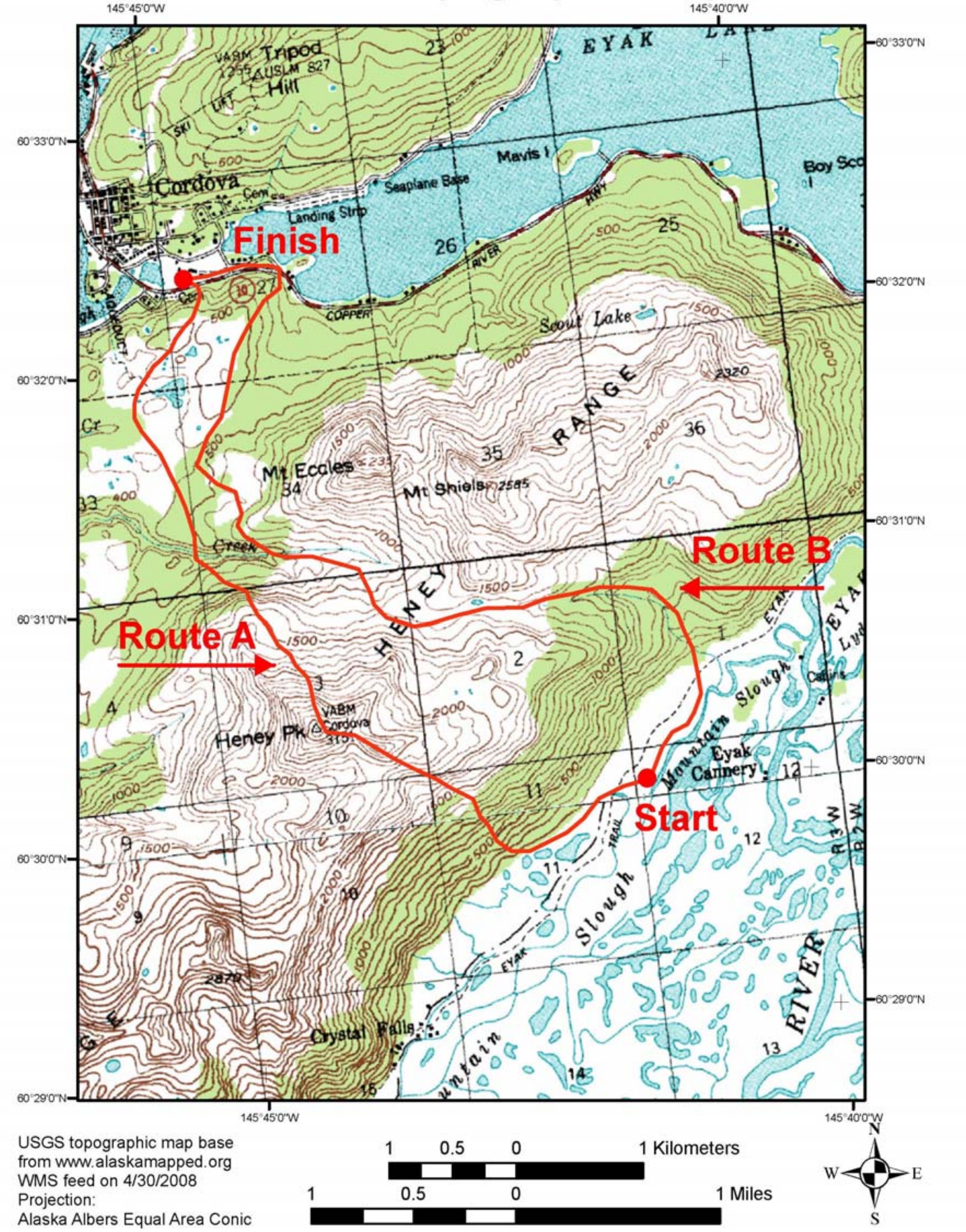
Station D - Topographic Map

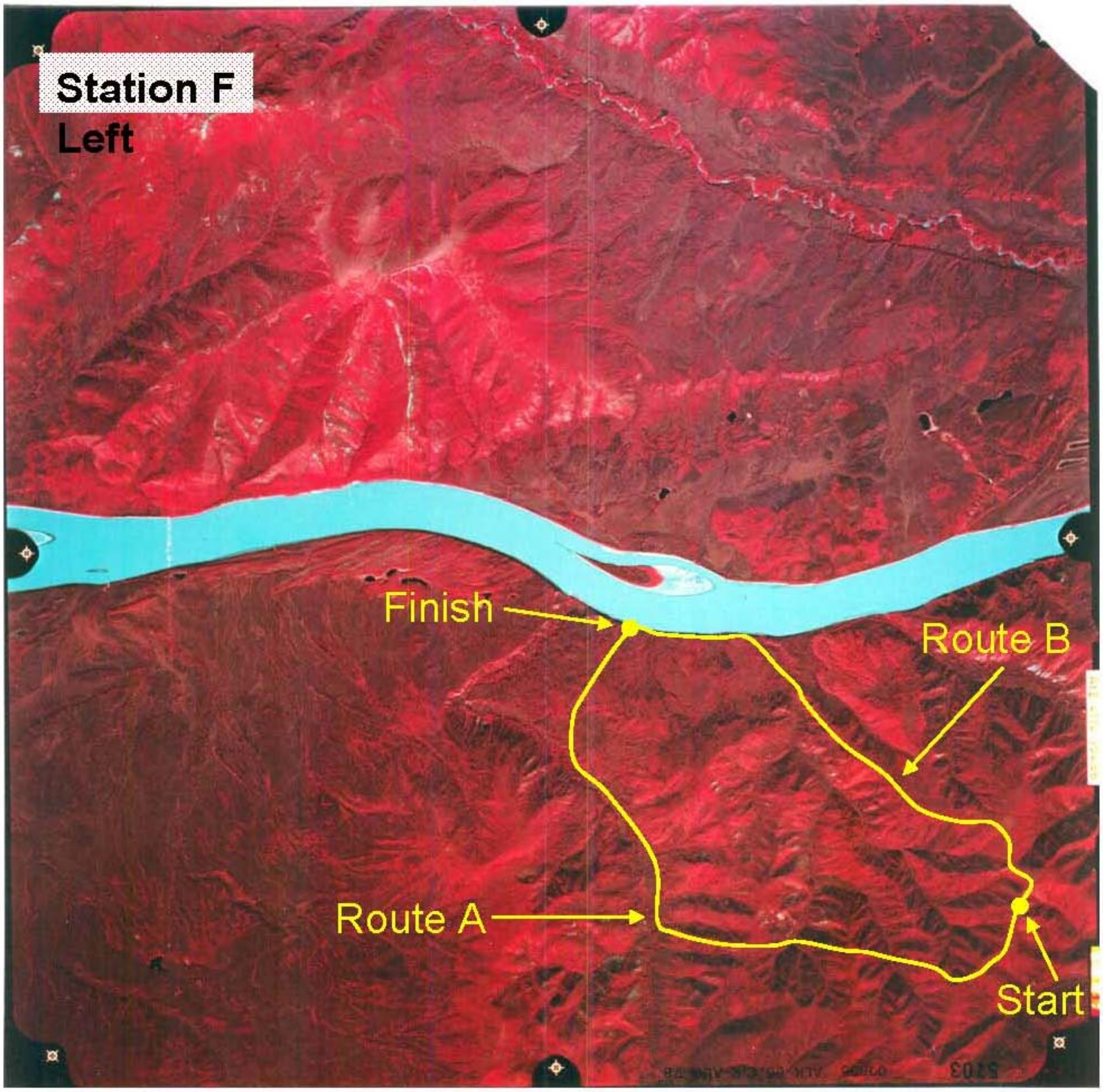



Station E
Left
Finish
Route B
Route A
Start


Station E
Right

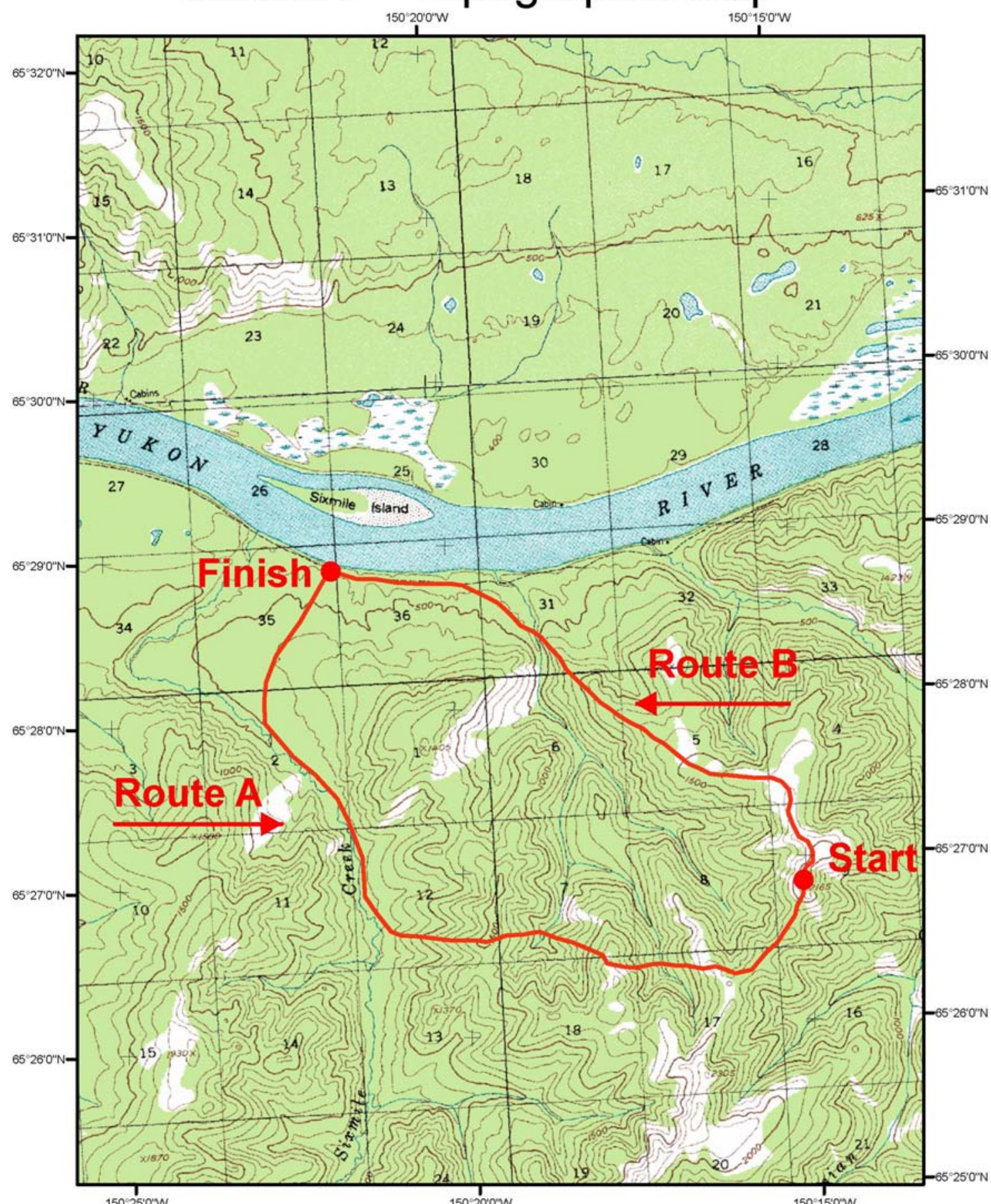
Station E - Topographic Map




Station F
Left
Finish
Route B
Route A
Start


Station F
Right

Station F - Topographic Map



USGS topographic map base
from www.alaskamapped.org
WMS feed on 4/29/2008
Projection:
Alaska Albers Equal Area Conic

1 0.5 0 1 Kilometers

1 0.5 0 1 Miles

RSG Lesson 3
EVALUATING EROSION
TEACHER INFORMATION

Lesson Summary Students use their air photo interpretation skills and prior knowledge of river systems to interpret erosion and deposition features in several CIR air photos.

Objectives Students will develop a better understanding of how running water changes the shape of the landscape.

Estimated Time 20 minutes

Correlation to Alaska Standards:

Cultural E-2	Understand the ecology and geography of the bioregion they inhabit.
Geography A	Make and use maps, globes and graphs to gather, analyze and report spatial (geographic) information.
Science D-2	Develop an understanding of the origins, ongoing processes, and forces that shape the structure, composition, and physical history of the Earth.

BACKGROUND FOR THE TEACHER

As you know from RSG Lesson 1, air photos reveal patterns and features of the Earth that can't be seen in any other way. They not only portray river channels, shorelines and islands, but through differences in color, tone, texture and size, air photos also reveal features such as gravel bars, vegetated islands and cutbanks and thus provide a window into erosion and deposition processes in river systems. Some of these features were represented in the Air Photo Key from RSG Lesson 1, but here we take a closer look at river processes as seen in air photos. The Major River Types handout provides background information for both you and your students, and an answer key is provided for you at the end of this lesson. This lesson is intended to supplement classroom study of erosion and deposition in river systems and work with stream tables, but can also be used to enhance student air photo interpretation skills.

MATERIALS

- Copy of Student Exercise and *Major River Types* handout for each student
- *Air Photo Key* from RSG Lesson 1 for each student

INSTRUCTIONAL PROCEDURES

- Review and discuss prior river and air photo studies
- Provide students with copies of Student Exercise and *Major River Types* handout.

- Have students work through exercise.
- Share and discuss student interpretation.

TEACHER RESOURCES

Understanding and Evaluating Erosion Problems. 1998. Prepared for the Alaska Department of Community and Regional Affairs by Woodward-Clyde Consultants. http://iss.poa.usace.army.mil/akerosion/references/Understanding%20and%20Evaluation%20Erosion%20Problems.pdf

Smith, Michael J. and J. B. Southard. 2001. *Investigating Rocks and Landforms* Teacher's Guide. It's About Time, Inc., Armonk, New York.

Sneider, Cary and K. Barrett et al. 1997. *River Cutters* Teacher's Guide*.* Lawrence Hall of Science, University of California at Berkeley.

The U.S. Army Corps of Engineers maintains a useful internet reference list of documents pertaining to erosion problems in Alaska at: http://iss.poa.usace.army.mil/akerosion/home/references.php

See RSG Lesson 1 for air photo interpretation resources.

STUDENT EXERCISE ANSWER KEY

1. The Kobuk River is a meandering river.
2. The white material on the inside bend is gravel and indicates that point A is a point bar.
3. Erosion would occur at point B.
4. The multiple stream channels indicate that the Tanana River is a braided river.
5. Point A is a cutbank, indicating that erosion was taking place.
6. The white and gray material on the inside bend is a gravel point bar and indicates that point B is an area of deposition.
7. Yes, the airport is located on the eroding, outside bend of the river.
8. The Yukon is a split channel river.
9. The banks of split channel rivers are typically very stable, and bars and islands (which are really a special kind of bar that happen to be in the middle of the river) are more erodible. Therefore we would expect erosion to occur at point A.
10. Islands are typically more rounded on the upstream side and elongated on the downstream side, indicating this river is flowing from right to left.

Name: ____________________

RSG Lesson 3
EVALUATING EROSION
STUDENT EXERCISE

Using your air photo interpretation skills and what you've observed and learned about river and beach erosion, answer the questions about the images that follow.

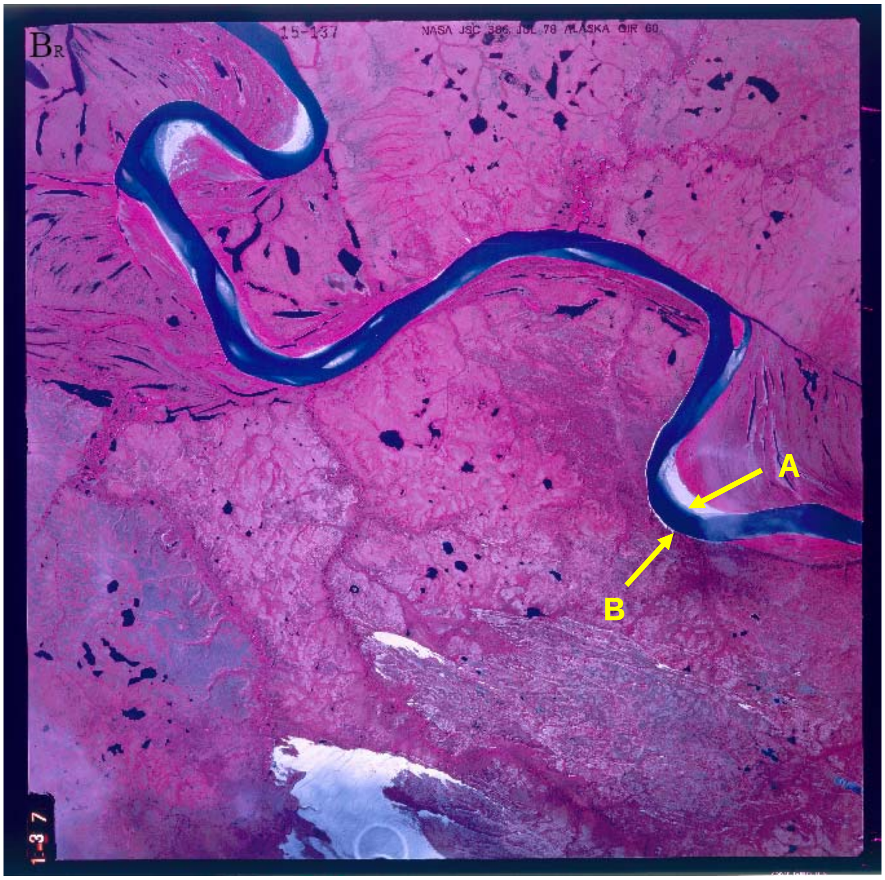


Figure 1 – Kobuk River

The Kobuk River runs though this image. To determine what type of river it is, use your "Major River Type" handout.

1. The Kobuk River is a ________________________ river.

2. Use your "Major River Type" handout to find a term that can be used to describe the feature at point A. What is it?

____

3. Where would you expect erosion to occur, at point A or point B? __________

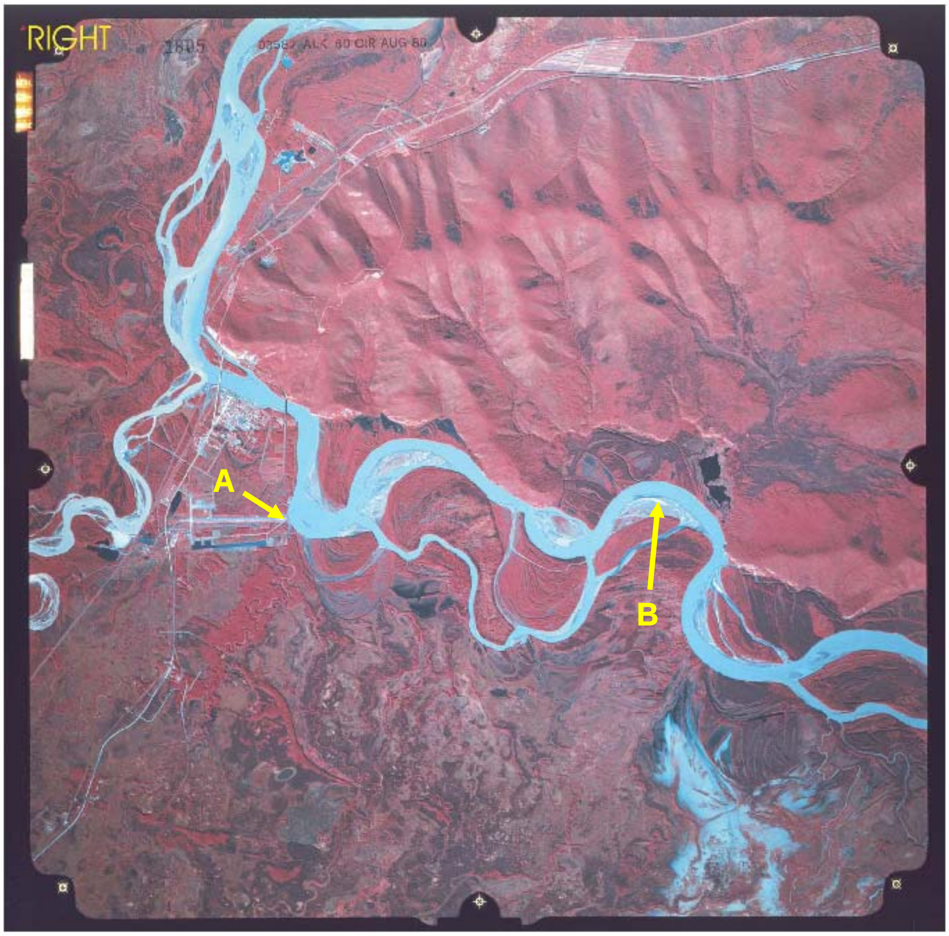


Figure 2 – The Tanana and Nenana Rivers near Nenana

The Nenana River joins the Tanana River at the village of Nenana. To determine what type of river the Tanana River is, use your "Major River Type" handout.

4. The Tanana River is a _______________________ river.

5. Do you think erosion or deposition was taking place at point A when this aerial photograph was taken in 1986?

   ____

6. Where would you expect deposition to occur, at point A or point B?________

7. Find the Nenana Airport in Figure 2. Do you think that erosion is a problem for the Nenana Airport?

   ____

Figure 3 – The Yukon River

The Yukon River runs through the middle of the image above. To determine what type of river it is, use your "Major River Type" handout.

8. The Yukon River is a ________________________ river.

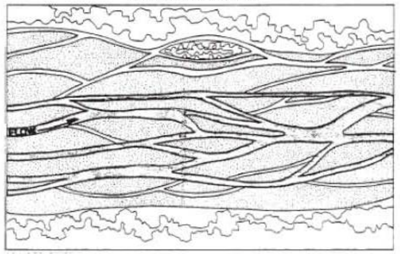
9. Where would you expect erosion to occur, at point A or point B? __________

10. Which direction do you think the river is flowing across the image: from right to left or from left to right? (Hint: look for clues on the "Major River Type" handout.)

____

Major River Types

Braided River



Yukon & White Rivers, Yukon Territory, Canada
U. S. Geological Survey

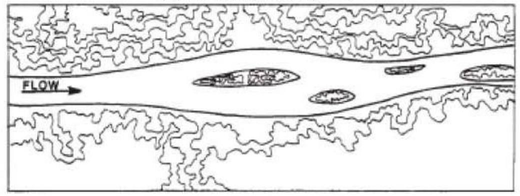
A **braided river** has multiple branching channels separated by many gravel bars and islands.

Flood channels only carry water during floods.

The **active channel** carries flow most of the time.

Channels shift by bank **erosion** and/or by channel diversion into what were previously flood channels. Channel shifts often occur during flood events.

Split Channel River



Yukon & Charlie Rivers, Alaska
U. S. Fish and Wildlife Service

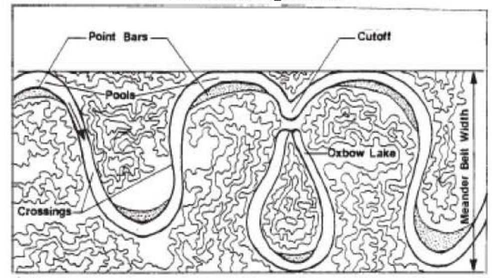
A **split channel river** has islands that split the flow into two channels.

Banks of **split channel rivers** are vegetated and relatively stable.

Gravel bars along the sides or in the middle of the river are more **erodable** than the banks. As a result, the bars rather than the banks **erode** during flood events, resulting in a channel that does not shift or move its banks.

Modification of the River and shoreline configuration section of **Understanding and evaluating Erosion Problems**. Prepared for the Alaska Department of Community and Regional Affairs by Woodward-Clyde Consultants, revised March 1998

Meandering River



Black River, Alaska
U.S. Fish and Wildlife Service

A **meandering river** that loops back and forth within the **floodplain**.

Flow is contained in a single channel.

There is a **point bar** at each inside bend where new material is deposited.

There is a pool, or deep water, on the outside bend where the main current is. The greatest **erosion** occurs at outside bends and result in **cutbanks.**

"Oxbow lakes" form when a channel shift cuts off a bend in the river.

RSG Lesson 4
CHANGE OVER TIME
TEACHER INFORMATION

Lesson Summary: Students study a chronological series of images and maps of Fairbanks or Nenana, looking for evidence of changes over time.

Objectives: Students will understand that maps and images capture and reflect the changing nature of the landscape.

Estimated Time: 30 minutes to 1 hour

Correlation to Alaska Standards:

Cultural E-2 Understand the ecology and geography of the bioregion they inhabit.

Geography A Make and use maps, globes and graphs to gather, analyze, and report spatial (geographic) information.

Science A-1 Develop an understanding of the processes of science.

BACKGROUND FOR THE TEACHER

Maps and images represent the landscape at a particular point in time. Comparison of different map or image vintages can yield visual clues and valuable insights into how a place has changed over time. Depending upon the data available, changes in infrastructure, land cover or watershed characteristics are just a few of the observations one might be able to infer from image comparisons. For example, in handout RSG4A *Fairbanks Time Series 1*, which includes four sets of data and ranges from a 1949 air photo to a 2003 SPOT 5 satellite image, one can easily see such things as: massive housing and road development in the Chena Ridge area; the creation and expansion of the Fairbanks International Airport; the disappearance of Marconi Slough; the cutting off of Deadman's Slough by airport construction; and the on-going erosion and build-up of sandbars and banks in the Tanana River.

There are various ways that one might want to use such a time series, but two ideas are presented below.

MATERIALS

Option 1

- One set of RSG4B images per student pair
- One Student Exercise for each student
- Overhead or slide of each image for class discussion

Option 2

- One color print of RSG4C time series per student
- One to two sheets of mylar per student
- Colored pencils
- Paper clips
- Overhead of each image for class discussion

INSTRUCTIONAL PROCEDURES

Getting Ready

- There are four different data choices for this exercise:
  - RSG4A: Fairbanks Time Series 1. Four maps/images including the dates the maps/images were created.
  - RSG4B: Undated Fairbanks Time Series 1.
  - RSG4C: Fairbanks Time Series 2. Includes just 2 of the 4 maps/images included above, but these are enlarged for easy tracing.
  - RSG4D: Nenana River Series.
- Any of these data sets will work for this activity but it is written with the Fairbanks data sets in mind.
- Make color copies of the time series you will be using.
  - Option 1: For each student pair, make one color copy of the RSG4B and cut images apart. Compile image sets of all four images for each student pair.
  - Option 2: Make a color copy for each student of RSG4C

Explore

Option 1

1. Ask students how they think Fairbanks and its surrounding area might have changed since about the end of World War II until the present. Record their predictions on the board. Hand out a set of RSG4B – Undated Fairbanks Time Series 1 images to each student pair.
2. Explain that the student's task is to carefully observe, compare and analyze the images and to order them in a time sequence from the earliest map/image to the most recent.
3. Students should record the order and observations on their student guide, justifying their inferences as directed.

Answer Key for RSG4B

Earliest Map/Image → **Most Recent Map/Image**			
A	**B**	**C**	**D**
Black and White Air Photo (1949)	CIR Air Photo (1978)	USGS Topo Map (1954, revised 1972, 1973 and 1994)	Spot 5 Satellite Image (2003)

4. When students finish, ask them to share/explain the order they chose. Have them use the overhead to point out observations.
5. Prompt students to think about observations they might have missed. Prompt further by asking such questions as:
   - Why do you suppose there was so much more development on the north side of the Tanana River? What can you see in the images that might explain this?
   - Why do you suppose Marconi Slough disappeared?
   - How stable do you think Byers Island is and why do you think so?

Option 2

1. Ask students how they think Fairbanks and its surrounding area might have changed from about the end of World War II until the present. Record their predictions on the board.
2. Hand out color copies of RSG4C - Fairbanks Time Series 2, mylar, paper clips and colored pencils to each student.
3. Explain that the student's job will be to carefully observe the photos, noticing things that have changed as time progresses. They should pick one particular theme to focus on (for example roads, housing developments, water bodies or one river in particular).
4. Explain that students will now use mylar to trace the feature they have chosen. Model the student activity using the overhead projector to demonstrate the steps:
   - Secure mylar to the topographic map with paper clips.
   - Identify a very prominent feature that is in both images and "register" the image by tracing that feature clearly. (This registering process will serve as a reference that students will use to align their second image.)
   - Instruct students to use just one color to thoroughly trace chosen feature on the topographic map.
   - Once students have finished with the topographic map, have them remove the mylar, align the "registered" feature on the mylar layer with the same feature on the Spot 5 satellite image, and secure the mylar with paper clips.
   - Have students choose a different color for the second image and trace feature.
5. When students finish, give them some time to analyze and record how their feature has changed over time.
6. Have students use the overhead projector to share observations.

7. Prompt students to think about observations they might have missed. Prompt further by asking such questions as:
   - Why do you suppose there was so much more development on the north side of the Tanana River? What can you see in the images that might explain this?
   - Why do you suppose Marconi Slough disappeared?
   - How stable do you think Byers Island is and why do you think so?

Names: ____________________

____

RSG Lesson 4
CHANGE OVER TIME
STUDENT EXERCISE

1. Carefully examine the four images of Fairbanks. Arrange them in order from the earliest image to the most recent image, and write the photo names in order in the boxes below.

Earliest Map/Image → Most Recent Map/Image			
A	**B**	**C**	**D**

2. Compare **A** and **B**. Why do you think **B** is a more recent map/image than **A**? Write down at least three observed differences supporting your placement.

____

____

3. Compare **B** and **C**. Why do you think **C** is a more recent map/image than **B**? Write down at least three observed differences supporting your placement.

____

____

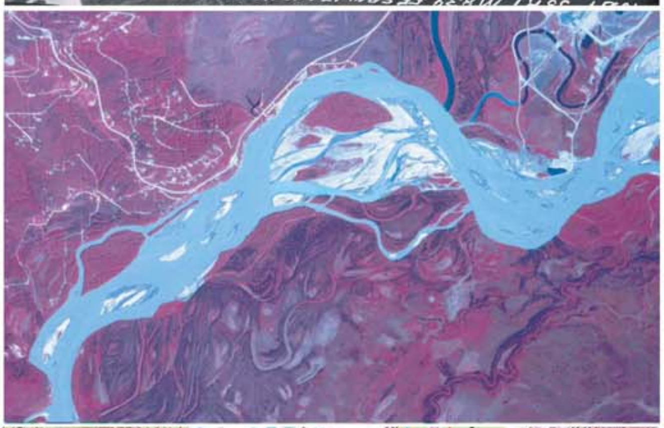
4. Compare **C** and **D**. Why do you think **D** is a more recent map/image than **C**? Write down at least three observed differences supporting your placement.

____

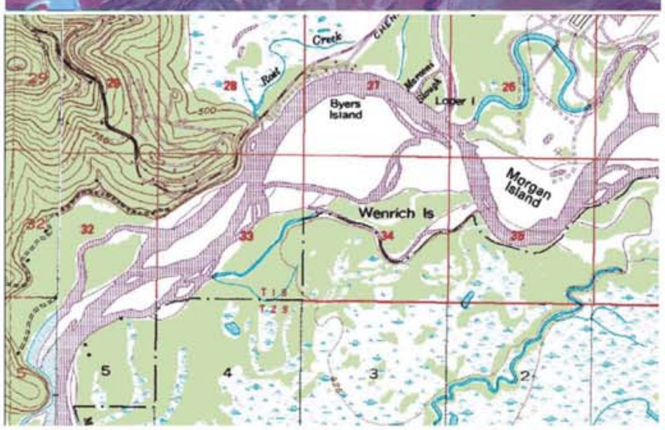
____

**RSG4A:
Fairbanks Time Series 1**

**Air Photo
1949**



**Air Photo
1978**

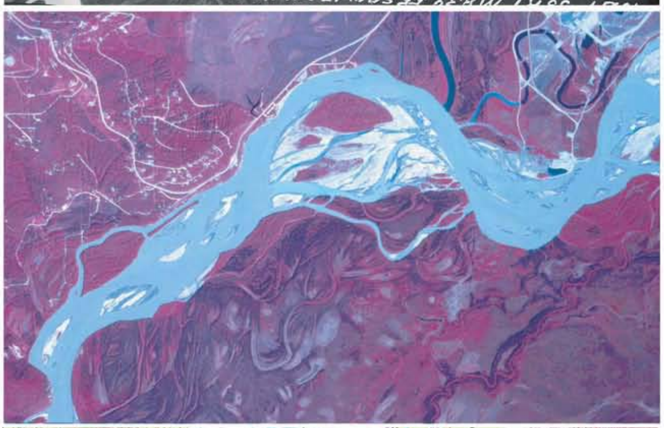


**USGS Topographic Map
1954
Revised 1972, 1973, 1994**

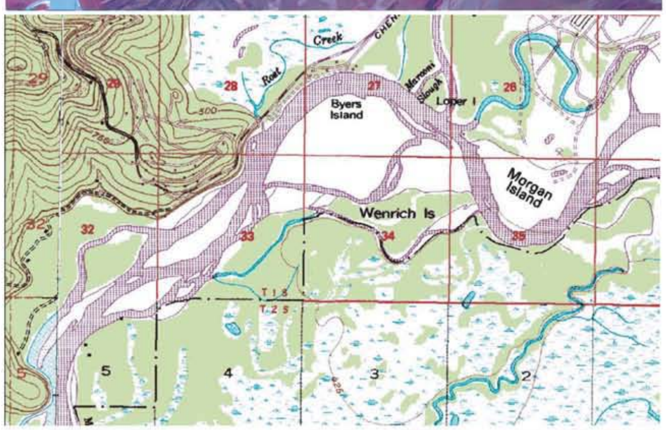
**SPOT5 Satellite Image
2003**

RS4B: Undated Fairbanks Time Series 1

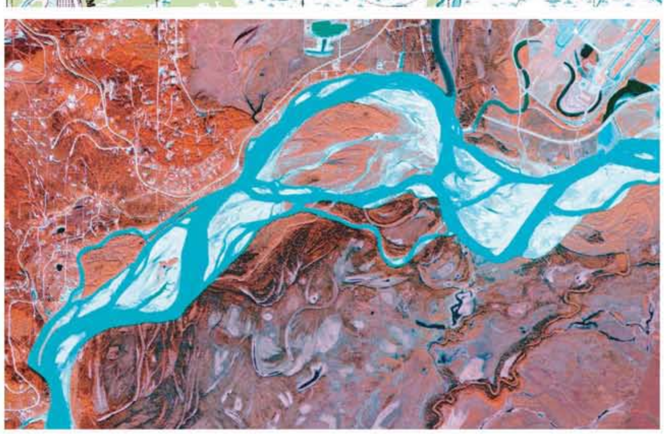
Black & White Air Photo



CIR Air Photo

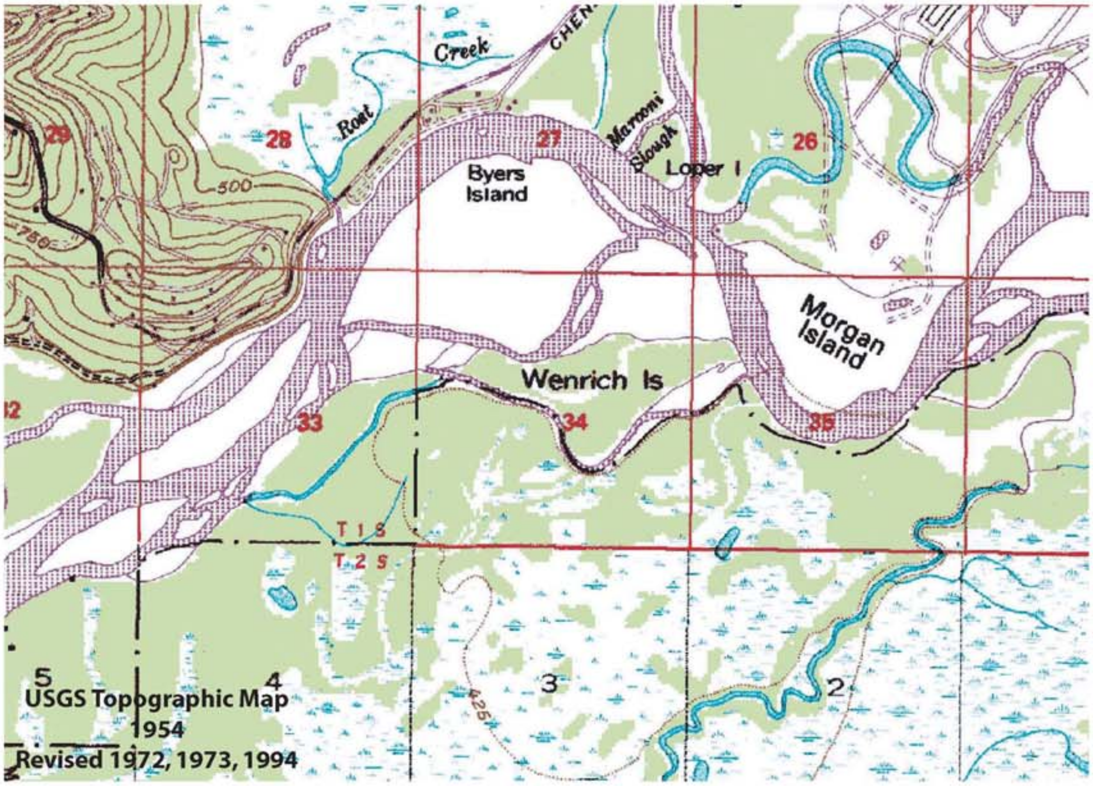


USGS Topographic Map



SPOT 5 Satellite Image

RSG4C: Fairbanks Time Series 2



RSG4D: Nenana River Series

USGS Topographic Map
(1950, minor revisions 1978)

Color-infrared Aerial Photograph
(1986)

Landsat Satellite Image
(1991)

SPOT5 Satellite Image
(2003)

Fifty-three Years of Landscape Change in the Nenana Area, Alaska

This series of images shows how the landscape around Nenana has changed since 1950. Dramatic changes have taken place in the course of Tanana River just upstream of Nenana next to the air strip, and about 4 miles downstream of Nenana. The course of Nenana River has also undergone major changes about 2-1/2 miles above its confluence with Tanana River. Expanding infrastructure and other human impacts are also readily observed in this sequence of images.

www.mapteach.org

Compiled 06/01/06 by Alaska Division of Geological & Geophysical Surveys - MapTEACH Project
3354 College Road, Fairbanks, AK 99709-3707 (907) 451-5014 www.dggs.dnr.state.ak.us

MapTEACH:

Global Positioning System (GPS)

GPS Lesson 1
INTRODUCTION TO GPS WITH GEOCACHING
TEACHER INFORMATION

Lesson Summary: During this lesson students will learn how to use GPS units to perform a variety of tasks. They will: become familiar with GPS and handheld GPS units; learn how to adjust the settings of the units; learn how to enter waypoint information; learn how to find a geocache; and learn how to place a geocache.

Objectives: Students will learn how to operate a GPS unit to collect and modify waypoint information.

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.

Technology A Operate technology-based tools.

BACKGROUND FOR THE TEACHER

The following explanation of GPS is courtesy of Garmin, one of the world's leading GPS manufacturers.

"The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day.

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is.

Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map.

A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance, distance to destination, sunrise and sunset time and more."

Geocaching is an entertaining treasure-hunting game for GPS users. Participating in geocaching is a good way to learn about the wonderful features and capabilities of a GPS unit. The basic idea is to set up caches of interesting items and to share the locations of these caches with others, who can then use the location coordinates and their GPS units to find them.

Some important concepts and tips for success when setting up and using GPS units:

- Check batteries before using the GPS unit. Batteries run down quickly in cold temperatures.
- GPS Units set their clocks and calendars from the satellite signal. Time settings selected in the GPS menus only affect the format that the time is displayed in.

MATERIALS

- GPS units – one for each student group
- Geocaches – one for each student group
- Copies of student directions for the lesson

INSTRUCTIONAL PROCEDURES

Getting Ready

Before starting this lesson with the students, you will need to create one geocache for each group of students. Three students per group is a good number, but this activity can be done with larger or smaller groups if necessary.

If you are new to GPS or rusty, it is important to run through the lesson that follows before placing the caches so that at least one of your GPS units has the correct settings and you know how to mark a waypoint.

- For each cache, acquire a large resealable plastic bag (e.g., Ziploc-type) or plastic tub.
- Put objects of interest in the bag (equal to the number of students participating in the exercise). Be creative here. Objects can be educational

or functional items like mini rulers or pencils, or simply fun like stickers or mini globes. For long-term caches, DO NOT use food (may attract unwanted wild geocachers). Use your judgment as a teacher. Do you really want to pass out noise-makers or yo-yos? Probably not.

- Label the bag or tub "MapTEACH" and the Cache # (1, 2, 3…).
- Without the students noticing, find a hiding place for the caches. Bring all of your GPS units with you.
- Select a hiding place that is more than 25 but less than 100 yards from where the class will start their searching. Avoid covered or heavily forested area (GPS signal will fade). Hide the cache from plain site, but don't make this too hard. In the past we have hidden caches in tall grass, or behind a tree, or in the end of a hollow log, and that has proven sufficiently challenging.
- Write down the cache # and corresponding coordinates for each geocache. Coordinates should be noted in degrees, minutes and decimal seconds (See Explore 2: Checking and adjusting the unit settings if needed).

Gear-up

- Ask students if they have ever used GPS units, or know somebody who uses one. What are they used for?
- Ask students if they know how a GPS unit works. Follow this up with a level-appropriate explanation of how GPS units use satellites to triangulate locations.
- Tell your students that they will be using GPS units to find hidden treasure! Explain geocaching.
- Assign Student groups.
- Post Student group name, assigned GPS #, geocache name, and corresponding coordinates in the classroom. Student groups will enter coordinates for their assigned geocaches into the GPS during Activity 3.
- At the end of the activities, ask students to share their experiences working with GPS units and geocaches. What makes a good or a bad geocache? How well did the GPS units lead them to the hidden treasures? Were they able to make any connections between the number of satellites, the accuracy of the GPS location and how well it worked to find the geocache? What does this say about the limitations of GPS units? Can they think of any other ways to navigate besides using GPS units (maps, verbal instructions, landmarks, etc.)? What are the pros and cons of each method?

That's it. There are many possible variations on this lesson. "Virtual" caches can be made in which the cache is a historical marker or a natural feature. The student must answer a question about the information in the marker or about the natural feature to get credit for the find.

TEACHER RESOURCES

The deviation or variance from true-north to magnetic north is significant at higher latitudes (such as places in Alaska) and changes every year. GPS units will correct for this if you set them to use “true” north (Explore 2, Step 3e). If you want to discuss the difference between magnetic north and true north and its effect on traditional magnetic compasses, the following website and its associated links provide a good explanation:
http://gsc.nrcan.gc.ca/geomag/field/magdec_e.php
You can use this website to determine the correct current adjustment for your location (to manually enter in the settings with “user” and then “mag”):
http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp

Converting between Decimal Degrees and Degrees/Min/Sec can be done online here:
http://www.fcc.gov/mb/audio/bickel/DDDMMSS-decimal.html
If you want the students to learn to make the conversion using their own math skills, a simple how-to is here:
http://www.mass.gov/mgis/llcoord.htm

Learn more about how GPS units work at: http://www8.garmin.com/aboutGPS/

Official “Geocaching” is a global hobby with a well established website and set of rules. You can read about it here: http://www.geocaching.com/

Group Name: ____________________ Group GIS Number: ____________________

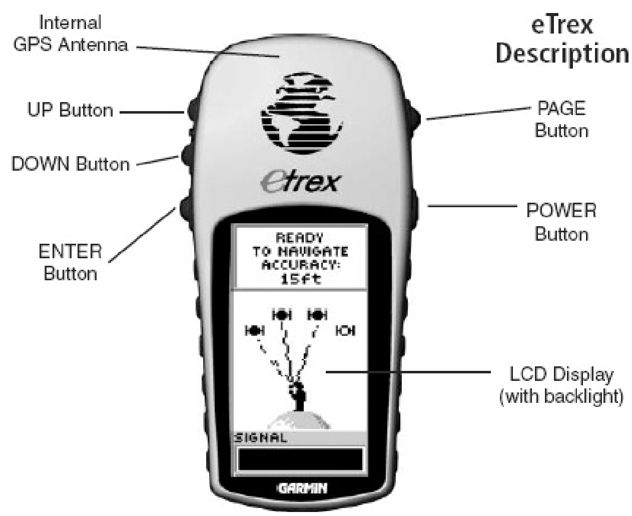
Group Members ____

GPS Lesson 1
INTRODUCTION TO GPS WITH GEOCACHING
STUDENT EXERCISE

Goal: Find hidden treasure with the use of a GPS unit and a set of latitude and longitude coordinates.

Explore 1: Familiarize Yourself with the GPS Unit (don't turn it on yet!)

1. **Note the location and basic function of each of the buttons.**



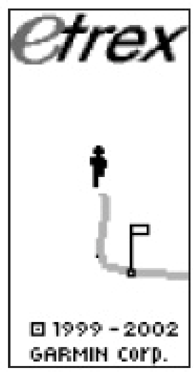
2. **Some things to know about these units:**
   - Basic handheld units like this are passive GPS receivers.
   - They receive signals from satellites but do not transmit any signals of their own.
   - The device receives information from satellites that makes it possible for the user to determine their position on the surface of the earth.
   - Locations and paths of travel can be programmed into or recorded by the GPS unit for **"wayfinding"** or **"tracking."**

3. Some things to know about GPS:

- The system consists of more than 24 satellites orbiting the Earth about 12,500 miles above.
- The arrangement of the satellites is called the **constellation** and it is constantly changing.
- The satellites must continue to move to stay in orbit.
- The spacing of the satellites gives global coverage 24/7.

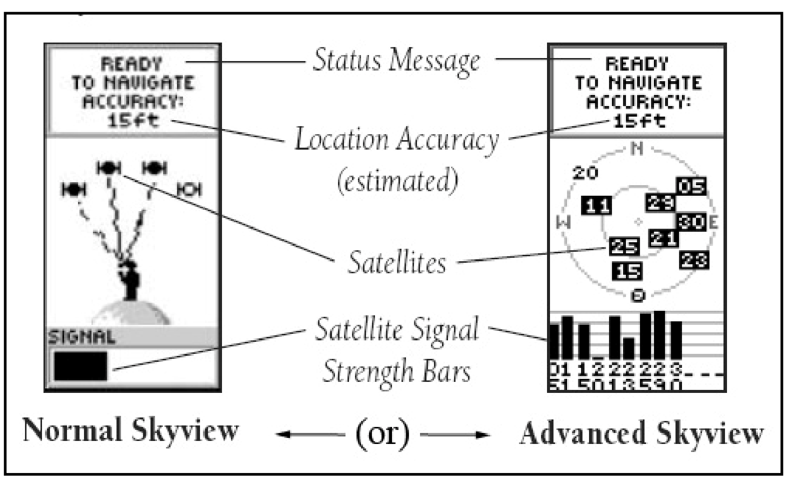
4. **Turn the unit on and learn how to use it.** This is best done outside with a clear view of the sky, or next to a window if you are inside.

   The screen should look like this first…



The Welcome Page

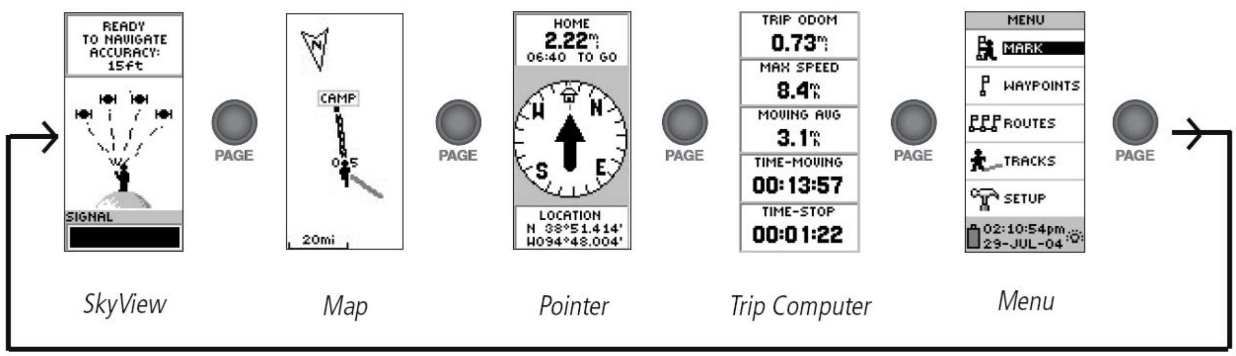
   and then this….



a) We will be using the **"Advanced Skyview"** because we want to see all of the available satellites.
If your screen shows "Normal Skyview," you need to switch to Advanced Skyview by using the **"Enter"** button and the **Up/Down** buttons on the left side of the unit to pull up an Options menu and **select "Advanced Skyview."**

b) If you have a clear view of the sky, the **GPS unit will start to recognize the signals from several satellites**. They will be represented by their **satellite ID number**. If you are indoors or under thick trees, your unit will not receive satellite signals well (if at all).

c) Now, using the **"Page"** button on the upper right side of the unit, you can page through the main five screens of the unit. Try it.



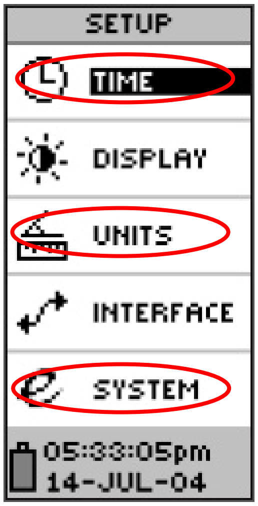
d) Show your teacher that you are in Advanced Skyview and can page through all five of the screens.

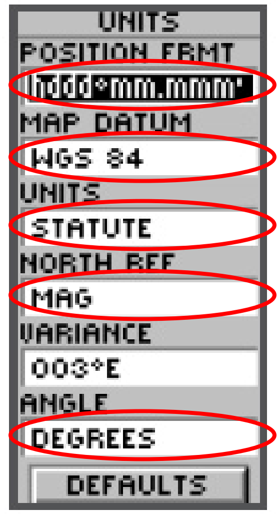
Teacher sign-off: ____________________________

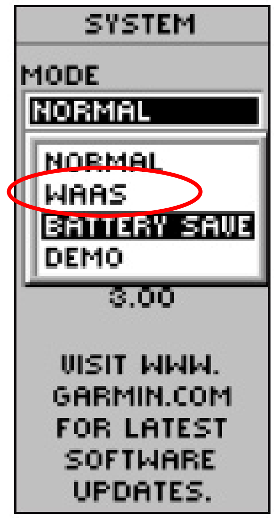
Explore 2: Check and Adjust the Unit's Settings

We will check and adjust the following: Time, Units, System

1. **Using the "page" button, page to the "Menu" screen.** Now **Select "Setup."** Use the Up/Down buttons to highlight "Setup" and press the "Enter" button.







2. **Time**
   a) **Select "Time."** Use the Up/Down buttons to highlight "Time" and press the "Enter" button.
   b) **Set "Time Format"** to **"12 HOUR."**
   c) Select TimeZone. Use the Up/Down buttons to highlight **"US-Alaska"** and press the "Enter" button.
   d) Leave UTC Offset alone (it will be -09:00 for Alaska).
   e) Set Daylight Saving to **"Auto."**
   f) Use the **"Page"** button to return to the **Setup** screen.

3. **Units**
   a) **Select "Units"** and press the "Enter" button.
   b) Set **"POSITION FRMT" to hddd.dddd°**
   c) Set **"MAP DATUM"** to **"WGS 84."**
   d) Set **"UNITS"** to **"STATUTE."**
   e) Set **"NORTH REF"** to **"TRUE."**
   f) Set **"ANGLE"** to **"DEGREES."**
   g) Use the **"Page"** button to return to the **Setup** screen.

4. **System**
   a) **Set "MODE" to "WAAS"** (this will give the unit more accuracy).
   b) Have an instructor check your settings and sign below.

Teacher sign-off: ____________________________

Explore 3: Enter a Waypoint (*the geocache location*)

Assigned coordinates:

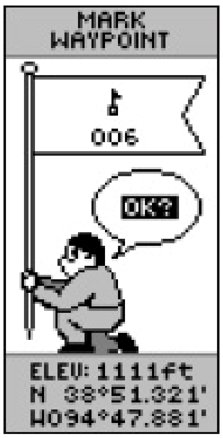
Waypoint name: ______________________________

Latitude: N ______________________________

Longitude: W ______________________________

1. Navigate to the **"Menu"** page and select **"Mark"** with the **"eEnter"** button.

2. Use the **"up"** or **"down"** button to highlight the **"Lat/Lon"** field and press **"enter."** The **Edit Location screen** will appear.



3. **Use the "up," "down"** and **"enter" buttons** to **edit the existing coordinates.** Once you have your assigned coordinates displayed, select **"OK"** with the **"enter"** button.

4. Use the **"up"** or **"down"** button to highlight the **"Identifier" or "Name"** field (default Identifier/Name is 001, 002, etc.) and press **"enter."** When you do this the **Edit Waypoint Name screen** appears.

5. **Use the "up," "down"** and **"enter" buttons** to edit the waypoint name. Once you have your **assigned waypoint name** entered select **"OK"** with the **"enter"** button.

6. **See if you can Change the Symbol** for the waypoint by using the **"up," "down"** and **"enter"** buttons.

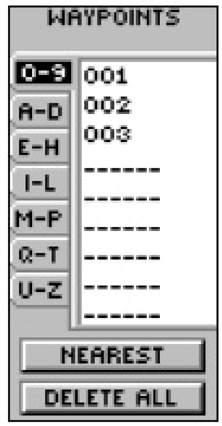
7. Back at the **"Mark Waypoint"** page, **save the location** by using the **"up"** or **"down"** arrow to **navigate** to **"OK"** and **select "OK"** with the **"enter"** button.

Teacher sign-off: ____________________________

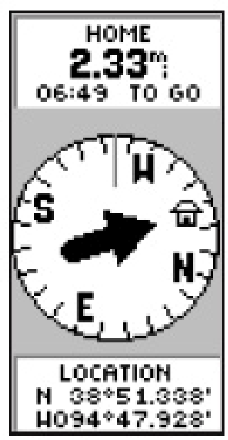
Explore 4: Finding a Geocache (Outside Activity)

1. **Getting Started**
   a) On the teacher's instructions, go outside and **turn on the GPS unit.**
   b) Make sure you have a **clear view of the sky.**
   c) **Wait for the GPS** unit to acquire enough satellite signals (3-4) to establish a location. On the **"Skyview"** page, the unit will note **"Ready to Navigate" (this may take a few minutes).**

2. **Start navigating**
   a) Page to the **"Menu"** page and select **"Waypoints"**
   b) Select the waypoint that represents the **geocache** for your group (e.g. Cache1, Cache5, etc.) and the review waypoint screen will appear.



   c) Select **"GOTO"** from the **"Review Waypoint"** screen and the digital compass screen will appear.



   d) **Follow the Arrow** to the location of the geocache**.** As you **get very close**, the **GPS will not help you** any more because it is usually only accurate to about 10-15 feet. You have to use your eyes!
   e) **Return** to the Teacher with your treasure.

Teacher sign-off: ___________________________

Explore 5: (Optional) Make a Geocache

Using your new GPS skills, plan and hide a geocache of your own!

1. **Name the geocache** (6 characters maximum)

   Geocache Name:____

2. **Choose items to hide**

3. **Put items and an identifying label in the container** (include the name of the cache)

4. **Choose a place to hide the cache**
   a) don’t make it too hard or it takes too long to find
   b) a portion of the container must be visible
   c) the cache cannot be buried

5. **Mark the location of the geocache and enter the geocache name in the GPS**

6. **Go to the classroom**

7. **Give the GPS unit to the teacher**

Teacher sign-off: ________________________
(make sure there is a valid waypoint for the geocache)

8. The instructor will give your group a GPS unit prepared by another group of students and the name of the Geocache that you will look for.

   Geocache Name:____

9. Using the skills you learned during Activity 4, **see if your group can find the geocache.**

   Take your “treasure” to the classroom.

10. **Return the GPS to the instructor.**

Teacher sign-off: ________________________

GPS Lesson 2
FIELD DATA COLLECTION FOR GPS DATA AND DIGITAL PHOTO DOCUMENTATION
TEACHER INFORMATION

Lesson Summary: During this lesson students will go on a field trip to collect geospatial data and other useful information to document sites of interest they encounter.

Objectives: In this lesson students learn to take field notes, take digital photos, and mark the location of their photos with GPS waypoints

Estimated Time: 1 hour or more

Correlation to Alaska Standards:

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

INSTRUCTIONS FOR THE TEACHER

Choose a field trip location or route that is of interest to your students and includes several notable features to document. These features or sites should be at least a few hundred feet away from each other so the GPS points the students collect have good geospatial separation if they are going to use the data to make AEJEE maps. If the sites are too close together the points will clump up in a very small area and the resulting maps will not be as rewarding. Before starting this lesson, students must have completed the "Introduction to GPS with Geocaching" lesson or equivalent.

Getting Ready

Make sure the GPS units and cameras are ready by:

- Checking batteries on both GPS Units and Cameras
- Clearing memory cards (of the cameras)
- Clearing waypoints and track logs from the GPS units
- Checking time/date setting on the cameras
- Making sure the cameras and GPS units are labeled

Gear-up

- Give the students a sense of what their objective is in terms of the photography. Are they looking for physical landscape features? Cultural landscape features? Landmarks? Points of interest?
- Make sure the students pass the worksheet, camera, and GPS unit around in their group so that each has an opportunity to work with the technology and the note taking.

Group Name: ____________________ Group GIS Number: ____________________

Group Members ____

Date: ____________________ Camera Number: ____________________

Observation Sheet

Field Data Collection Sheet for GPS Data and Digital Photo Documentation

Student expectations:
Your work will be graded based on attitude, neatness, completeness, photo quality, and description quality.

Data collection procedure:
Select one group member to do each of the following tasks (members will switch tasks for each site visited): **Recorder**, **GPS Operator**, **Photographer**.

When we arrive at each field site:

1. The **Group** assigns a one or two word ***site name*** that will be used to label the site on maps.
2. The **Recorder** writes down the ***site name***.
3. The **Group** decides how they want to ***describe*** the site.
4. The **Recorder** writes the ***description*** on the Observation Sheet.
5. The **GPS Operator** makes sure that they are getting a good GPS reading (at least 60 ft. ***GPS accuracy***).
6. The **GPS Operator** marks a ***waypoint*** and relays GPS information to the recorder.
7. The **Recorder** writes the ***waypoint number*** and ***GPS accuracy*** on the Observation Sheet.
8. The **Photographer** takes one ***photo*** and the **Recorder** writes the ***Photographer's*** name on the Observation Sheet.
9. **Group members *switch data collection tools and tasks***.

Photo 1

Photographer: ____________________

GPS Operator: ____________________

GPS accuracy: __________ feet Waypoint: __________

Site Name: ____________________

Description: ____________________

____

Photo 2

Photographer: ____________________

GPS Operator: ____________________

GPS accuracy: __________ feet Waypoint: __________

Site Name: ____________________

Description: ____________________

____

Photo 3

Photographer: ____________________

GPS Operator: ____________________

GPS accuracy: __________ feet Waypoint: __________

Site Name: ____________________

Description: ____________________

____

Photo 4

Photographer: ______________________________

GPS Operator: ______________________________

GPS accuracy: ____________ feet Waypoint: ______________

Site Name: ______________________________

Description: ______________________________

____

Photo 5

Photographer: ______________________________

GPS Operator: ______________________________

GPS accuracy: ____________ feet Waypoint: ______________

Site Name: ______________________________

Description: ______________________________

____

Photo 6

Photographer: ______________________________

GPS Operator: ______________________________

GPS accuracy: ____________ feet Waypoint: ______________

Site Name: ______________________________

Description: ______________________________

____

Photo 7
Photographer: ______________________________

GPS Operator: ______________________________

GPS accuracy: ____________ feet Waypoint: ____________

Site Name: ______________________________

Description: ______________________________

____

Photo 8
Photographer: ______________________________

GPS Operator: ______________________________

GPS accuracy: ____________ feet Waypoint: ____________

Site Name: ______________________________

Description: ______________________________

____

Photo 9
Photographer: ______________________________

GPS Operator: ______________________________

GPS accuracy: ____________ feet Waypoint: ____________

Site Name: ______________________________

Description: ______________________________

____

Photo 10
Photographer: ______________________________

GPS Operator: ______________________________

GPS accuracy: ____________ feet Waypoint: ______________

Site Name: ______________________________

Description: ______________________________

____

Photo 11
Photographer: ______________________________

GPS Operator: ______________________________

GPS accuracy: ____________ feet Waypoint: ______________

Site Name: ______________________________

Description: ______________________________

____

Photo 12
Photographer: ______________________________

GPS Operator: ______________________________

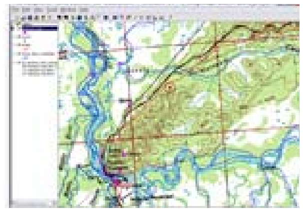
GPS accuracy: ____________ feet Waypoint: ______________

Site Name: ______________________________

Description: ______________________________

____

GPS Lesson 3
USING YOUR OWN FIELD TRIP DATA
TEACHER INFORMATION

Lesson Summary: During this lesson students will make GIS maps using data they have collected on a local field trip with their GPS units and digital cameras. They will download photos they took with their cameras, and will use the computer program GPSBabel to download their GPS waypoints into a CSV file. They will modify their CSV files to include an informative name for the sites they documented with their waypoints. Students will then generate points from this CSV file in AEJEE and make a map of their sites that includes photos they took on their field trip.

Objectives: Students will learn to download photos from their digital cameras and waypoint data from their GPS units and to make a map using these data in AEJEE. (It is assumed that students have completed GIS lesson 1 "Many Layers Make a Map," GIS lesson 2 "Introduction to GIS using AEJEE" and, optionally, GIS lesson 10 "Good Map, Bad Map.")

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.

Technology A-1 Use a computer to enter and retrieve information.

BACKGROUND FOR THE TEACHER

This lesson teaches students how to prepare site observations from an earlier field trip for inclusion in an AEJEE GIS map.

For each site on the field trip, the student(s) need to have marked a GPS waypoint, taken a digital picture, and written down notes that will help label and explain what they observed. A GPS field trip lesson with field data sheets is also included in the MapTEACH curriculum.

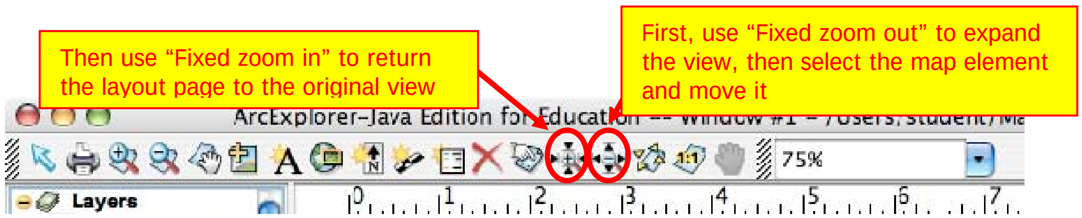
The best data is the students' own data, and students are very excited to see their own observations and pictures attached to an AEJEE map. If time or weather issues preclude students being able to make their own field trip observations, you may opt to go out yourself and make observations at a handful of sites along a road, trail or near the school, and then share the pictures and GPS unit with students so they can download and prepare the data.

At the end of the lesson, you might ask the students for ideas about other field trips that could be documented this way and shared on maps that would be interesting to the local community.

Some important concepts and tips for success:

- Please review the information provided on CSV files and layouts that appears in previous lessons.
- Make sure the GPS unit is plugged into the computer and turned on before opening GPSBabel, or the proper port won't show up in the drop-down menu.
- Photos placed in an AEJEE layout will default to a square shape. Resizing the photo using the corners of the square will stretch or squash the image, so students should be observant of what their photos look like in their final layouts.
- This is a long lesson with multiple steps. Consider splitting it into two or more sessions if you have limited computer time. A good way to split this lesson is to have students work through Explore 3 (Add Waypoints to Your AEJEE Map), then do the Field Trip layout as a separate session.
- Layouts in AEJEE must be done in a single session! **Do not let students begin working on a layout if they do not have enough time to finish it to your satisfaction, or their work will be lost.**
- **Symbology and labels should be exactly the way the student wants them before switching to Layout View in AEJEE**. Changing the symbology and labels after entering layout view can cause problems.
- Do not switch back and forth between Layout View and Map View. Once you are in Layout View, stay there.
- Students should not change the scale of their map document after they enter Layout View in AEJEE. Redraw times are very long if the scale is changed, and it is much better to leave the document at the default scale.
- If the student is having trouble selecting a map element (scale bar, north arrow, text, etc.) that is on top of the map data frame, have them click on the white space around the map, then click on the map data frame, and then move the data frame out of the way. The map element can then be selected and moved off to the side. The map data frame can then be selected and moved back into place, and the map element can be selected and placed where the student wants it to be.

- If the student moves a map element too far off to the side of the layout page, AEJEE may not be able to select the element. If the map element is far off to the side and the student is unable to select it, use the "Fixed zoom out" tool to expand the view of the layout page. You can then select the out-of-bounds map element and move it back into the work area. Then use the "Fixed zoom in" tool to return to the original view of the page.



- Keep in mind the general guidelines for cartography and working with map layouts in AEJEE:
  - o Map should have a clearly defined subject, or *theme* – a purpose for the map, or the story that the map is meant to tell
  - o Map should include data points that are symbolized and labeled so they are legible and informative
    - ▪ Symbol sizes and colors should show up well on the base layer and shouldn't interfere with each other
    - ▪ Label text should be a legible font style, color, and size, and show up well on the base layer
    - ▪ ***Important Tip: When working in AEJEE layouts, make text and symbols for points much bigger than you think they should be; they end up looking smaller in the final printed map***
  - o Map area should be zoomed in on the selected data points and whatever other features that should be included on the map
  - o Map balance
  - o Elements should be placed on the page so there is an even distribution of elements covering the page and there isn't a lot of white space
  - o Fonts for text and titles should be carefully selected
    - ▪ Fonts should be chosen that are easy-to-read, attractive, and fit the theme of the map
    - ▪ Try to limit font selection to no more than two fonts; this helps the map look more uniform and professional
    - ▪ The title is usually the largest font size on the map

MATERIALS

- Computers - one for each student is best or two students can share. The computers must meet the following specifications to run AEJEE:
  - o Macintosh: MacOS 10.3 or above, 100 MB hard drive space, Internet connection; recommend G4 or faster processor and more than 64 MB RAM

  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- GPSBabel software to download and convert the GPS waypoint data can be provided on a CD or downloaded from our website at http://www.mapteach.org or downloaded at http://www.gpsbabel.org
- Digital cameras containing photos of the field trip sites, and camera download cables
- GPS units with waypoints of the field trip sites, and GPS download cables (with USB serial adaptors, if needed)
- Field trip data sheets with information about the sites and photos.
- Copies of student directions for the lesson

INSTRUCTIONAL PROCEDURES

Before Class

- At the minimum, have a single GPS unit prepared with a handful of waypoints, so that each waypoint matches the location of a single site, a digital photo, and a record of observation(s) for the site. All students can then download data from this one shared GPS unit.
- Ideally, students have records from a recent field trip where groups of students were able to visit sites of interest, and at each site collect their own digital photo, GPS waypoint, and observation notes. In this case, students also need to keep careful track of which camera and which GPS unit they used.
- Check, update and/or maintain all student equipment including computers so everything works as smoothly as possible.
- Prepare materials for the lesson and try out all the activities well in advance before the students work through them.
- **Make sure your local base map data layers (topography and satellite imagery) are accessible in the Data_MapTEACH_WGS84 directory and that you have the file names and directory locations written down correctly. You will need to supply this information and the correct angle for the North arrow for your local area to your students before they can make their local field trip maps.**

Gear-up

- Ask the students if any of them have used digital photo software to download photos into a computer. Ask one to describe how he or she did it. Ask if any of the students have used photo software to show where they took their photos on an online map.

- Explain that in this lesson they will download photos, locate the sites where the photos were taken using GPS waypoints, and then add information to each record so this can all be included in a GIS map they will make using AEJEE.
- Write on the board or pass out as handouts the angle for the North arrow, the names of the image files for your local topography and satellite imagery, and which data folder(s) those image files are located in. Your students will need this information to load the base map data for their local field trip maps.
- If students are going to work on layouts in the current session, emphasize to them that they should keep in mind the general guidelines for cartography and working with map layouts in AEJEE. These guidelines are listed in the student lesson. Make sure they know that layouts need to be completed in a single computer session because they can not be reliably saved and reopened later. The only permanent record of their final map will be the JPG file they generate from their layout.

MORE EXPLORATION

Look up geotagged photos on Flickr at http://www.flickr.com/
What might be the advantages and disadvantages of using a mapping service like this as compared to how you might use AEJEE GIS maps?

TEACHER RESOURCES

Specific instructions on creating CSV files with Macs and PCs to make point shapefiles and hotlinks can be found in ESRI's "Introduction to ArcExplorer—Java Edition for Education" for AEJEE 2.3 available as an Adobe Acrobat PDF: http://www.esri.com/software/arcexplorer/download.html

Wikipedia provides information about Comma-Separated Values (CSV) files at: http://en.wikipedia.org/wiki/Comma-separated_values

Cooke, Donald (2005). **Fun with GPS**, ESRI Press, Redlands, CA

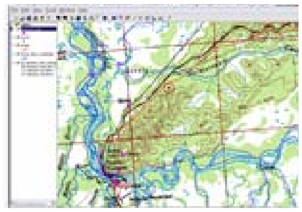
TEACHER REFERENCES

ESRI's "Introduction to ArcExplorer—Java Edition for Education" available as an Adobe Acrobat PDF: http://www.esri.com/software/arcexplorer/download.html

GPSBabel converts waypoints, tracks, and routes collected using GPS from one format to another (including CSV files) and runs on multiple computer platforms http://www.gpsbabel.org/

Name: ____________________

GPS Lesson 3
USING YOUR OWN FIELD TRIP DATA
STUDENT EXERCISE

Objectives: Students will learn to download photos from their digital cameras and waypoint data from their GPS units and to make a map using these data in AEJEE.

Estimated Time: 1 hour

Explore 1: Downloading Trip Data on a Macintosh

First, download your field trip photos from your camera into your **MapTEACH_Work** directory.

1. Connect your camera to your computer using the cable provided.

2. If the camera does not start communicating with the computer on its own, press the **"OK"** button on the camera.

3. Close iPhoto if it automatically pops up.

4. Open the camera folder that is now on your desktop and navigate through the DCIM folder until you get down to the photos (.jpg extension).

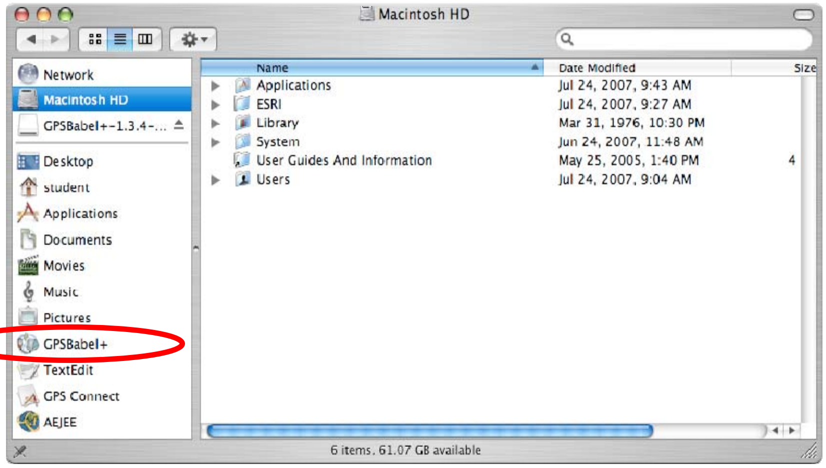
5. Drag and drop the photos into your MapTEACH_Work folder.

6. When you are finished copying your photos, drag and drop the icon for the camera into the Trash/Eject area of your screen, disconnect the camera, and pass it and the cable to the next person in your group.

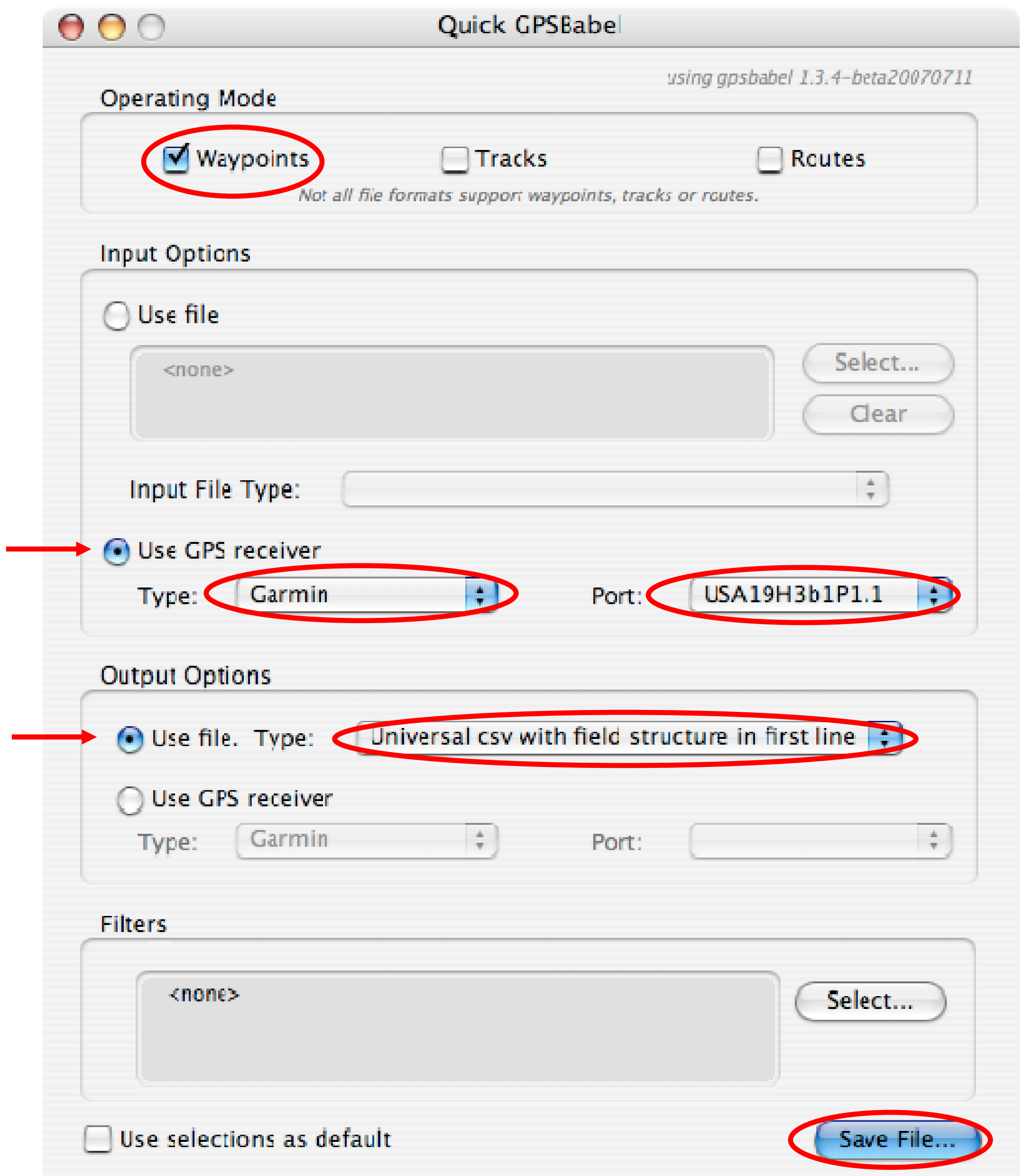
Now, download your GPS waypoints from your GPS into your **MapTEACH_Work** directory.

1. **Connect the cable to your GPS unit and plug it into a USB port** on your Macintosh.

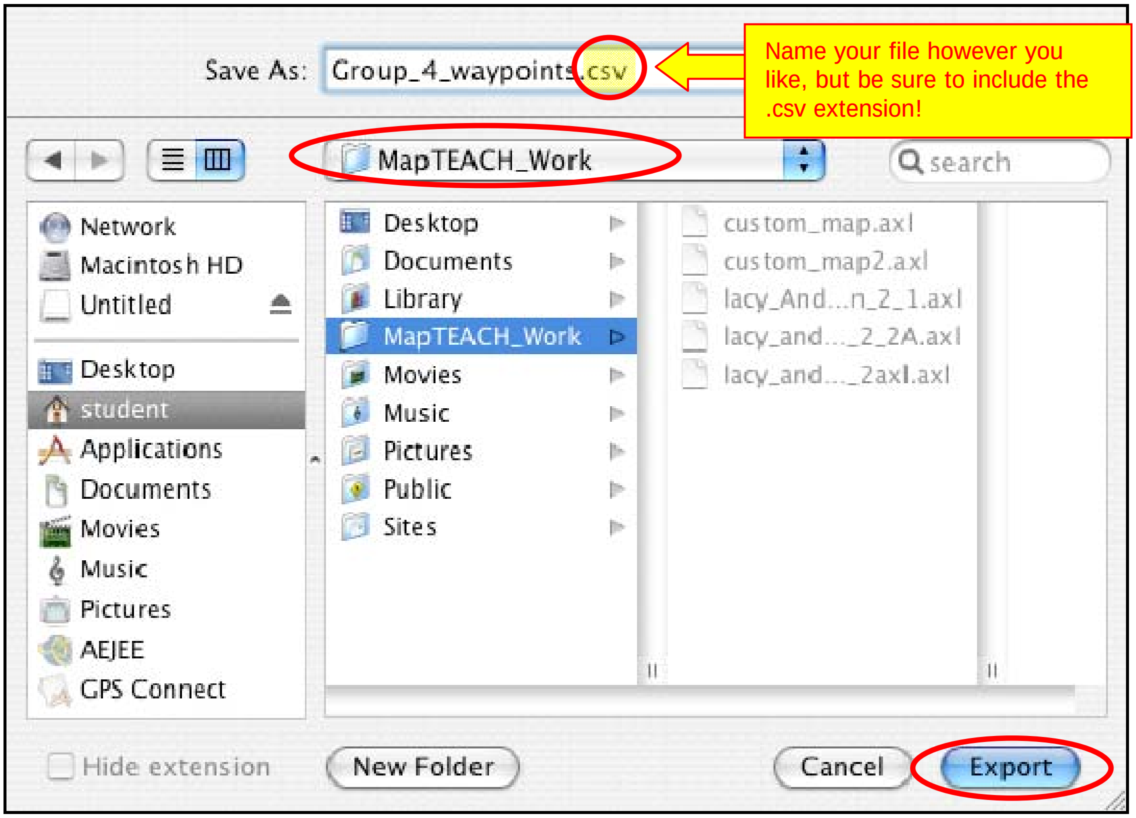
2. **Turn on the GPS unit, then Start GPSBabel**. You can launch it from the dock on your computer or from its icon on the desktop.



3. In the Quick GPSBabel window:
   - For the Operating Mode: **Check "Waypoints."**
   - For the Input Options: **Check "Use GPS receiver"** and **select "Garmin"** from the "Type" drop-down menu and the item beginning with **"USA"** from the "Port" drop-down menu.
   - For the Output Options: **Check "Use file"** and **select "Universal csv with field structure in first line"** for the Type drop-down menu.



4. **Click "Save File,"** and **save the file in your MapTEACH_Work** folder. Name it however you like, but ***be sure to include the .csv extension*** so the computer will know that this is a Comma Separated Value file.

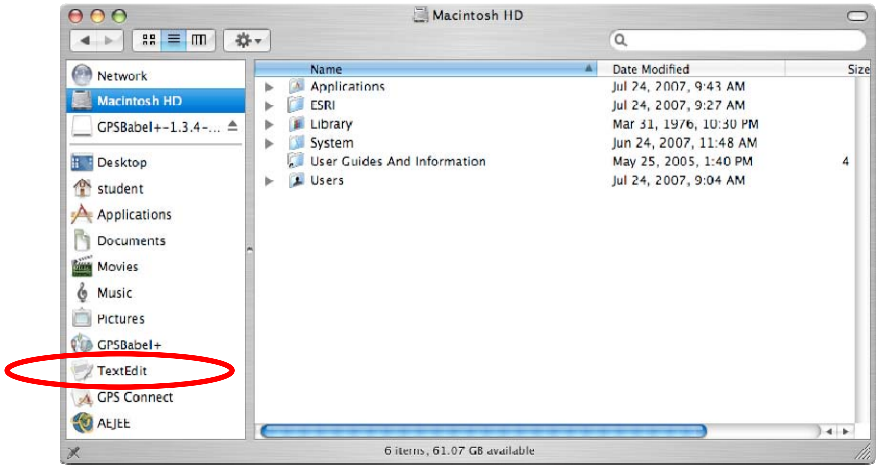


5. **Exit** the GPSBabel program and pass the GPS unit and cable to the next person in your group.

Explore 2: Add More Information to Your Waypoint Data File

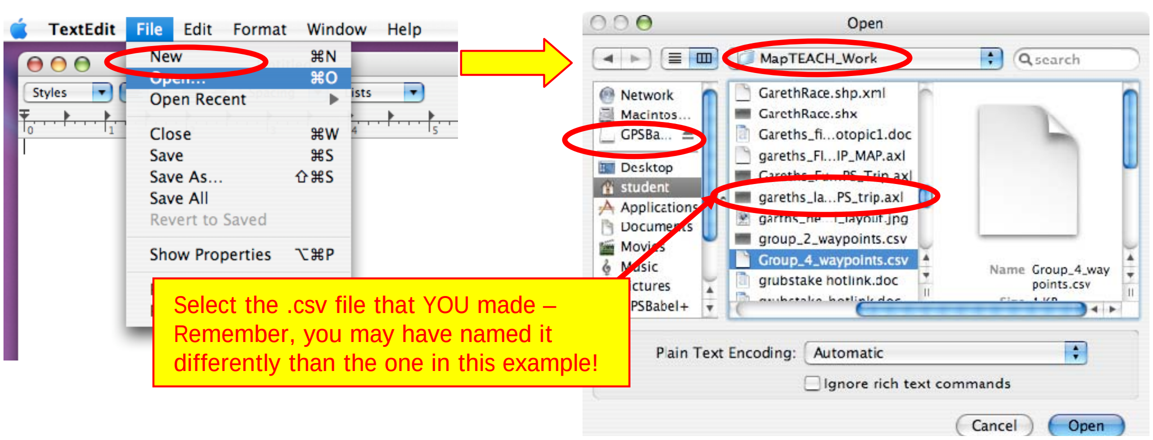
We want to add some of the information you collected on your field trip. It would be much more informative if the waypoints were labeled with the site names. To do this, you must add a new field to the .csv file and then type in the name for each point.

1. Start up the **TextEdit** application and **open the waypoint .csv file** you just created.



2. If it is not on the dock of your computer desktop, you can access TextEdit by going to **Macintosh HD / Applications** and **double-clicking** on **TextEdit.**

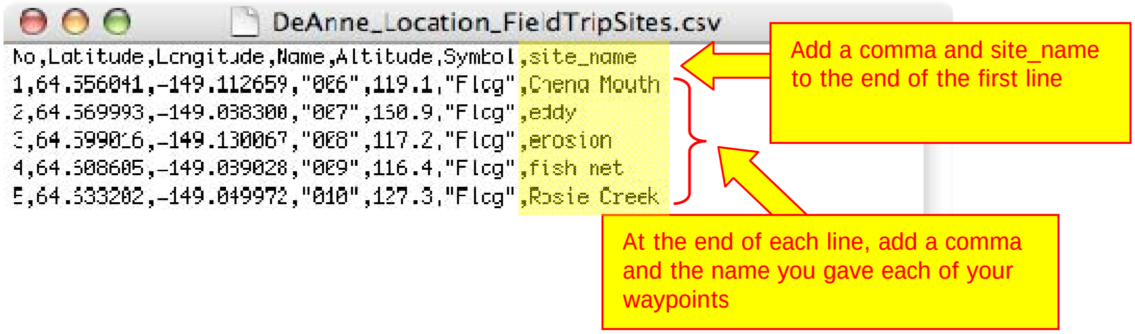
3. Go to **File / Open** in the TextEdit menu bar and navigate to your **student / MapTEACH_Work** folder and **select your .csv file**.



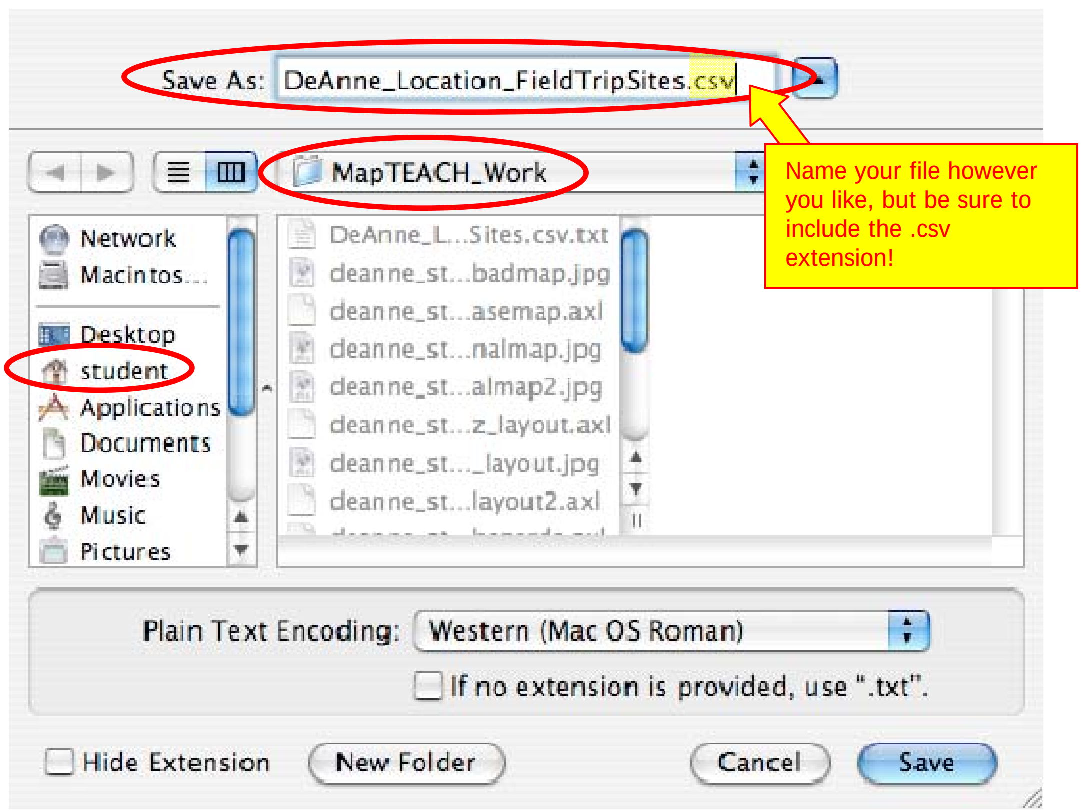
4. **In the first line, add a comma and a new field called “site_name” at the end of the line**.
   ***IMPORTANT: Do not add a space after the comma

5. **At the end of each of the other lines, type in a comma and the site name that you recorded on your field data sheet**. You can have spaces in this entry (just not <u>right</u> after the comma!), but keep it short – you will be using this to label your points on your map.

Your file may look something like this:



6. Use **Save As** and save this file in your **MapTEACH_Work** folder. Name it however you like, but **be sure to include the .csv extension** so the computer will know that this is a Comma Separated Values file.



Show your .csv file to your teacher.

Teacher sign-off: ___________________________
(Check for errors and confirm that the student's site names are included)

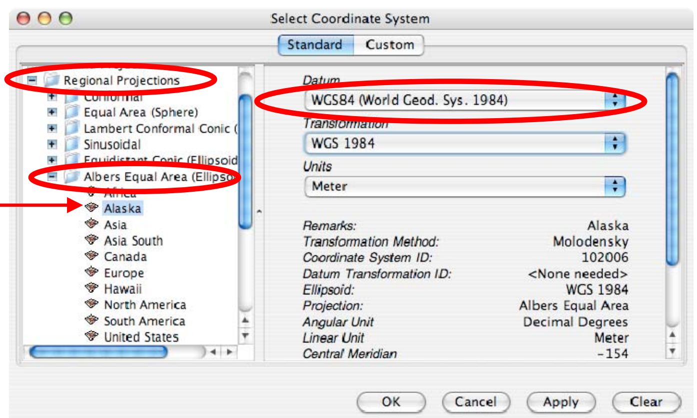
Explore 3: Add Waypoints to Your AEJEE Map

1. **Open AEJEE** and start a new map.

2. Navigate to the folder **/ESRI/AEJEE/Data_MapTEACH_WGS84**.

3. **Add *Coastline_Simple*** from the ***Base_Data*** folder.

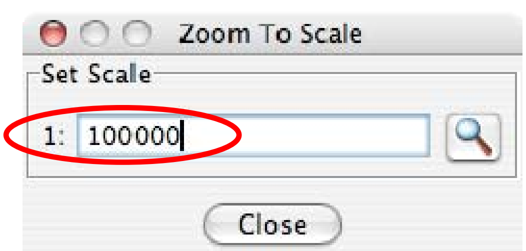
4. **Set your projection** to **Regional Projections/Albers Equal Area (Ellipsoid)** and select **Alaska. Set your datum** to **WGS84 (World Geod. Sys. 1984).**



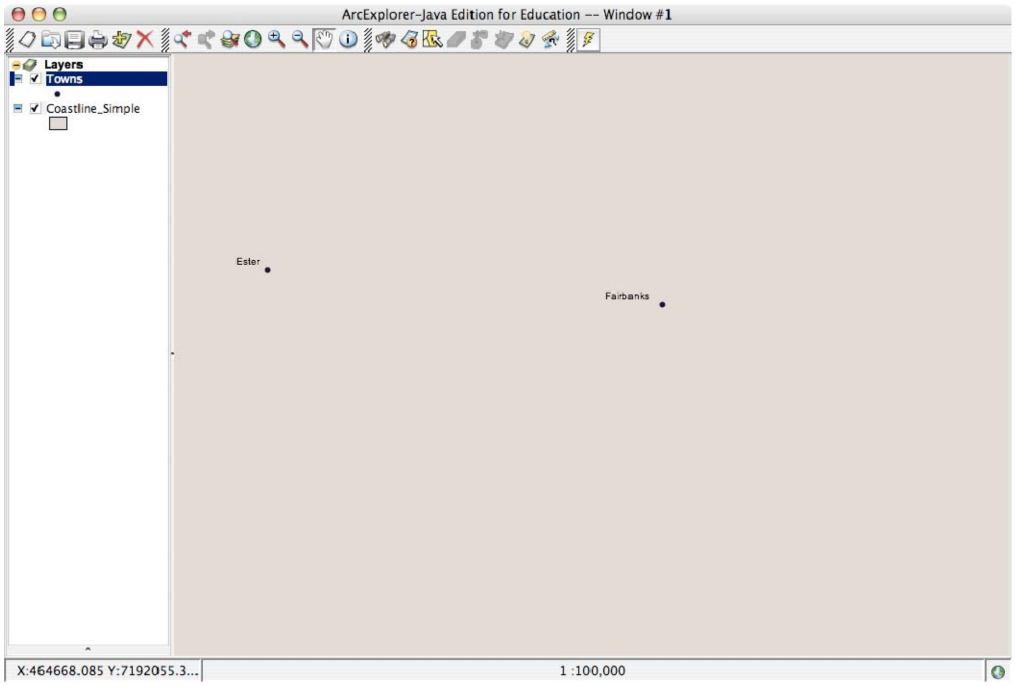
5. **Add *Towns*** from the ***Infrastructure*** folder.

6. Label the ***Towns*** using **Name**.

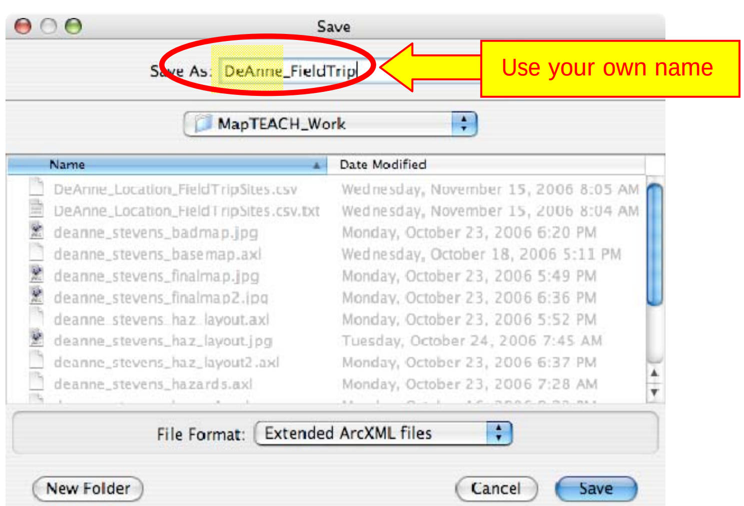
7. Zoom in on your town so it is in the middle of the screen. Use the **Zoom to Scale tool** to **zoom-in** to a scale of **1:100000**.



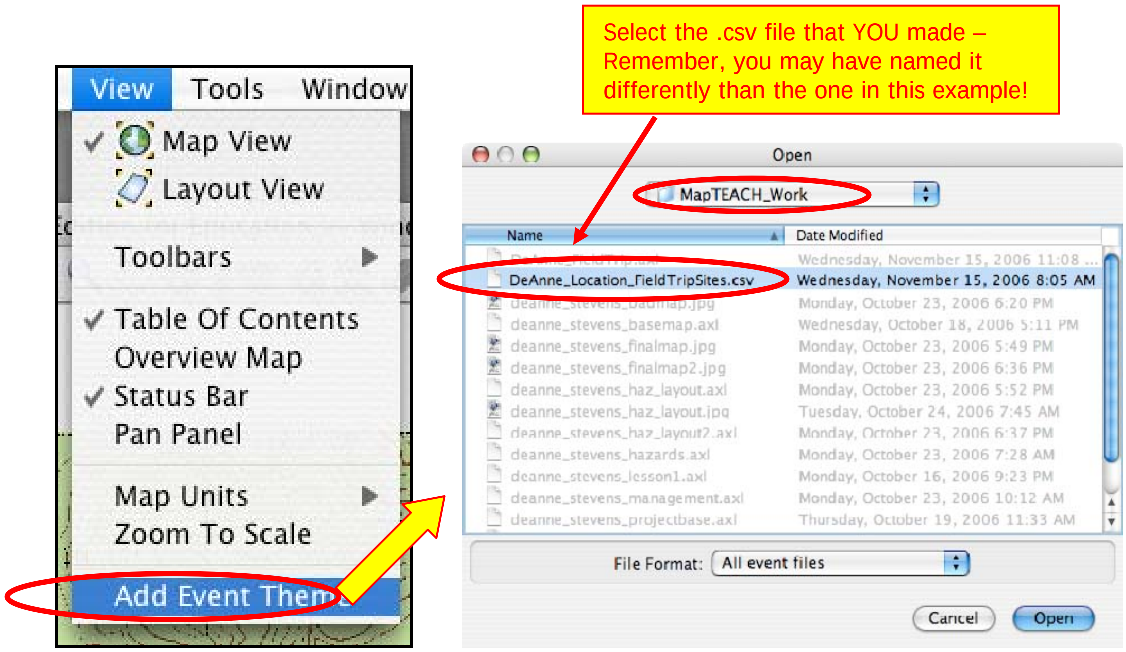
Your map might look something like this:



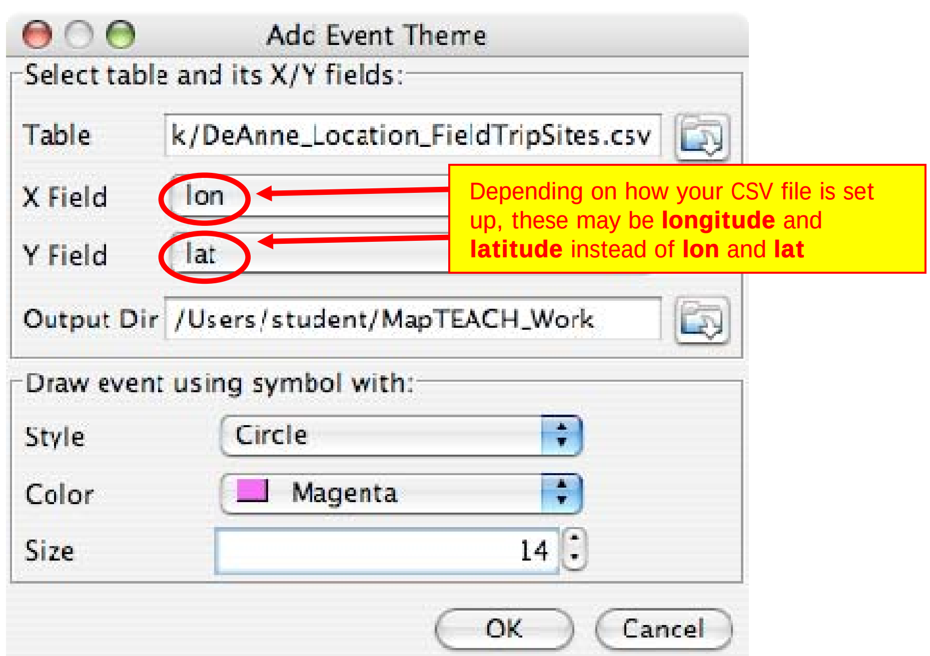
8. **Save** your map project:
   - **Click** on **"File"** in the Menu Bar
   - Select **"Save As"**
   - **Navigate** to the **student/MapTEACH_Work** folder
   - **Name the project** using your name followed by "FieldTrip": **firstname_FieldTrip**



9. Now we can add and view our points with “**Add Event Theme**” from the AEJEE “View” menu.

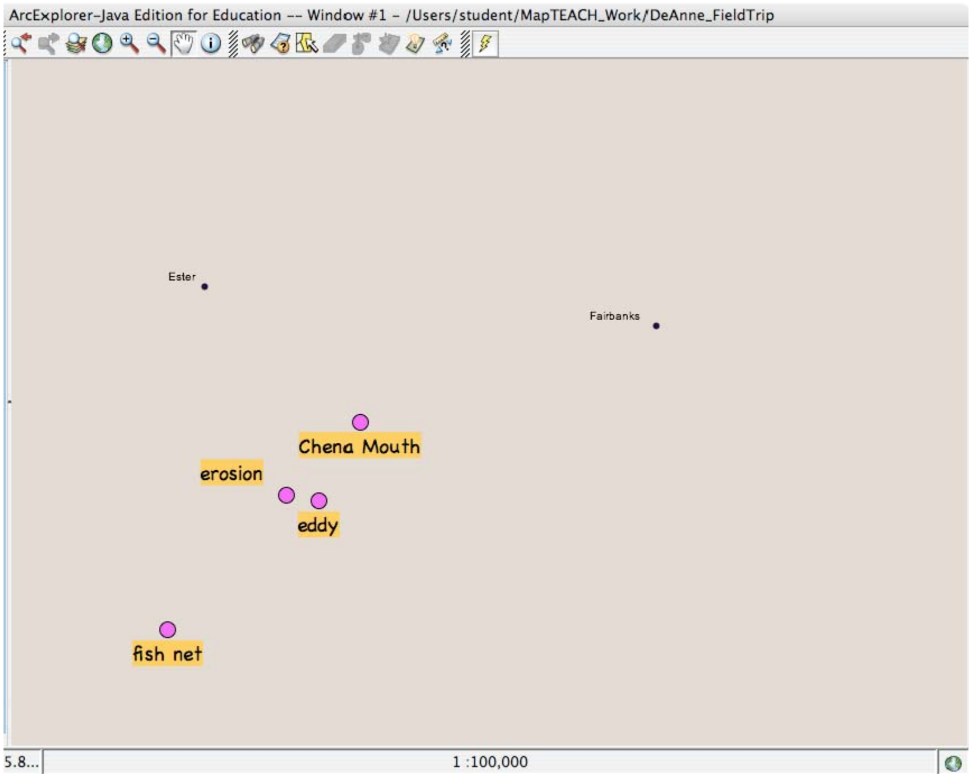


10. **Select your .csv file for “Table,”** set “**lon**” or “**longitude**” for **X Field** and “**lat**” or “**latitude**” for **Y Field**. Make the symbol style, color and size whatever you like.



11. You can now **label your points with their "site_name"** by using the layer properties (Control-Click layer name). Make the labels look the way you want.

Your result might look something like this:



12. **Turn off *Coastline_Simple***.

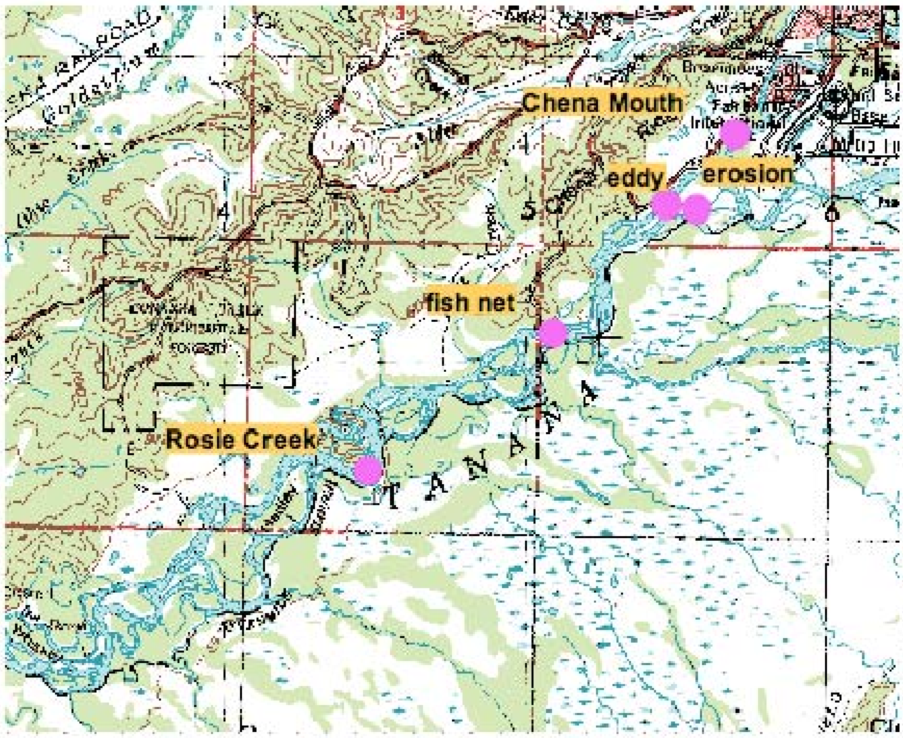
13. **Add layers for your local topography and satellite imagery.** Your teacher will provide the file names and directory locations for these data layers. See how your map looks with different satellite imagery as a background and how it looks with the topographic map as a background by checking and unchecking the boxes next to the names of the raster data layers.

14. **Pick the base layer (topographic map or a satellite image) you like best and leave it turned on**. Turn off or remove the raster data layers you are not using.

15. Zoom in and out to see what view looks best.

16. **Symbolize** your points and text the way you like them. Make sure that your points and text are large enough so you are able to read them easily.

Your map might look something like this:



Save your project and have a teacher sign off.

Teacher sign-off: ___________________________
(Check that student has selected appropriate base map and symbology)

If your lab session is almost over, you may need to complete the next section in another lab session.

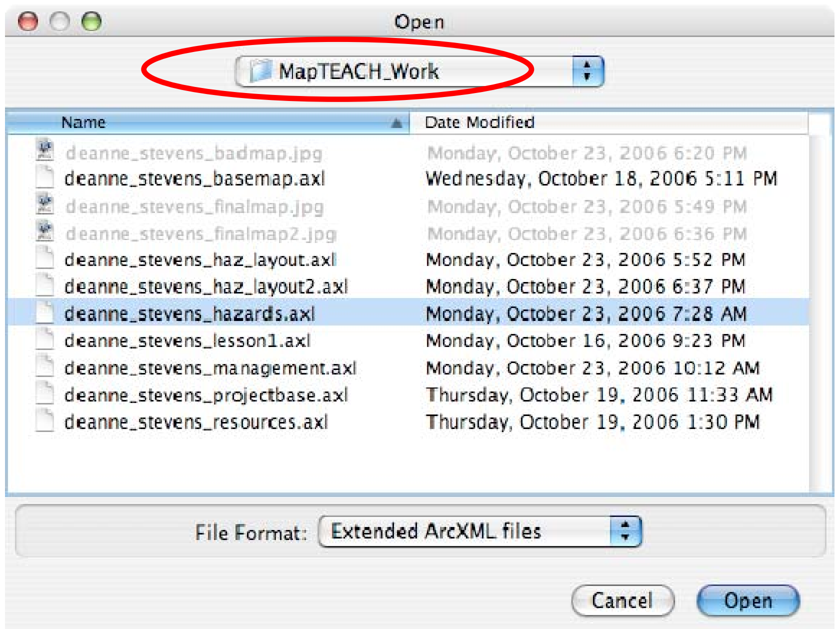
****ASK YOUR TEACHER IF YOU SHOULD CONTINUE****

Remember that you cannot save layouts, so make sure you have enough time to do a complete layout before you begin.

Explore 4: Making a Layout of Your Field Trip Map

If you are continuing this lesson without a break, go to step 2.

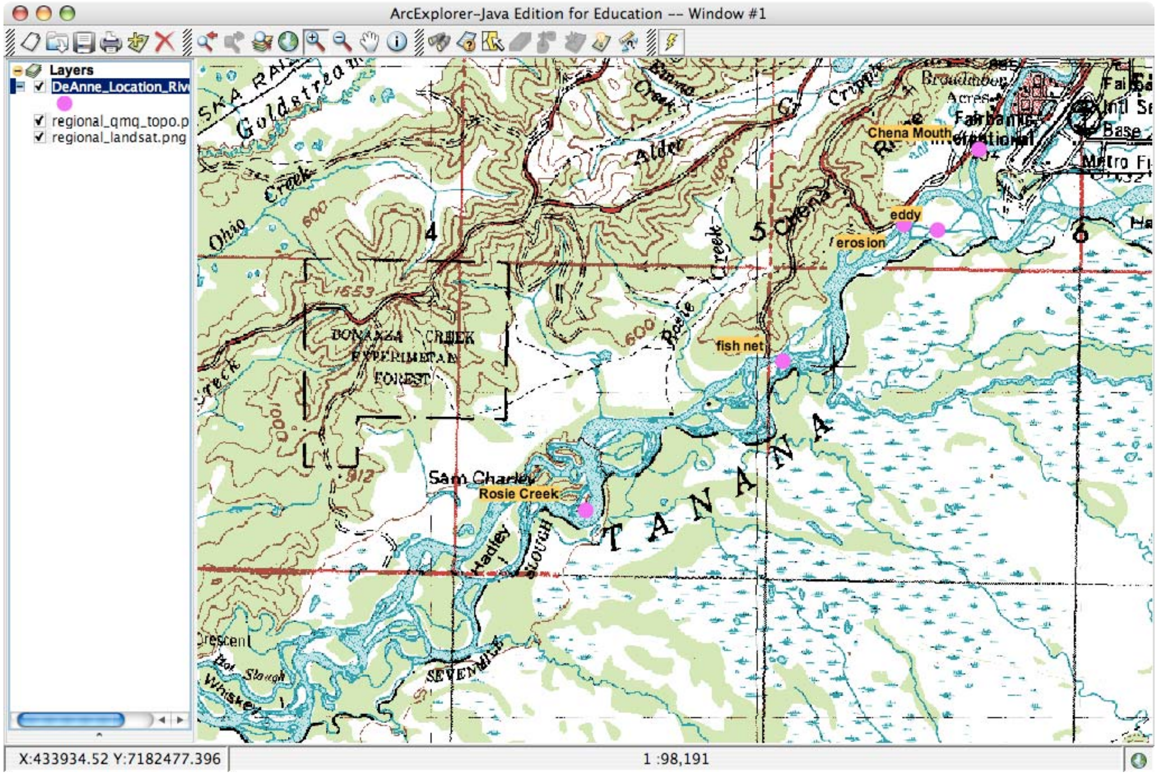
1. **Start AEJEE and navigate** to your ***MapTEACH_ Work*** folder and **open** your **field trip project that you want to make a finished map layout for**.



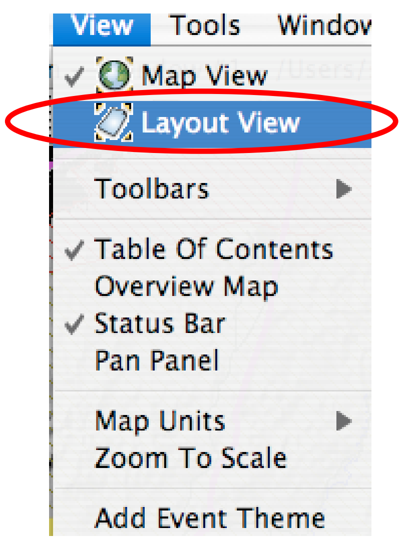
2. **Make your AEJEE window bigger** by clicking on the green button in the top left of the window.

3. **Make sure that everything looks just the way you want it to look on your final map. THIS IS REALLY IMPORTANT!!!**
   a) Make sure you are zoomed in to the area of the map that you want to show on your map layout. If you are zoomed too far out, there won't be enough detail to see your data points. If you are zoomed too far in, some of your data points may be outside the map, and your base map image will look really fuzzy.
   b) This is your last chance to fiddle with your fonts and symbols. It is not a good idea to change symbology in AEJEE once you've started the layout process.
   c) ***Remember to make your labels and symbols for points bigger than you think they should be*** *– they'll show up better in the final map. The symbols for lines will show up pretty much the way they look in the regular map view.*

Your map might look something like this:

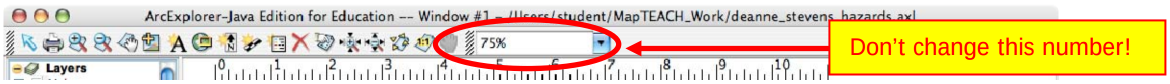


4. Start the layout process by selecting **View** from the main menu, and selecting “**Layout View.**”



5. **Wait patiently for AEJEE to redraw the map**. Your map data frame will appear to be drawn on a standard sheet of paper, measuring 8½ by 11 inches.

IMPORTANT TIP: Do not change the scale while you are working in layout view. Doing this will make your map take a REALLY long time to redraw.



You can check your map symbols and fonts at this point by clicking on **"File"** and **"Export to Image."**

- Use **150 dpi** for **Input**.
- Examine your map carefully in the Export window.
- If you like what you see, click **"Close"** and continue with the map layout instructions below.
- If you don't like the symbols and fonts, click **"Close," exit AEJEE (don't save)**, and **re-open your project** to make the changes you want.

The basic elements required in your final field trip map include:

- Data Frame
- Title and text
- Legend
- North Arrow
- Scale Bar
- Author
- Date
- Citation/Credit
- Photograph

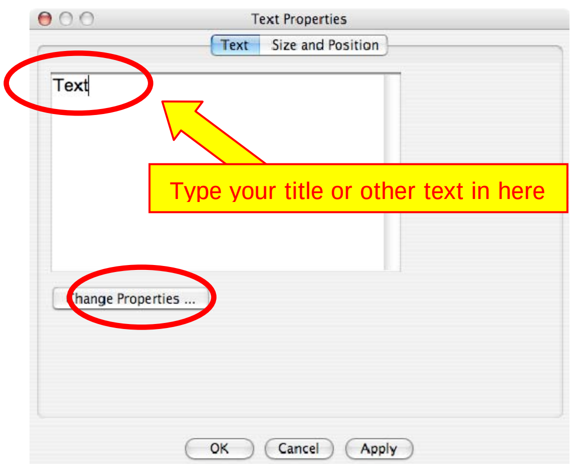
Follow along with these steps to add the required elements to your layout:

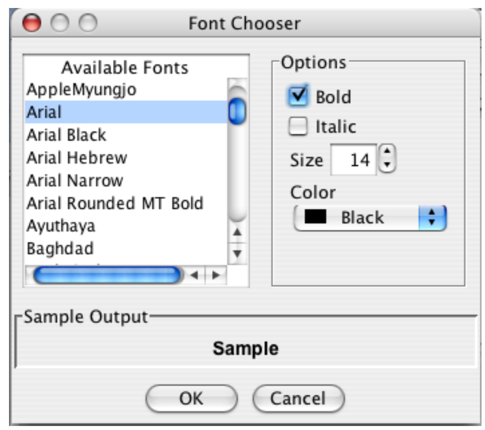
Data Frame (this is your actual "map" that you've been seeing all along)

- You can leave the data frame where it is, or move and change the size **by selecting and dragging, or by grabbing the corner handles to change the size.** Before you resize the data frame**,** control-click **on it to choose** "Properties," **go to the** "Size and Position" **tab, and click the box next to** "Preserve Aspect Ratio." **This will maintain your map area so it doesn't get stretched or squashed.**

Title and Text

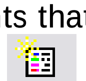
- Every finished map needs a title. The title provides a very brief introduction and overview to what the map describes. The title will most often describe the subject and location of the map.
- **First click on an empty space on the layout** to deselect any other elements.
- **Select** , **the Add Text button,** to insert a text box
    - o A small box will appear on the page that says "Text."
    - o **Drag** this box to a position you like on the page.
    - o **Control-Click the box** and choose **"Properties."** The Text Properties window will appear.
    - o **Type** in your text. You can also change the font, size and color of text by selecting the **"Change Properties …"** button.





More text boxes can be added using a smaller font to describe more information about your map. You should also add text to make captions for any photos you include on your map (see "Photograph" section below).

Legend

- The map legend is a small table that explains the symbols used on the map. Legends are often called "keys."
- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the legend.
- **Select** **, the Add Map Legend button**. The map legend graphic will appear on the page and can be dragged and resized.
- **Control-Click the legend element** and choose **"Properties"** to access the options available for customizing the legend.

North Arrow

- The North Arrow orients the viewer to determine the direction of North on the map.
- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the north arrow.
- **Select**  **, the Add north arrow button.** The North arrow selector window opens and presents many different styles to choose from. Choose one, drag, drop and alter the size and color so that it looks good on the layout. **Make sure you change the angle of the North arrow so it points towards north for your map area. Your teacher will provide this angle.**

Scale Bar

- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the scale bar.
- **Select**  **, the Add map scale bar button.** Choose the bar you like and place it on the map. **Control-Click on the scale bar element**, use **"Properties"** to select ***miles or kilometers*** for the units shown.

Author

- **Make a text box and add the author's name.** This entry may also include where the author works or goes to school.

Date

- **Make a text box and add the date when the map was completed.** This may be appended to the author.

Citation/Credit

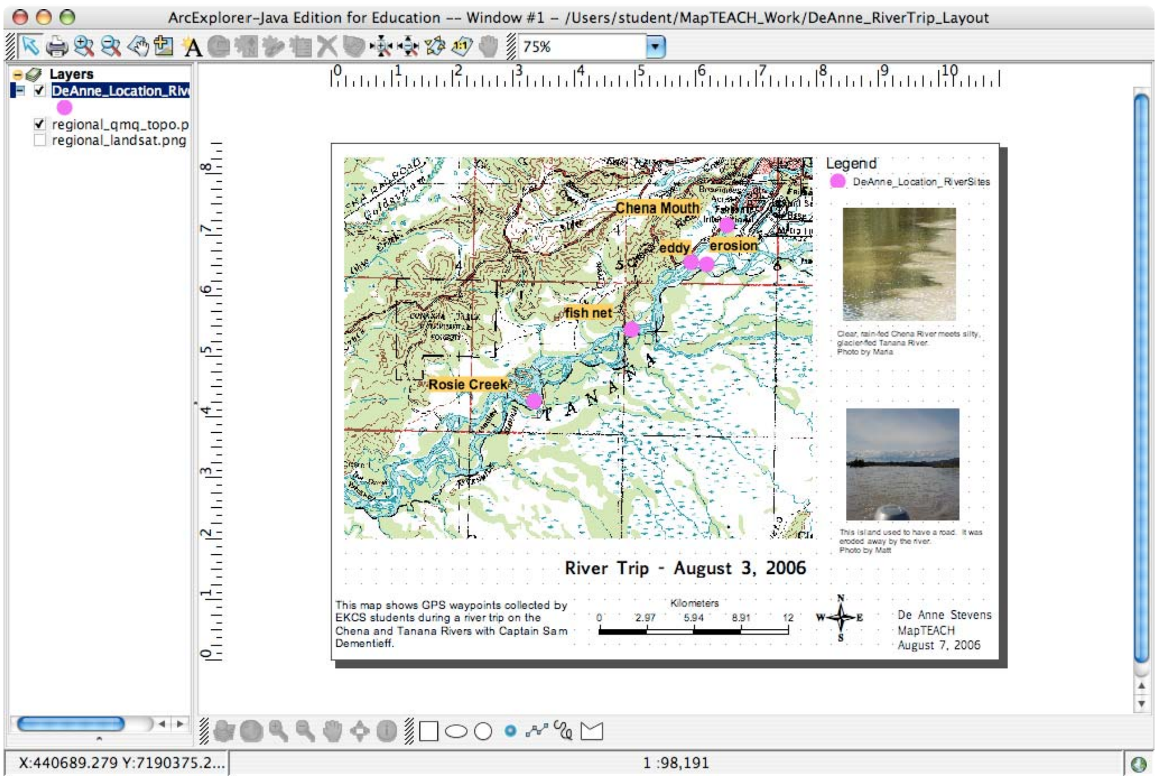
- The citation tells the viewer where data for the map came from. The citation includes any necessary or important information about sources of data for the map, when data was gathered, projection information and any thing else that seems important for a person reading the map.
- **Make a text box to add a citation.** Some citations are brief.

Photograph

- A photograph or other picture can be added when you **select**  **, the Add image button.**
    - o Use at least one of the photographs you downloaded from the digital camera: **navigate** to the ***MapTEACH_Work*** folder and **select your image**.

- o You can resize your photo image by grabbing and using the corner handles. Pay attention to what you're doing, since you can stretch or squash your picture this way.
- o Make sure to use the Text tool to add a caption describing the photograph and giving credit for the photographer.

When your map layout is complete, it might look something like this:



Show your map layout to a teacher.

Teacher sign-off: ___________________________

Save your map project:

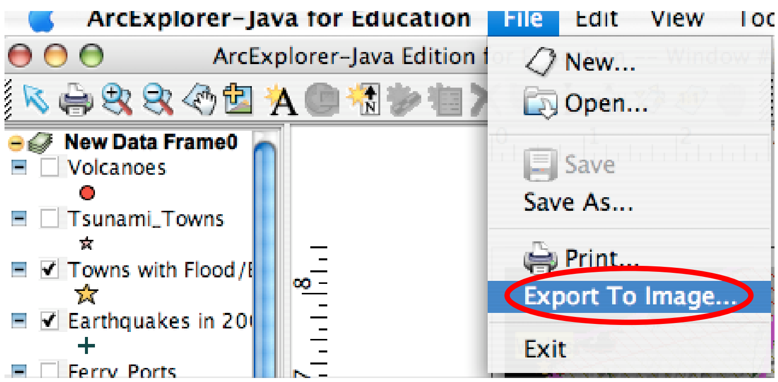
- **Click** on **"File"** in the Menu Bar
- Select **"Save As"**
- **Navigate** to the **student/MapTEACH_Work** folder
- **Name the project** using an appropriate name that includes your own name (for instance, *yourname_FieldTripLayout*)

Explore 5: Export Your Map Layout

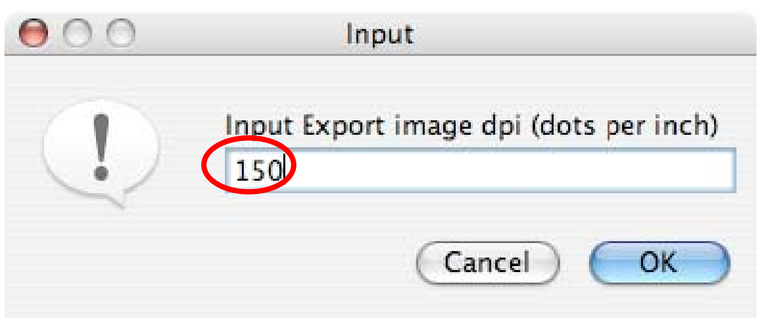
Because AEJEE does not reliably save map layouts, the only way to preserve your final map is to convert it into a graphics file. We will use a JPG format.

Your map can then be printed, added as a picture into a word processing document, or used as a graphic image in presentation software like MS PowerPoint.

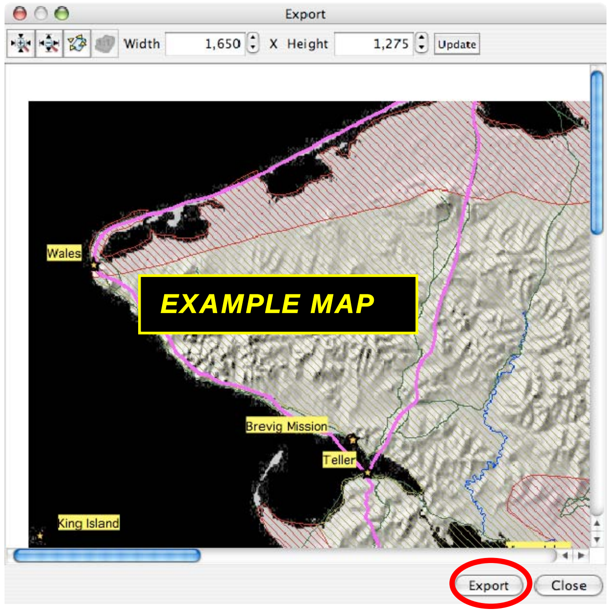
1. **Choose File/Export to image from the AEJEE menu.**



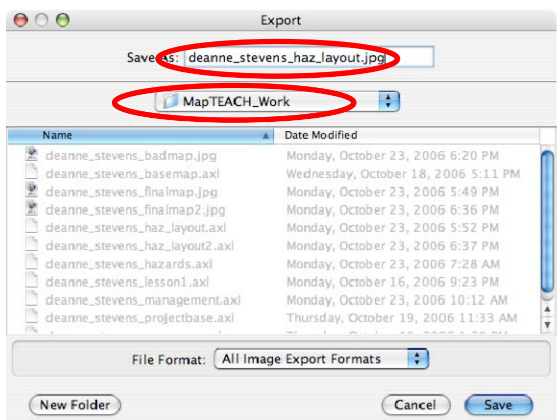
2. **Choose File/Export to image from the AEJEE menu.** A dialogue box will appear and require a number for dots per inch (dpi) to specify the resolution of the output file. **Use 150 dpi**.



3. ***Wait*** patiently **until a new window appears**. It can take a couple minutes. **In the Export window, click "Export."**



4. **Save the image** into your **MapTEACH_Work** folder as a JPG. **Name the file to include the extension ".jpg"**. Otherwise it will not save. Wait a minute or two while the computer exports your map.



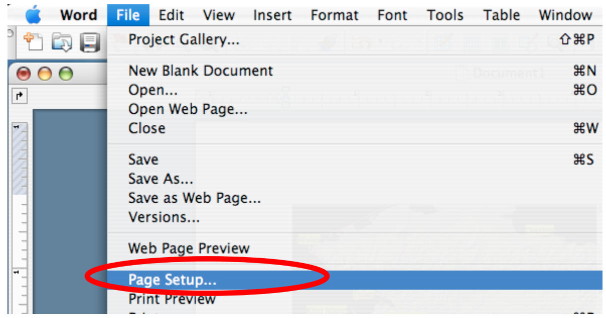
5. **Wait a moment to allow AEJEE to complete the export process, then close** the **Export window** and **exit AEJEE.**

Print Your Map Layout

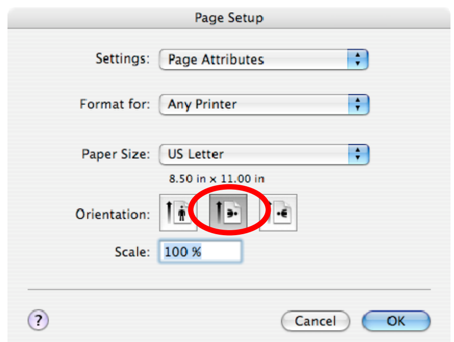
Once the map image is saved, it can be imported to word processing documents (MS Word), graphics presentations (MS PowerPoint) or any image processing application. The exported map can also be emailed anywhere as an attachment. **You may be able to just open your JPG map directly by double-clicking on the file, and then print it from your computer's picture viewer.**

1. **Start up MS Word.**

2. **Select Page Setup** from the **File** pull-down menu.

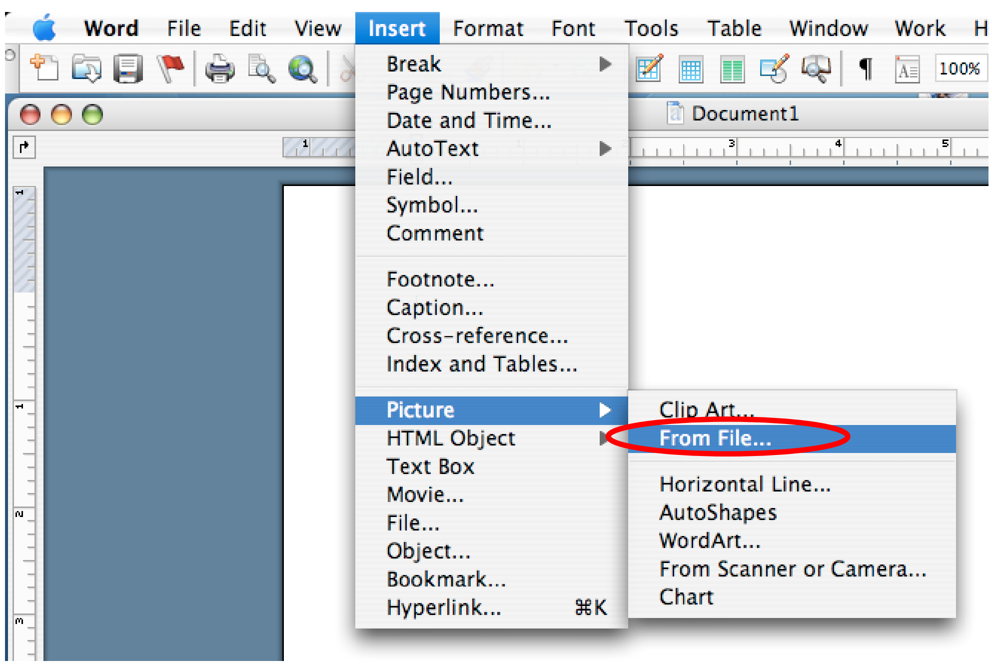


3. **Change** the **Orientation** of the page by **selecting the middle icon.**

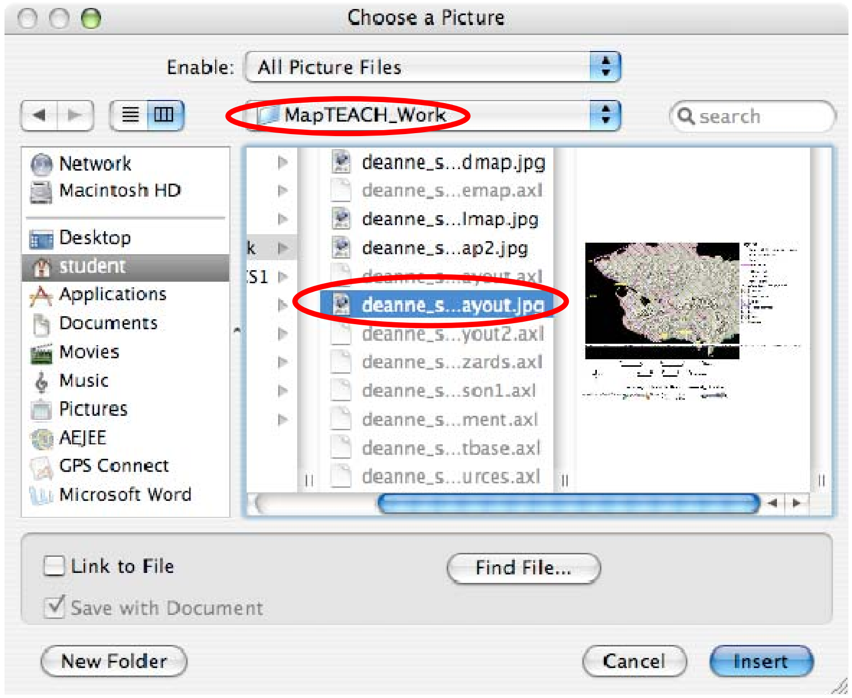


4. **Click "OK."**

5. **Select Insert/Picture/From File** from the pull down menu.



6. **Navigate** to your **JPG file** in **MapTEACH_Work** and **click** the **Insert** button.



7. The image appears in the document. You can re-size the picture if you wish.

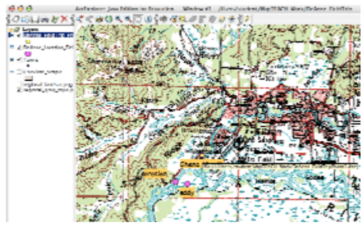
8. **Save** your Word document map to your **MapTEACH_Work** directory, using any name you would like.

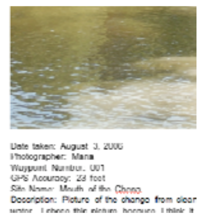
9. **Print your map,** or have the Word document transferred to your teacher's thumb drive for printing.

Show your printed map to a teacher.

Teacher sign-off: ___________________________

GPS Lesson 4
HOTLINKING TO A FIELD TRIP DATA DOCUMENT
TEACHER INFORMATION





Lesson Summary: During this lesson students use data they collected on a field trip to learn how to hotlink to Word documents in a GIS project. They will make one or more Word documents in which they describe their field trip sites and embed the digital photographs they took during the trip. The CSV file created in GPS Lesson 3 "Using Your Own Field Trip Data," is modified to include the pathname and document names for the sites they are linking. The revised CSV file is loaded into their existing AEJEE field trip project and the hotlink is activated, allowing the user to click on the point representing the site and connect to the informative Word document.

Objectives: Students will learn to hotlink a document to a point in their AEJEE map.

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.

Technology A-1 Use a computer to enter and retrieve information.

BACKGROUND FOR THE TEACHER

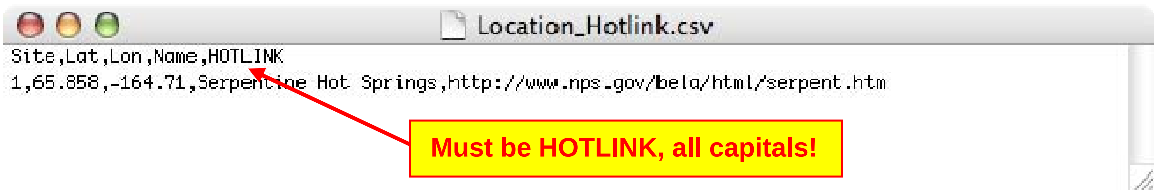
This lesson teaches students how to work with site observations from an earlier field trip for inclusion in an interactive AEJEE GIS map.

For each site on the field trip, the student(s) need to have marked a GPS waypoint, taken a digital picture, and written down notes that will help label and explain what they observed. A GPS field trip lesson with field data sheets is also included in the MapTEACH curriculum.

Students should complete GPS Lesson 3 Using Your Own Field Trip Data prior to starting this lesson; the layout portion of that lesson is not a prerequisite for this lesson. GIS Lesson 13 Hotlinking introduces the concept of hotlinking by connecting a single point to a web site.

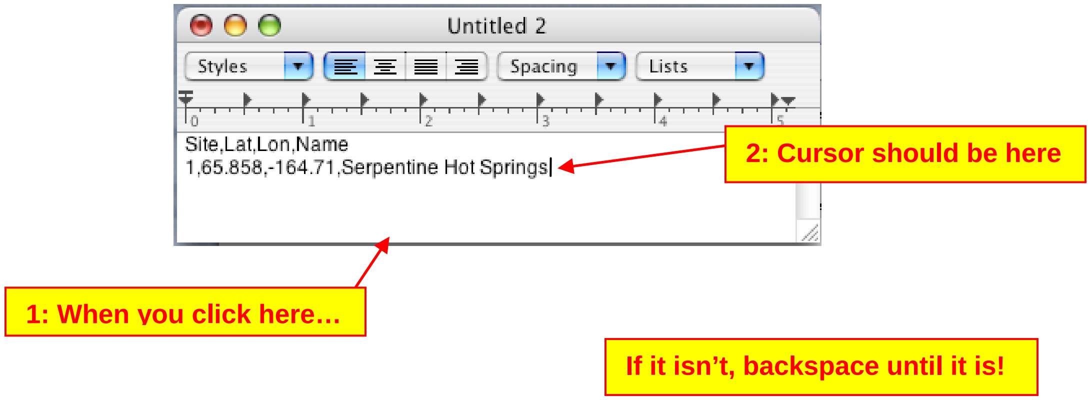
Some important concepts and tips for success:

- AEJEE uses comma separated values files (.csv, or CSV) to generate shapefiles of points that can be hotlinked.
- The attribute name in the first line of the CSV file that equates to the hotlink must be HOTLINK, all in capital letters. See example:



- This lesson constructs a hotlink to connect to a document file. Hotlinks can connect to any kind of file your computer can open, including pictures, text documents, video clips, sound files, web sites, etc.
  - The syntax to connect to a file on your computer is **file:///** followed by the pathname and document name.
    Example:
    File:///Users/student/MapTEACH_Work/FieldTripSite1.doc
    (This connects to a Word document named FieldTripSite1.doc that is located in the MapTEACH_Work folder in the Users/student directory of a Mac computer; if you want to hotlink to a file or document that is saved somewhere else, remember that the syntax must exactly match the pathname so AEJEE can find your file)
  - The syntax to connect a point to a web site is **http://** followed by the web site pathname.
    Example:
    http://www.nps.gov/bela/html/serpent.htm
- When hotlinking to files or documents, AEJEE will not accept a document name that has spaces. Instead of using a name like “my field trip.doc”, you should use alternatives like “my_field_trip.doc”, “MyFieldTrip.doc” or “myfieldtrip.doc”. It is also a good idea to avoid special characters when naming a file: #, $, /,*, or others like this can cause problems. Stick with letters, numbers, underscores, and dashes.
- Older versions of AEJEE did not allow spaces on either side of the commas in the CSV files, although the newest version seems more tolerant. To avoid possible confusion, the lesson retains instructions for the older versions of AEJEE.

- There can be no “empty returns” at the end of the CSV document. If you click your pointer in the blank white area below your last line of data and a cursor appears below your last line of data, you must backspace or delete until the cursor is exactly after (to the right of) your last piece of data.



- Working with CSV files and hotlinks can be very frustrating for students, who are often rushing and not paying close attention to what they are typing. Any typographical error, extra space or misplaced comma will cause the process to malfunction. If the hotlink is not working, work patiently with the student to very carefully check their file for errors.
- When activating hotlinks, there are some critical items that must be kept in mind:
  - MapTips must be set to reference HOTLINK in the point shapefile that the hotlink is generated from
  - The shapefile containing the hotlink(s) must be selected (highlighted) in the Table of Contents on the left side of the AEJEE window
  - The Hotlink lightning bolt tool must be used to select the point in the map project
  - Hover the Hotlink lightning bolt tool over the point until the MapTip info appears next to point (either the url if linking to a web site, or the pathname and file name if linking to a file or document); do not click until you can see this information
  - If you can see the MapTip info next to the point but are having trouble clicking on it, try zooming in a little so you can better target the point
  - If you can see the MapTip info and can successfully click the point, but nothing happens, it probably means that you have set up everything correctly but there is either: 1) a typographical error in the url, pathname, or file name in your CSV file and AEJEE can not find your hotlinked web site or file - check for typos!; or 2) there is a space or a special character in the file name you are trying to link to – check the file name!

MATERIALS

- Computers - one for each student is best or two students can share. The computers must meet the following specifications to run AEJEE:
  - o Macintosh: MacOS 10.3 or above, 100 MB hard drive space, Internet connection; recommend G4 or faster processor and more than 64 MB RAM
  - o Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- GPSBabel software to download and convert the GPS waypoint data can be provided on a CD or downloaded from our website at http://www.mapteach.org or downloaded at http://www.gpsbabel.org
- Microsoft Word software. If Word is not available on your class computers, any other word-processing program will work. If substituting a different word-processing program, you will need to revise the student instructions accordingly.
- Field trip data sheets with information about the sites and photos.
- Copies of student directions for the lesson.

INSTRUCTIONAL PROCEDURES:

Before Class

- Make sure that the students have downloaded the digital photos from the field trip into their MapTEACH_Work directories. This was part the GIS lesson “Using Your Own Field Trip Data.”
- Make sure that the students have CSV files of their GPS waypoints in their MapTEACH_Work directories. This was part of GPS Lesson 3 “Using Your Own Field Trip Data.”
- Check, update and/or maintain all student equipment including computers so everything works as smoothly as possible.
- Prepare materials for the lesson and try out all the activities well in advance before the students work through them.

Gear-up

Have the students recall their experiences on the field trip. Ask them about what kinds of things would they like to share with someone else about what they saw on the trip. They have already made a layout of their field trip, with one or more photos. Can they think of a different way to use AEJEE to show this information to someone? Remind them about the GIS lesson “Hotlinking.”

Explain that in this lesson students will be making an interactive map that will allow others to click on the points representing the sites they visited to connect to Word documents describing those sites and showing pictures that the students took during their field trip. Remind them to think about their experiences with hotlinking and emphasize that they need to be very careful when entering their information into the CSV files.

MORE EXPLORATION

Look up geotagged photos on Flickr at http://www.flickr.com/
What might be the advantages and disadvantages of using a mapping service like this as compared to how you might use AEJEE GIS maps?

TEACHER RESOURCES

Specific instructions on creating CSV files with Macs and PCs to make point shapefiles and hotlinks can be found in ESRI's "Introduction to ArcExplorer—Java Edition for Education" for AEJEE 2.3 available as an Adobe Acrobat PDF:
http://www.esri.com/software/arcexplorer/download.html

Wikipedia provides information about Comma-Separated Values (CSV) files at:
http://en.wikipedia.org/wiki/Comma-separated_values

Cooke, Donald (2005). Fun with GPS, ESRI Press, Redlands, CA

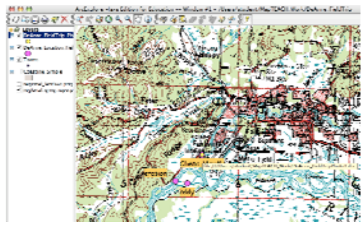
TEACHER REFERENCES

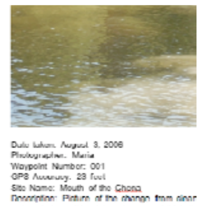
ESRI's "Introduction to ArcExplorer—Java Edition for Education" available as an Adobe Acrobat PDF: http://www.esri.com/software/arcexplorer/download.html

GPSBabel converts waypoints, tracks, and routes collected using GPS from one format to another (including CSV files) and runs on multiple computer platforms
http://www.gpsbabel.org/

Name: ____________________

GPS Lesson 4
HOTLINKING TO A FIELD TRIP DATA DOCUMENT
STUDENT EXERCISE





Objectives: Students will learn to hotlink a document to a point on their AEJEE map.

Estimated Time: 1 hour

In this lesson you will make an interactive map that will allow someone to click on sites in your AEJEE map project to open informative documents that you have written that describe the site and why it is important or interesting. You will write the document using a word-processing program, and you will include photos that you took on your field trip. You will then hotlink your GPS points on your AEJEE map to connect to your descriptions.

Explore 1: Making a Photo Data Document

The first thing you need to do is **pick a site from the field trip** you want to describe.

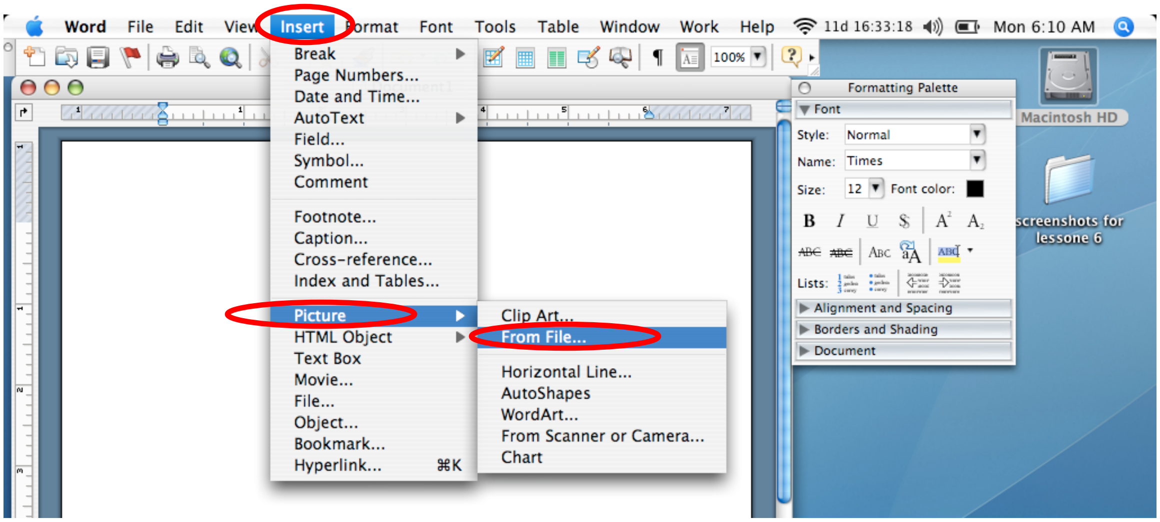
Site I am using for this exercise: ______________________________________

Decide which photo of this site you would like to link to and write down the file name. You can look at your photos by double-clicking on their file names in the Mac Finder window for MapTEACH_Work.

File name of photo to use in hotlinked document: _________________________
(Remember: This photo should relate to the site you are hotlinking to!)

We need to make a document to link to that has the photo and information about why the site is important. We will make this document in Microsoft Word.

1. **Start up MS Word and select Insert/Picture/From File** from the pull down menu.



2. Find the photo you want to use in your **MapTEACH_Work** folder and **click "insert."**

3. Now you can add information about the photo to the document. Refer to your field data sheet for the information you recorded about the photo and the site it documents. This information should include:
   a) Date
   b) Photographer
   c) Waypoint number
   d) GPS accuracy
   e) Site name
   f) Description – **describe this photo and this site in complete sentences**. Why is this site important or interesting? What are we seeing in the photo?
   g) Anything else your teacher suggests you should include

Here is an example of a Field Trip Data Document:

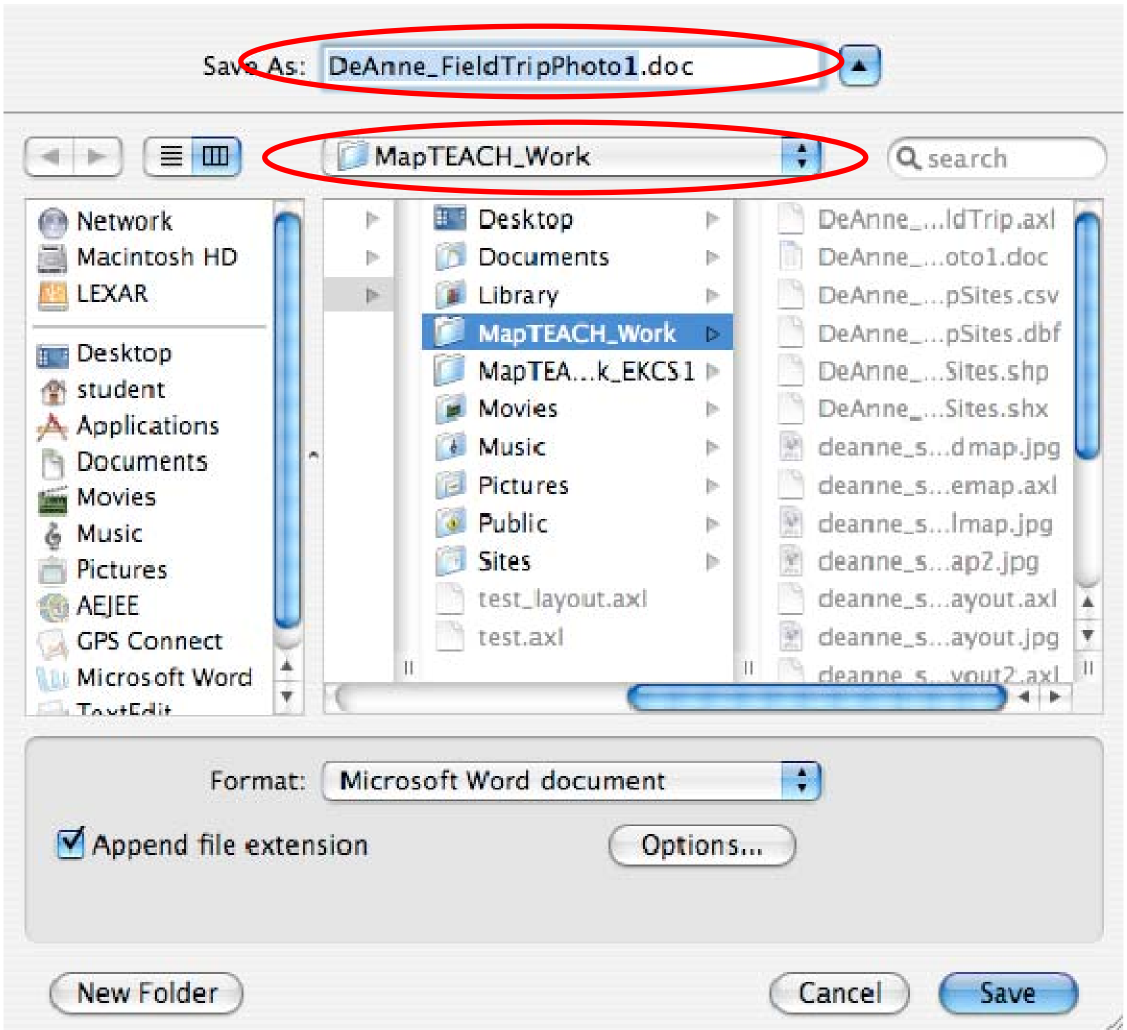
DeAnne_FieldTripPhoto1.doc

Date taken: August 3, 2006
Photographer: Maria
Waypoint Number: 001
GPS Accuracy: 23 feet
Site Name: Mouth of the Chena
Description: Picture of the change from clean rain-fed water to silty glacier-fed water. I chose this picture because I think it is really great that the students were able to see this confluence of two very different kinds of rivers. The same thing happens where the Clearwater River joins the Tanana River near Delta Junction. When you sit quietly on top of the water of a silty, glacier-fed river like the Tanana River, you can actually hear the hiss of the silt hitting the boat. Silt and other particles carried by river water are effective agents of erosion. We learned from Sam in the classroom that rain fed rivers like the Chena are strongly affected by rainfall and will rise quickly after a rain. Glacier-fed rivers like the Tanana are not so responsive to rainfall, but will rise quickly on a hot summer day when the glaciers that feed them are actively melting, especially in the afternoon. This is why it is important to remember that the level of a glacier-fed river that is crossable in the morning may rise dramatically in the afternoon and no longer be crossable – this is a big deal if you are hiking and cross a river in the morning and want to get back in the afternoon!

Sec 1 1/1 At 8.1" Ln 16 Col 87 148/233 REC TRK EXT OVR

4. Save your Word document to your **MapTEACH_Work** directory, giving it a name like "yourname_FieldTripPhoto1.doc".

   Do not include any spaces or special characters (like # or @ or /) in this name, or the hotlink will not work!



What did you name your Word document? ______________________________

Show your Word document to a teacher.

Teacher sign-off: ___________________________

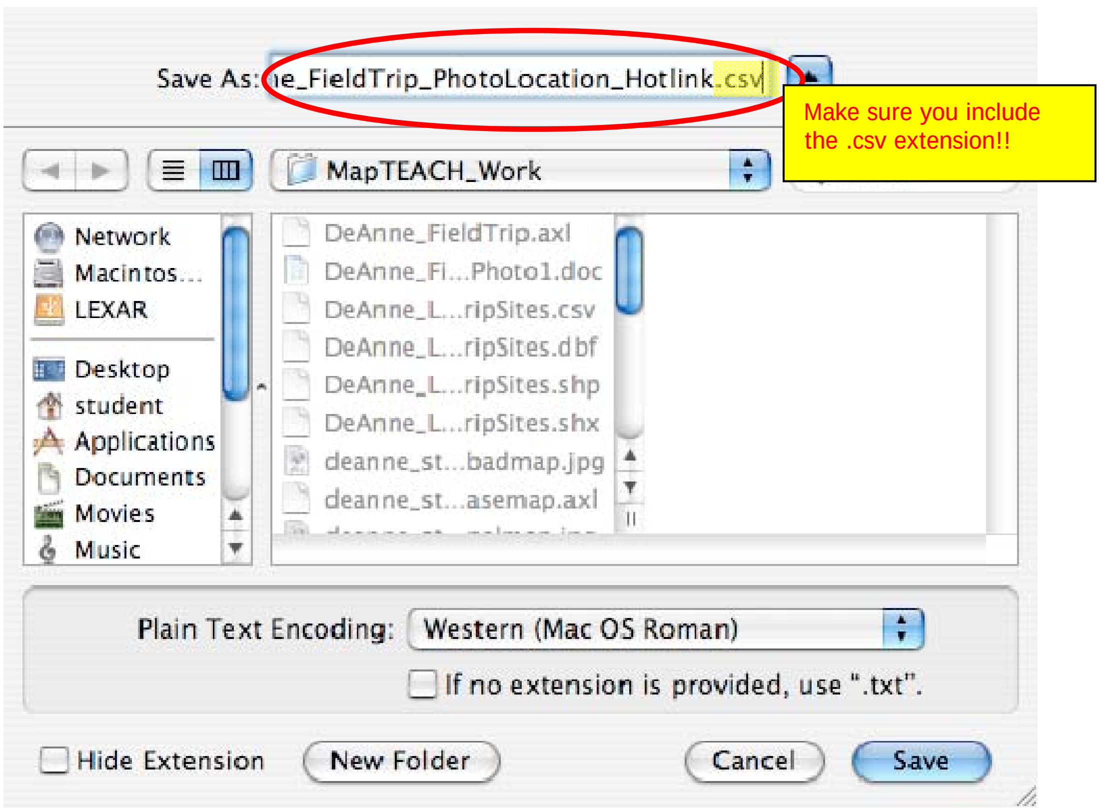
Explore 2: Making the Hotlink CSV File

1. Now we are going to make the hotlink to the file you created. To do this, we are going to make a new .csv file using the one you already made as a starting point so you don't have to re-type as much.

2. Start up the **TextEdit** application and open the waypoint file you made earlier and saved in MapTEACH_Work folder. It should be called something like
yourname_Location_FieldTripSites.csv

3. Now, do a **"Save As"** and give it a name something like
yourname_FieldTrip_PhotoLocation_Hotlink.csv

   Make sure you put the .csv extension after the file name!



Now you need to edit this file to make a hotlink of only the site you want to document.

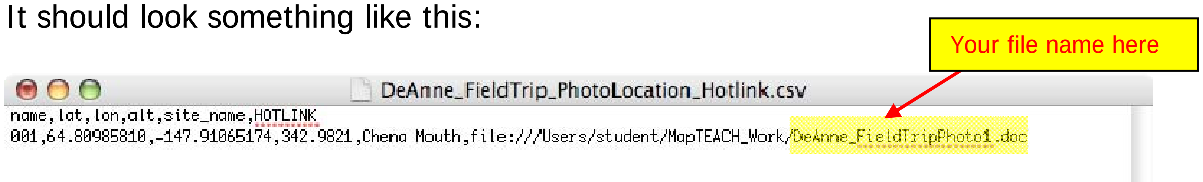
4. **Delete** all the lines **except the first line and the line with the data about the point you picked the photo for**. Refer to page 1 of this lesson to see which site you are working with.

5. **Just after "site_name." add a comma and the new field called "HOTLINK" all in capital letters.** Remember: do not include any extra spaces immediately before or after the commas in this file.

   Then, just after the site name of the location you picked the photo for, add a comma and type **file:///Users/student/MapTEACH_Work/** followed by the name of the document you created. Refer to page 5 of this lesson to see what you named the document.

6. **Check the file carefully** for typographical errors and save it.

It should look something like this:



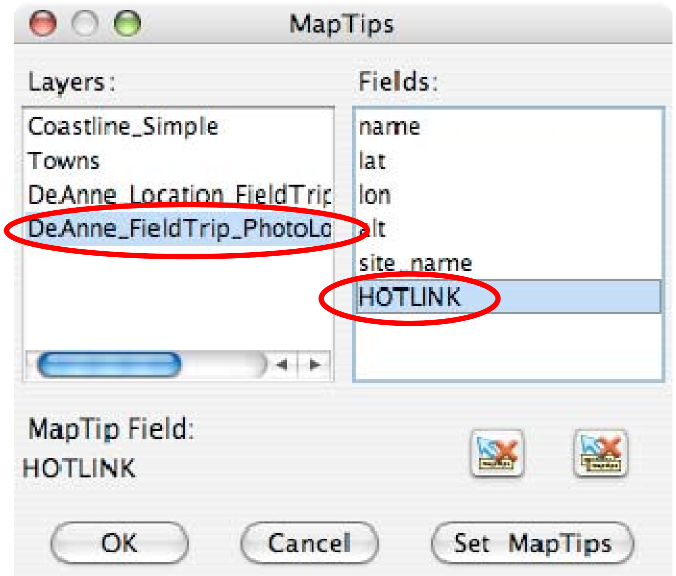
Explore 3: Adding the Hotlink to Your AEJEE Field Trip Map

1. **Open your AEJEE field trip project** and use the **Add Event Theme** process to make a new shapefile, which will automatically be named the same as your CSV file, but without the .csv extension.

2. **Make the symbol anything you would like, but make sure you can see it on top of the points you already have on your map.**

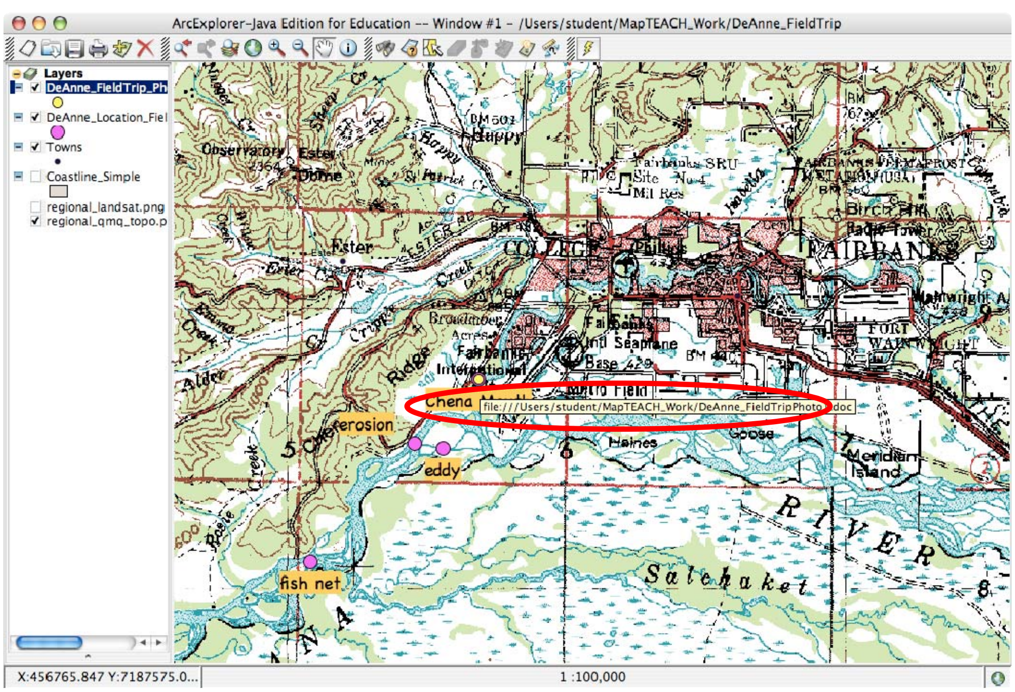
3. On the AEJEE menu, use **Tools/Map tips** to open the MapTips dialogue box. This will help AEJEE to find the hot spot for the link on the map.

4. In the **MapTips** box, select **"yourname_FieldTrip_PhotoLocation_Hotlink"** for the **layer** and **HOTLINK** as the field. **Click Set MapTip**s and then click "OK."



Make your hotlinked layer the active layer by clicking on it in the Table of Contents window. Select the "Hot Link" lightening bolt from the tool bar.

5. Hover the cursor right over the dot at your point until the Map Tip info pops up and shows the path and file name you have linked to the point. It might take a few seconds for the information to show up, so be patient. When the information shows up, click and your browser will open the Word document describing the site you have documented.



Show your hyperlink to a teacher and demonstrate that it works.

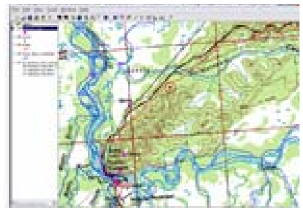
Teacher sign-off: ___________________________

Extra Credit:
Make linked documents for one or more of your other Field Trip sites.

Show your additional hyperlink(s) to a teacher and demonstrate that they work.

Teacher sign-off: ___________________________

GPS Lesson 5
USING TRACK LOG DATA
TEACHER INFORMATION



Lesson Summary: During this lesson students will make GIS maps using trail data they have collected on a local field trip with their GPS units and digital cameras. They will download their GPS track logs into a CSV file. Students will then generate points from this CSV file in AEJEE and make a map of their journey that includes photos they took on their field trip.

Objectives: Students will learn to download photos from their digital cameras and track log data from their GPS units and to make a map using these data in AEJEE.

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.

Technology A-1 Use a computer to enter and retrieve information.

BACKGROUND FOR THE TEACHER

This lesson teaches students how to prepare GPS track log data from an earlier field trip for inclusion in an AEJEE GIS map.

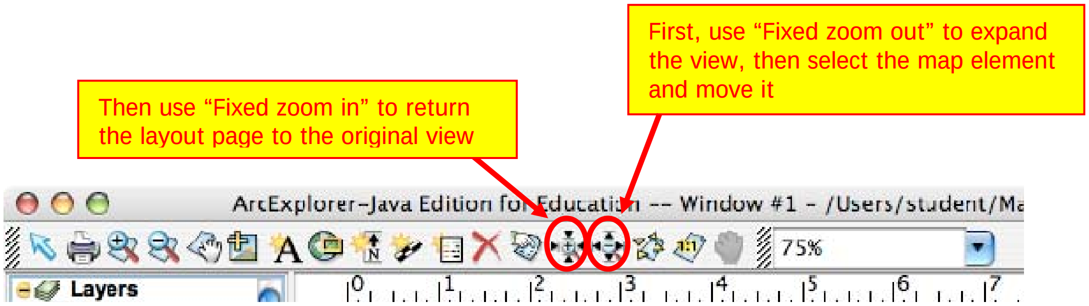
A GPS field trip lesson with field data sheets is included in the MapTEACH curriculum. This lesson can be modified to include collecting a track log as part of the trip.

The best data is the students' own data, and students are very excited to see their own observations and pictures attached to an AEJEE map. If time or weather issues preclude students being able to make their own field trip observations, you may opt to go out yourself and make observations and collect a GPS track log along a road, trail or near the school, and then share the pictures and GPS unit with students so they can download and prepare the data.

At the end of the lesson, you might ask the students for ideas about other field trips that could be documented this way and shared on maps that would be interesting to the local community.

Some important concepts and tips for success:

- Please review the information provided on CSV files and layouts that appears in previous lessons.
- Make sure the GPS unit is plugged into the computer and turned on before opening GPSBabel, or the proper port won't show up in the drop-down menu.
- Photos placed in an AEJEE layout will default to a square shape. Resizing the photo using the corners of the square will stretch or squash the image, so students should be observant of what their photos look like in their final layouts.
- This is a long lesson with multiple steps. Consider splitting it into two or more sessions if you have limited computer time. A good way to split this lesson is to have students work through Explore 3 (Add Track Log to Your AEJEE Map), then do the Trail Trip layout as a separate session.
- Layouts in AEJEE must be done in a single session! **Do not let students begin working on a layout if they do not have enough time to finish it to your satisfaction, or their work will be lost.**
- **Symbology and labels should be exactly the way the student wants them before switching to Layout View in AEJEE**. Changing the symbology and labels after entering layout view can cause problems.
- Do not switch back and forth between Layout View and Map View. Once you are in Layout View, stay there.
- Students should not change the scale of their map document after they enter Layout View in AEJEE. Redraw times are very long if the scale is changed, and it is much better to leave the document at the default scale.
- If the student is having trouble selecting a map element (scale bar, north arrow, text, etc.) that is on top of the map data frame, have them click on the white space around the map, then click on the map data frame, and then move the data frame out of the way. The map element can then be selected and moved off to the side. The map data frame can then be selected and moved back into place, and the map element can be selected and placed where the student wants it to be.
- If the student moves a map element too far off to the side of the layout page, AEJEE may not be able to select the element. If the map element is far off to the side and the student is unable to select it, use the "Fixed zoom out" tool to expand the view of the layout page. You can then select the out-of-bounds map element and move it back into the work area. Then use the "Fixed zoom in" tool to return to the original view of the page.



- Keep in mind the general guidelines for cartography and working with map layouts in AEJEE:
  - Map should have a clearly defined subject, or *theme* – a purpose for the map, or the story that the map is meant to tell
  - Map should include data points that are symbolized and labeled so they are legible and informative
    - Symbol sizes and colors should show up well on the base layer and shouldn't interfere with each other
    - Label text should be a legible font style, color, and size, and show up well on the base layer
    - ***Important Tip: When working in AEJEE layouts, make text and symbols for points much bigger than you think they should be; they end up looking smaller in the final printed map***
  - Map area should be zoomed in on the selected data points and whatever other features that should be included on the map
  - Map balance
    - Elements should be placed on the page so there is an even distribution of elements covering the page and there isn't a lot of white space
  - Fonts for text and titles should be carefully selected
    - Fonts should be chosen that are easy-to-read, attractive, and fit the theme of the map
    - Try to limit choices to no more than two fonts; this helps the map look more uniform and professional
    - The title is usually the largest font size on the map

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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM

- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- GPSBabel software to download and convert the GPS waypoint data can be provided on a CD or downloaded from our website at http://www.mapteach.org or downloaded at http://www.gpsbabel.org
- Digital cameras containing photos of the field trip, and camera download cables.
- GPS units with track logs of the field trip sites, and GPS download cables (with USB serial adaptors, if needed).
- Copies of the GPS Track Log Setup sheet.
- Field trip data sheets with information about the photos.
- Copies of student directions for the lesson.

INSTRUCTIONAL PROCEDURES

Getting Ready

- At the minimum, have a single GPS unit prepared with a track log, so that the track log includes the locations of sites of interest and digital photos. Students can then all download data from this one shared GPS unit.
- Ideally, students will use records from a field trip where groups of students were able to travel a trail or route and collect their own: digital photo, GPS track logs, and observation notes. Students will need to keep careful track of which camera and which GPS unit they used. They may also have collected waypoints for sites of interest along the trail, which can be added to their AEJEE project as an optional extra step.
- Check, update and/or maintain all student equipment including computers so everything works as smoothly as possible.
- Prepare materials for the lesson and try out all the activities well in advance before the students work through them.
- **Make sure your local base map data layers (topography and satellite imagery) are accessible in the Data_MapTEACH_WGS84 directory and that you have the file names and directory locations written down correctly. You will need to supply this information and the correct angle for the North arrow for your local area to your students before they can make their local field trip maps.**

Gear-up

- Ask the students if any of them have used a GPS unit to map a trail or route. Ask one to describe how he or she did it.
- Explain that a track log is a series of coordinates of points along the way that the GPS can automatically collect if you set it up to do that. This is like a breadcrumb trail, where each breadcrumb is a point that the GPS

locates and records the location of. This sprinkling of points shows where you have traveled with your GPS unit.

- If a field trip is to be part of this lesson, pass out copies of the GPS Track Log Setup sheet and work through the process with students prior to going on the field trip. Have the students collect track logs, take digital photos, and record observations about interesting sites.
- Back in the classroom, explain that in this lesson they will download track logs collected by the GPS units and then make an AEJEE map of their trail that includes photos.
- Write on the board or pass out as handouts the angle for the North arrow, the names of the image files for your local topography and satellite imagery, and which data folder(s) those image files are located in. Your students will need this information to load the base map data for their local field trip maps.
- If students are going to work on layouts in the current session, emphasize to them that they should keep in mind the general guidelines for cartography and working with map layouts in AEJEE. These guidelines are listed in the student lesson. Make sure they know that layouts need to be completed in a single computer session because they can not be reliably saved and reopened later. The only permanent record of their final map will be the JPG file they generate from their layout.

TEACHER RESOURCES

Specific instructions for creating CSV files with Macs and PCs to make point shapefiles and hotlinks can be found in ESRI's "Introduction to ArcExplorer—Java Edition for Education" for AEJEE 2.3 available as an Adobe Acrobat PDF: http://www.esri.com/software/arcexplorer/download.html

Wikipedia provides information about Comma-Separated Values (CSV) files at: http://en.wikipedia.org/wiki/Comma-separated_values

Cooke, Donald (2005). Fun with GPS, ESRI Press, Redlands, CA

TEACHER REFERENCES

ESRI's "Introduction to ArcExplorer—Java Edition for Education" available as an Adobe Acrobat PDF: http://www.esri.com/software/arcexplorer/download.html

GPSBabel converts waypoints, tracks, and routes collected using GPS from one format to another (including CSV files) and runs on multiple computer platforms http://www.gpsbabel.org/

Name: ____________________

GPS Lesson 5
USING TRACK LOG DATA
STUDENT EXERCISE

Objectives: Students will learn to download photos from their digital cameras and track log data from their GPS units and to make a map using these data in AEJEE.

Estimated Time: 1 hour

Explore 1: Downloading Trip Data on a Macintosh

First, download your field trip photos from your camera into your **MapTEACH_Work** directory.

1. Connect your camera to your computer using the cable provided.

2. If the camera does not start communicating with the computer on its own, press the **"OK"** button on the camera.

3. Close out of iPhoto if it automatically pops up.

4. Open the camera folder that is now on your desktop and navigate through the DCIM folder until you get down to the photos (.jpg extension).

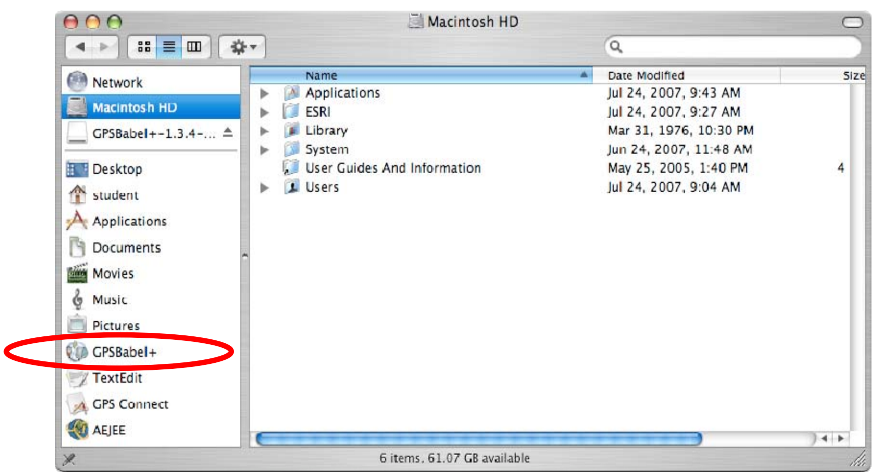
5. Drag and drop the photos into your MapTEACH_Work folder.

6. When you are finished copying your photos, drag and drop the icon for the camera into the Trash/Eject area of your screen, disconnect the camera, and pass it and the cable to the next person in your group.

Now, download your GPS track log from your GPS into your **MapTEACH_Work** directory.

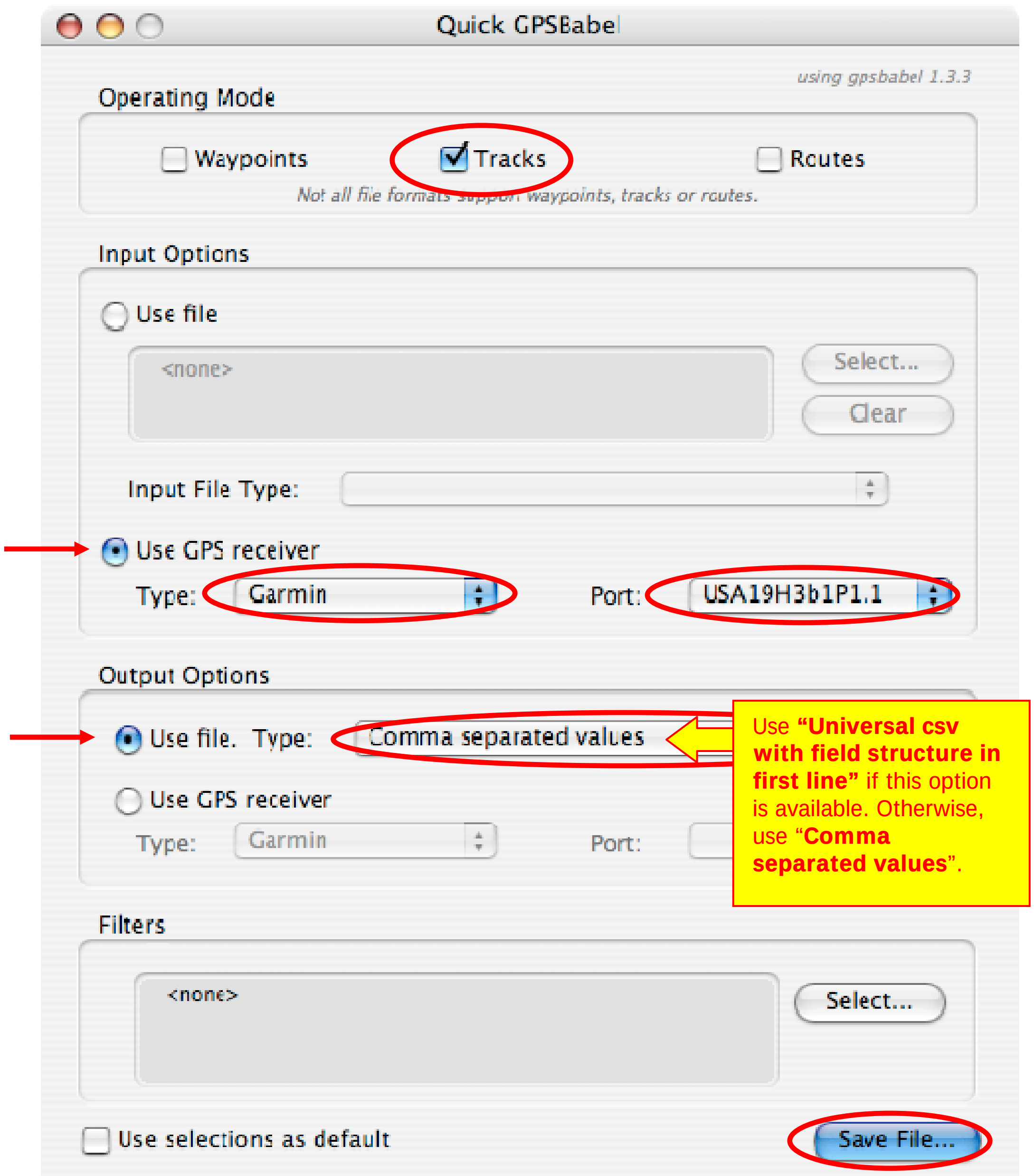
1. **Connect the cable to your GPS unit and plug it into a USB port** on your Macintosh.

2. **Turn on the GPS unit, then Start GPSBabel**. You can launch it from the dock on your computer or from its icon on the desktop.

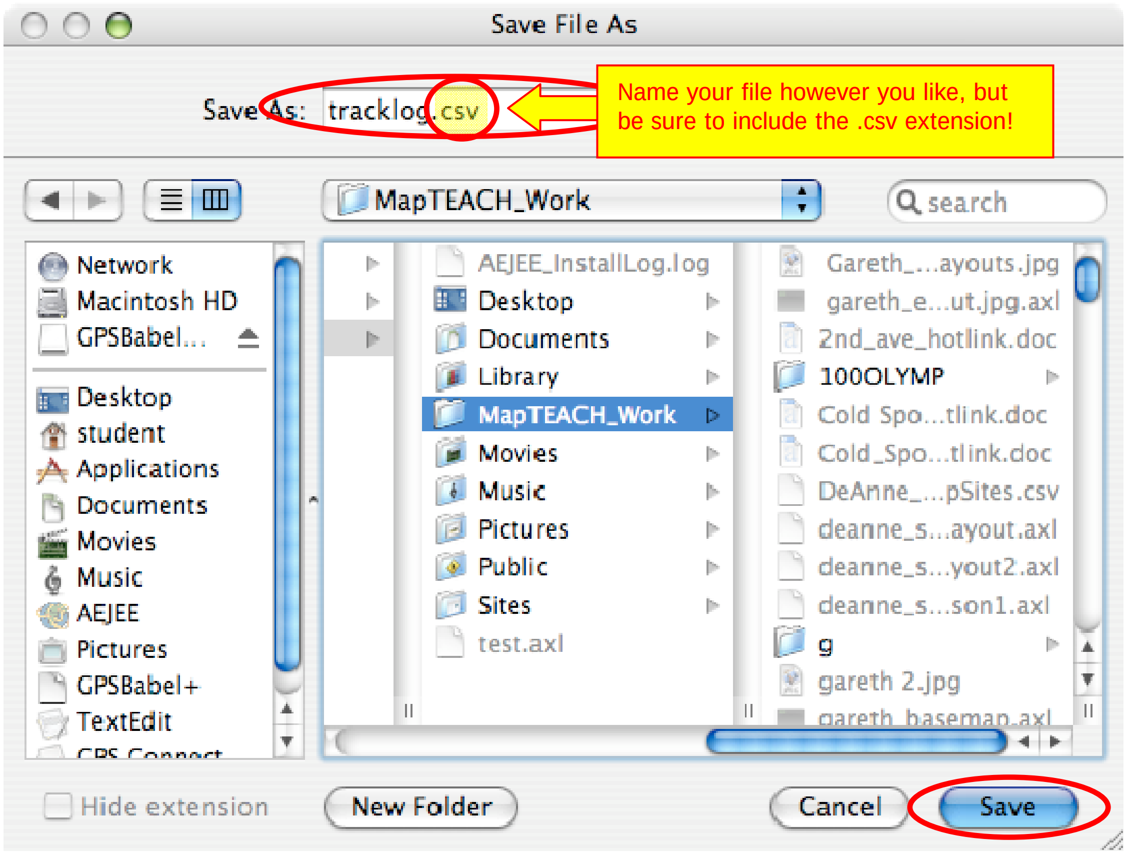


3. In the Quick GPSBabel window:
   - For the Operating Mode: **Check "Tracks."**

- For the Input Options: **Check "Use GPS receiver"** and **select "Garmin"** from the "Type" drop-down menu and the item beginning with **"USA"** from the "Port" drop-down menu.
- For the Output Options: **Check "Use file"** and **select "Universal csv with field structure in first line"** for the Type drop-down menu. If this option is not available use **"Comma separated values."**



4. **Click "Save File,"** and **save the file in your MapTEACH_Work** folder. Name it however you like, but ***be sure to include the .csv extension*** so the computer will know that this is a Comma Separated Value file.

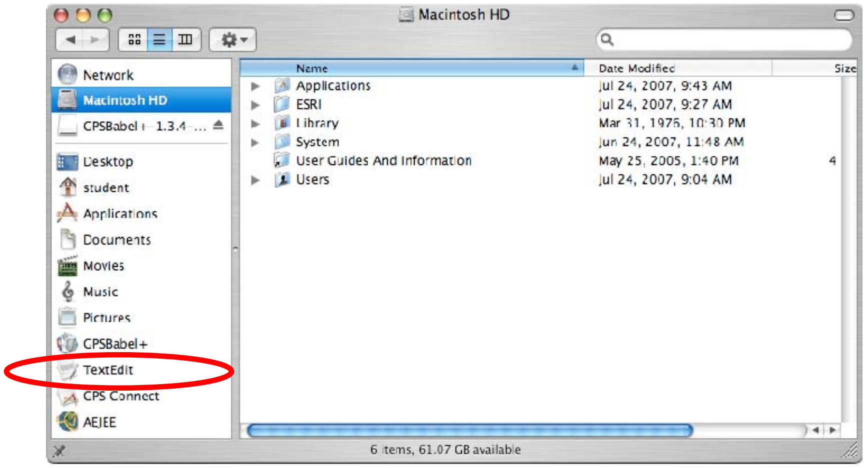


5. **Exit** the GPSBabel program and pass the GPS unit and cable to the next person in your group.

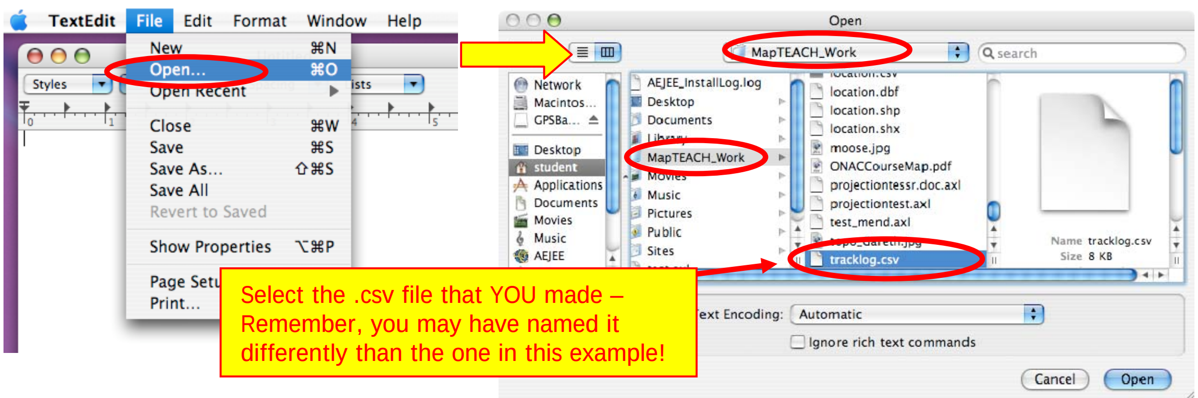
Explore 2: Add Header Information to Your Track Log File
(You can skip this step if you were able to use the "Universal csv with field structure in first line" option during the GPSBabel download step. You only need to do this step if you had to use the "Comma separated values" option.)

We need to add some more information to the track log CSV file you created in the last step before we can import it into AEJEE. AEJEE needs the first line in your csv file to be a "header line" that tells it how to define the columns of data it contains.

1. Start up the **TextEdit** application and **open the track log .csv file** you just created.
   a) If it is not on the dock of your computer desktop, you can access TextEdit by going to **Macintosh HD/Applications** and **double-clicking** on **TextEdit.**

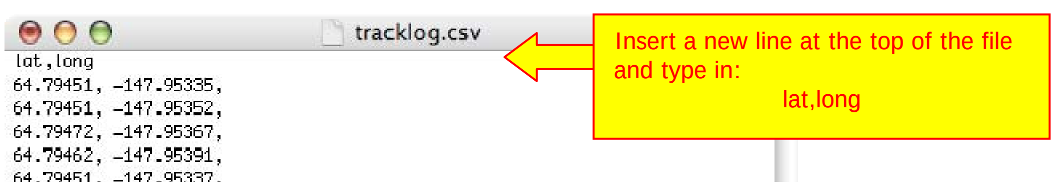


b) Go to **File / Open** in the TextEdit menu bar and navigate to your **student / MapTEACH_Work** folder and **select your .csv file**.



2. **Insert a new line at the top of the file and type in the headings "lat" and "long."**

Your file should look something like this:



3. **Save** your edited file.

Show your .csv file to your teacher.

Teacher sign-off: ______________________________
(Check for errors and confirm that the student's site names are included)

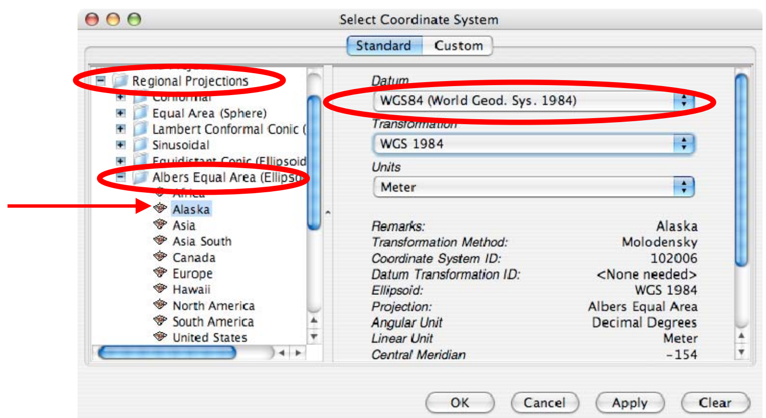
Explore 3: Add a Track Log to Your AEJEE Map

1. **Open AEJEE** and start a new map.

2. Navigate to the folder **/ESRI/AEJEE/Data/Data_MapTEACH_WGS84**.

3. **Add *Coastline_Simple*** from the ***Base_Data*** folder

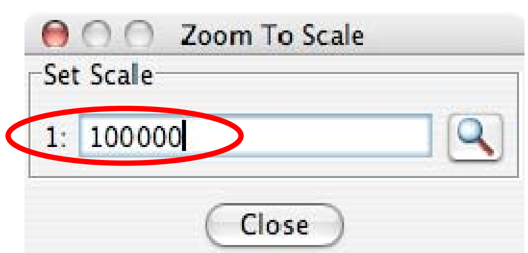
4. **Set your projection** to **Regional Projections/Albers Equal Area (Ellipsoid)** and select **Alaska. Set your datum** to **WGS84 (World Geod. Sys. 1984)**



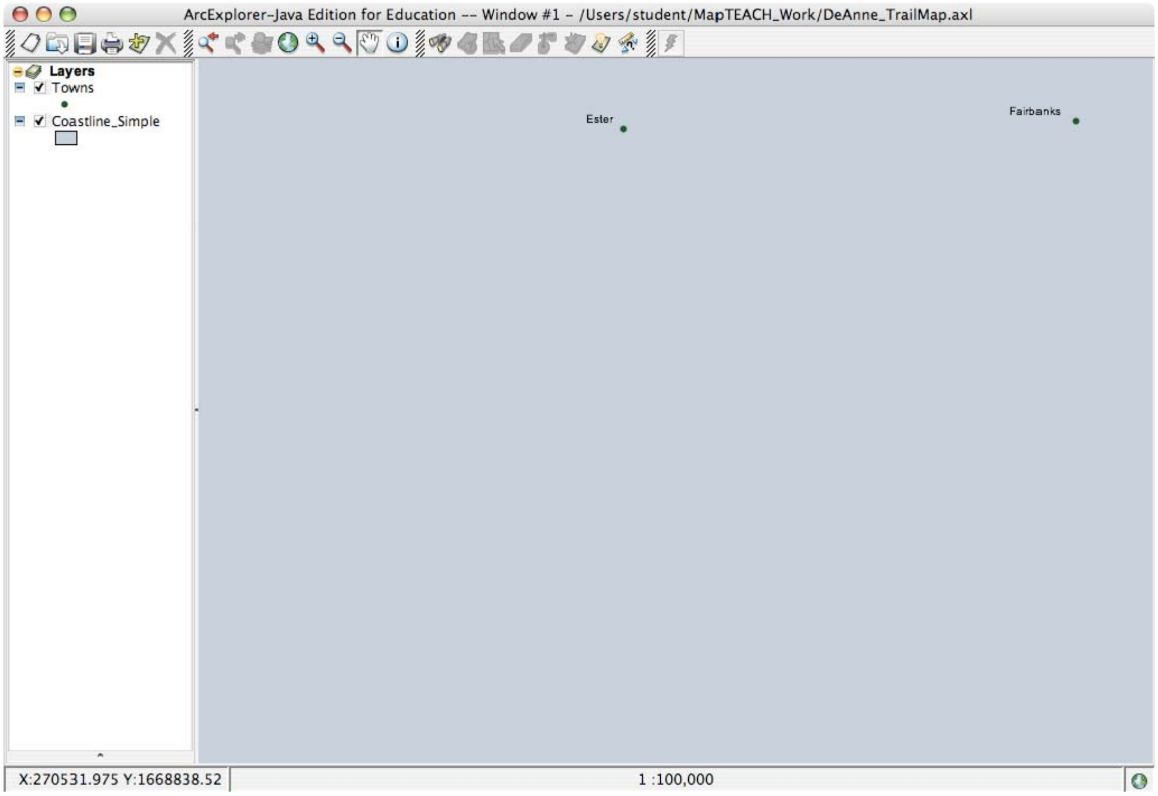
5. **Add *Towns*** from the ***Infrastructure*** folder.

6. Label the ***Towns*** using **Name**.

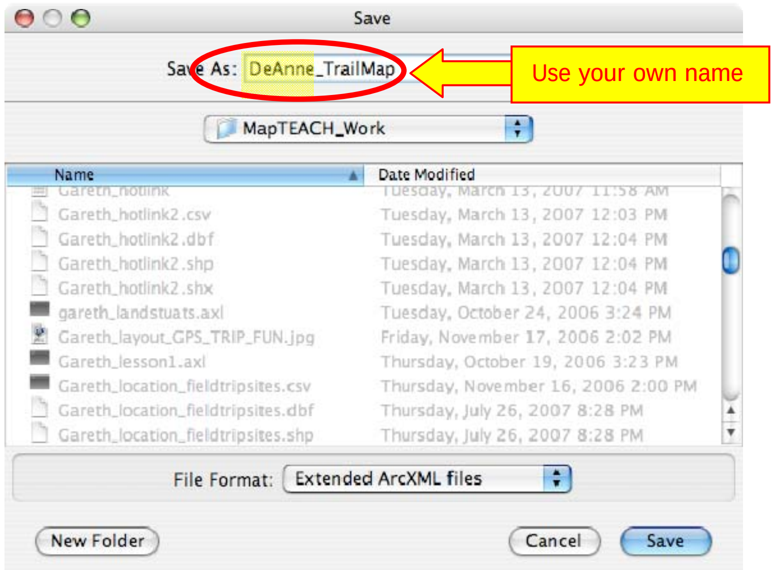
7. Zoom in on your general field trip location so it is in the middle of the screen. Use the **Zoom to Scale tool** to **zoom-in** to a scale of **1:100,000**.



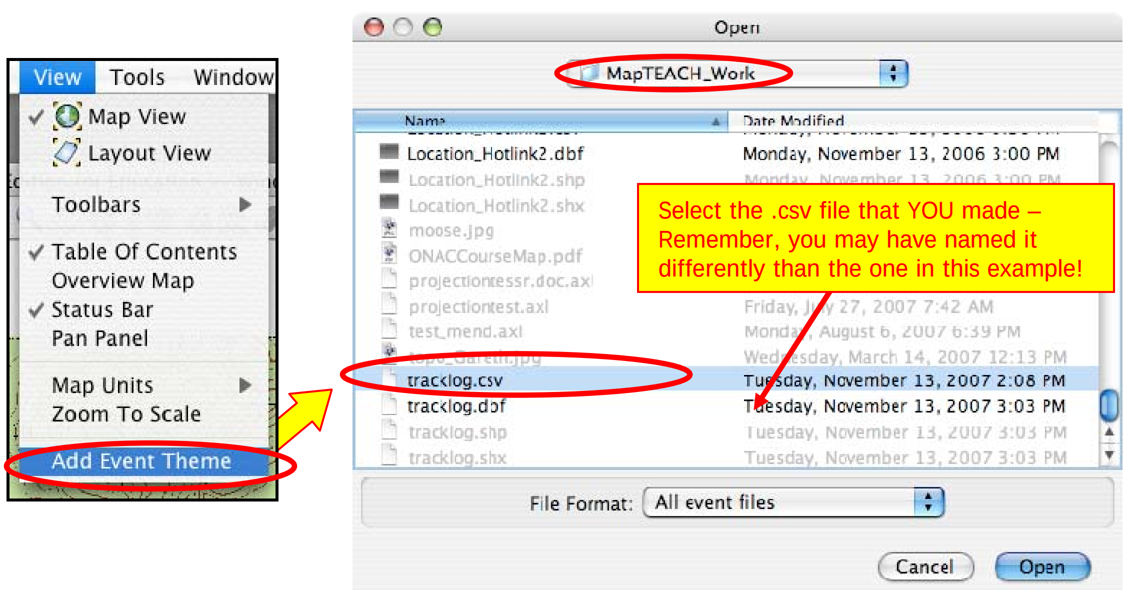
Your map might look something like this:



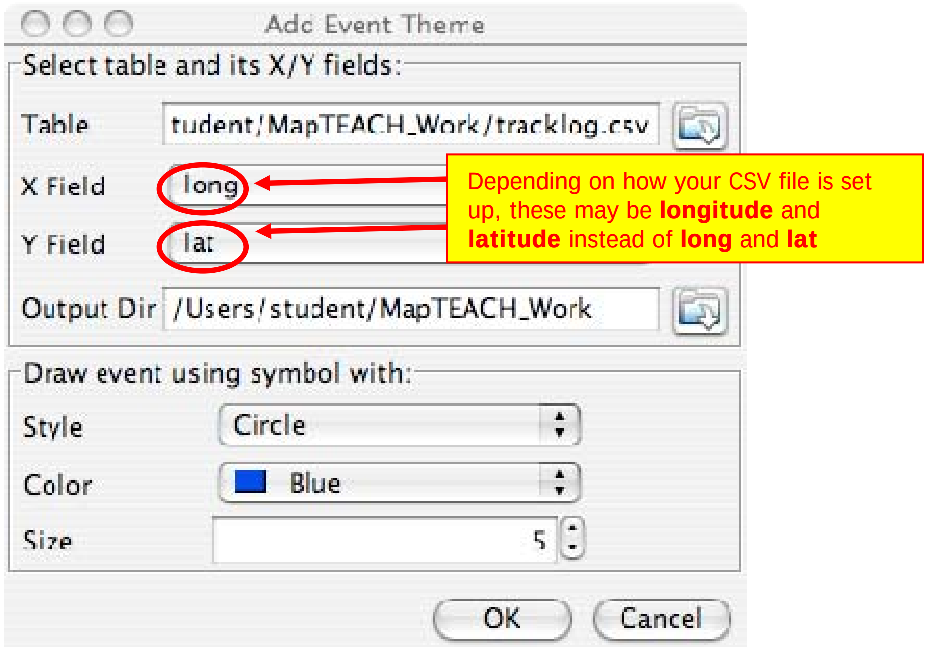
8. **Save** your map project:
   - **Click** on **"File"** in the Menu Bar
   - Select **"Save As"**
   - **Navigate** to the **student/MapTEACH_Work** folder
   - **Name the project** using your name followed by "TrailMap": **firstname_TrailMap**



9. Now we can add and view our points with **"Add Event Theme"** from the AEJEE "View" menu.

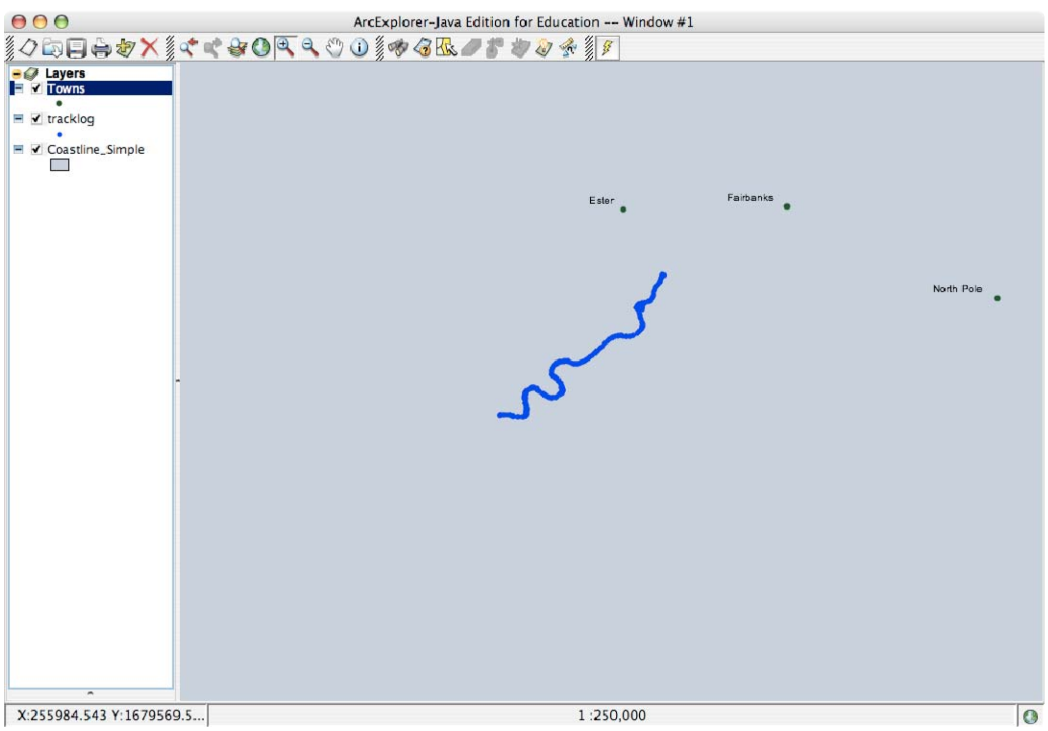


10. **Select your .csv file for "Table,"** set **"long"** or **"longitude"** for **X Field** and **"lat"** or **"latitude"** for **Y Field**. Make the symbol style, color and size whatever you like.



11. Zoom out so your entire track log is visible.

Your map might look something like this:



12. **Turn off *Coastline_Simple***.

13. **Add layers for your local topography and satellite imagery.** Your teacher will provide the file names and directory locations for these data layers. See how your map looks with different satellite imagery as a background and how it looks with the topographic map as a background by checking and unchecking the boxes next to the names of the raster data layers.

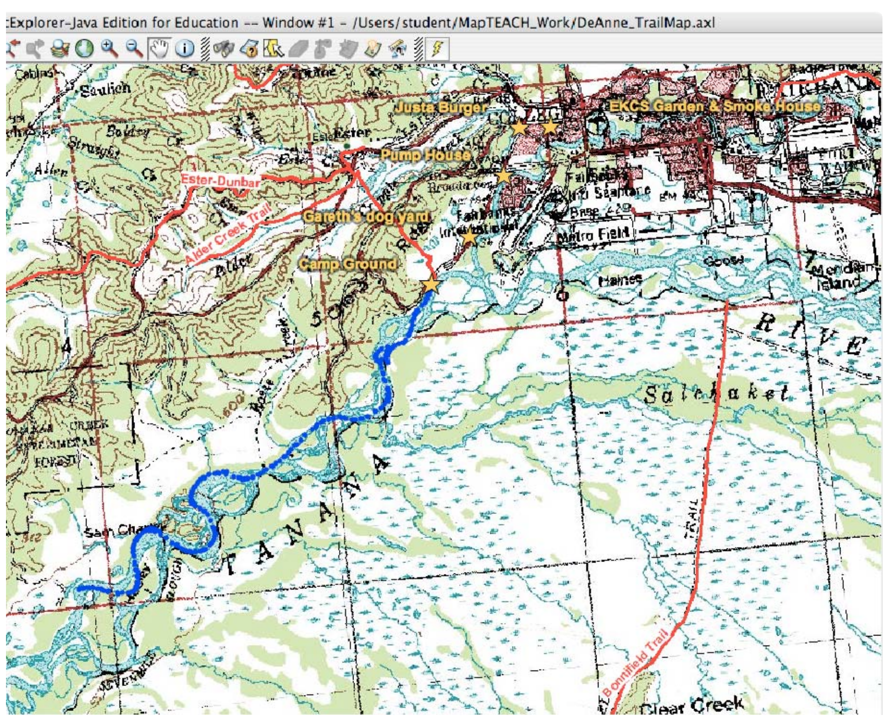
14. **Pick the base layer (topographic map or a satellite image) you like best and leave it turned on**. Turn off or remove the raster data layers you are not using.

15. Zoom in and out to see what view looks best.

16. If you have other data you would like to add to your map, do so. This might include sites that you have visited and collected GPS points for during a class field trip, or it might be other data layers from the Data_MapTEACH_WGS84 folder.

17. **Symbolize** your points and text the way you like them. Make sure that your points and text are large enough so you are able to read them easily.

Your map might look something like this:



Save your project and have a teacher sign off.

Teacher sign-off: __________________________
(Check that student has selected appropriate base map and symbology)

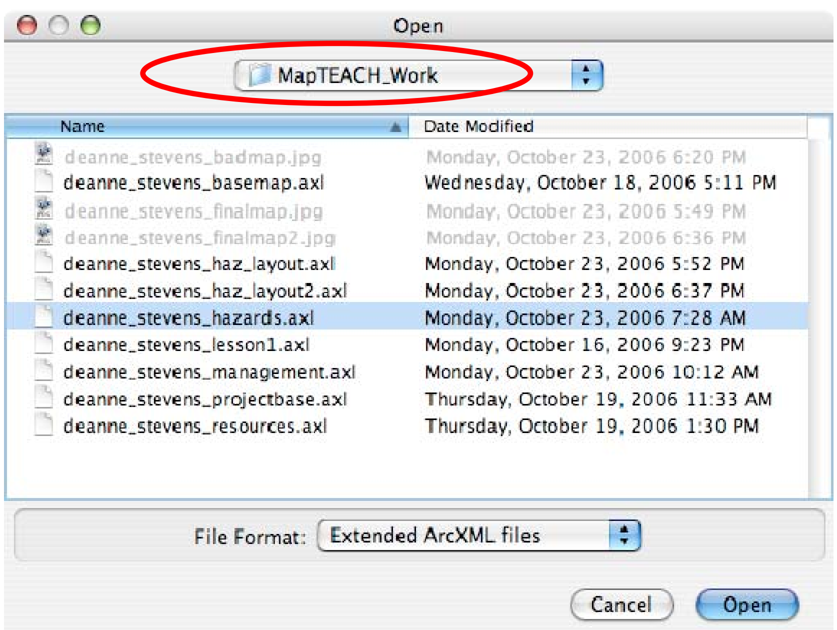
If your lab session is almost over, you may need to complete the next section in another lab session.

****ASK YOUR TEACHER IF YOU SHOULD CONTINUE****

Remember that you cannot save layouts, so make sure you have enough time to do a complete layout before you begin.

Explore 4: Making a Layout of Your Trail Map
If you are continuing this lesson without a break, go to step 2.

1. **Start AEJEE and navigate** to your ***MapTEACH_ Work*** folder and **open** your **field trip project that you want to make a finished map layout for**.

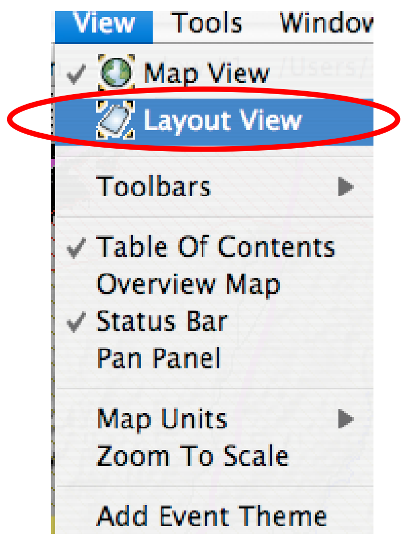


2. **Make your AEJEE window bigger** by clicking on the green button in the top left of the window.

3. **Make sure that everything looks just the way you want it to look on your final map. THIS IS REALLY IMPORTANT!!!**

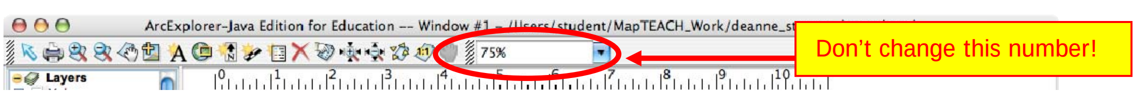
a) Make sure you are zoomed in to the area of the map that you want to show on your map layout. If you are zoomed too far out, there won't be enough detail to see your data points. If you are zoomed too far in, some of your data points may be outside the map, and your base map image will look really fuzzy.
b) This is your last chance to fiddle with your fonts and symbols. It is not a good idea to change symbology in AEJEE once you've started the layout process.
c) ***Remember to make your labels and symbols for points bigger than you think they should be*** *– they'll show up better in the final map. The symbols for lines will show up pretty much the way they look in the regular map view.*

4. Start the layout process by selecting **View** from the main menu, and selecting **"Layout View."**



5. **Wait patiently for AEJEE to redraw the map**. Your map data frame will appear to be drawn on a standard sheet of paper, measuring 8 ½ by 11 inches.

IMPORTANT TIP: Do not change the scale while you are working in layout view. Doing this will make your map take a REALLY long time to redraw.



You can check your map symbols and fonts at this point by clicking on **"File"** and **"Export to Image."**

- Use **150 dpi** for **Input**.
- Examine your map carefully in the Export window.
- If you like what you see, click **"Close"** and continue with the map layout instructions below.
- If you don't like the symbols and fonts, click **"Close," exit AEJEE (don't save)**, and **re-open your project** to make the changes you want.

The basic elements required in your final field trip map include:

- Data Frame
- Title and text
- Legend
- North Arrow
- Scale Bar
- Author
- Date
- Citation/Credit
- Photograph

Follow along with these steps to add the required elements to your layout:

Data Frame (this is your actual "map" that you've been seeing all along)

- **You can leave the data frame where it is, or move and change the size** by selecting and dragging, or by grabbing the corner handles to change the size. **Before you resize the data frame**, **control-click** on it to choose **"Properties,"** go to the **"Size and Position"** tab, and click the box next to **"Preserve Aspect Ratio."** This will maintain your map area so it doesn't get stretched or squashed.

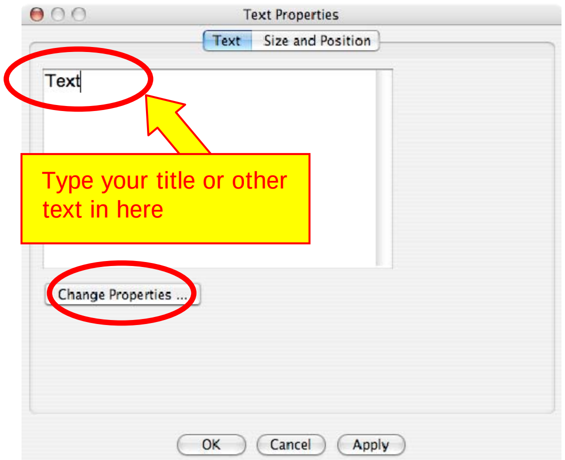
Title and Text

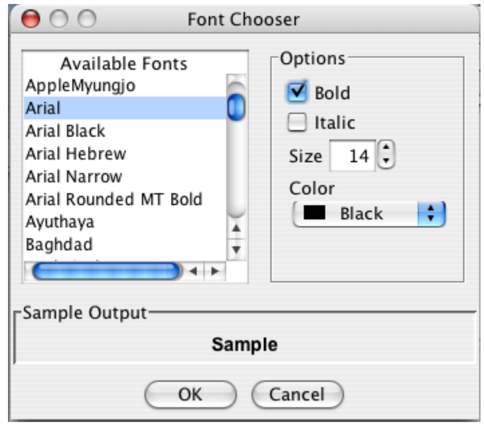
- Every finished map needs a title. The title provides a very brief introduction and overview to what the map describes. The title will most often describe the subject and location of the map.

- **First click on an empty space on the layout** to deselect any other elements.

- **Select** , **the Add Text button,** to insert a text box
  - A small box will appear on the page that says "Text."
  - **Drag** this box to a position you like on the page.
  - **Control-Click the box** and choose **"Properties."** The Text Properties window will appear.

- **Type** in your text. You can also change the font, size and color of text by selecting the **"Change Properties …"** button.





More text boxes can be added using a smaller font to describe more information about your map. You should also add text to make captions for any photos you include on your map (see "Photograph" section below).

Legend

- The map legend is a small table that explains the symbols used on the map. Legends are often called "keys."

- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the legend.

- **Select**  **, the Add Map Legend button**. The map legend graphic will appear on the page and can be dragged and resized.
- **Control-Click the legend element** and choose **"Properties"** to access the options available for customizing the legend.

North Arrow

- The North Arrow orients the viewer to determine the direction of North on the map.
- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the north arrow.

- **Select**  **, the Add north arrow button.** The North arrow selector window opens and presents many different styles to choose from. Choose one, drag, drop and alter the size and color so that it looks good on the layout. **Make sure you change the angle of the North arrow so it**

points towards north for your map area. Your teacher will provide this angle.

Scale Bar

- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the scale bar.
- **Select** **, the Add map scale bar button.** Choose the bar you like and place it on the map. **Control-Click on the scale bar element**, use **"Properties"** to select ***miles or kilometers*** for the units shown.

Author

- **Make a text box and add the author's name.** This entry may also include where the author works or goes to school.

Date

- **Make a text box and add the date when the map was completed.** This may be appended to the author.

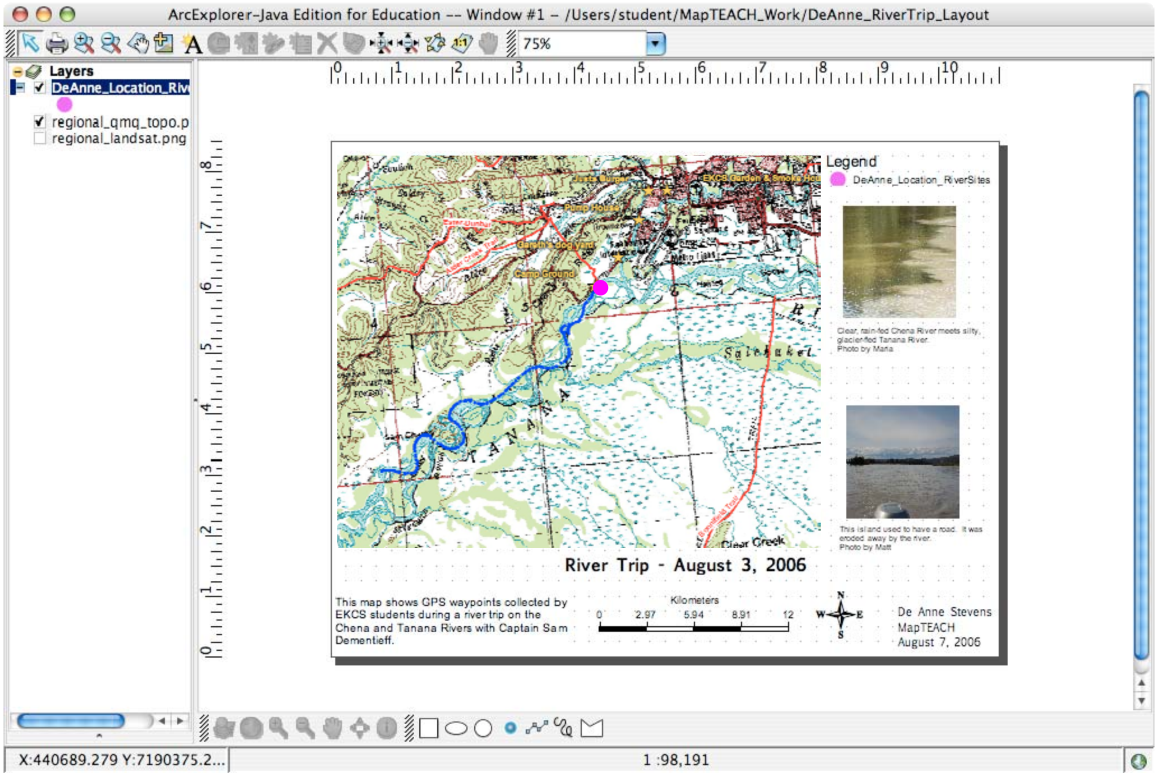
Citation/Credit

- The citation tells the viewer where data for the map came from. The citation includes any necessary or important information about sources of data for the map, when data was gathered, projection information and any thing else that seems important for a person reading the map.
- **Make a text box to add a citation.** Some citations are brief.

Photograph

- A photograph or other picture can be added when you **select**  **, the Add image button.**
  - Use at least one of the photographs you downloaded from the digital camera: **navigate** to the ***MapTEACH_Work*** folder and **select your image**.
  - You can resize your photo image by grabbing and using the corner handles. Pay attention to what you're doing, since you can stretch or squash your picture this way.
  - Make sure to use the Text tool to add a caption describing the photograph and giving credit for the photographer.

When your map layout is complete, it might look something like this:



Show your map layout to a teacher.

Teacher sign-off: ____________________________

Save your map project:

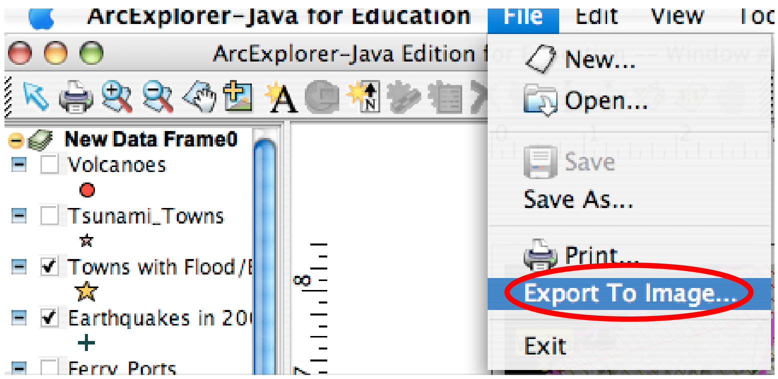
- **Click** on **"File"** in the Menu Bar
- Select **"Save As"**
- **Navigate** to the **student/MapTEACH_Work** folder
- **Name the project** using an appropriate name that includes your own name (for instance, *yourname_TrailMapLayout*)

Explore 5: Export Your Map Layout

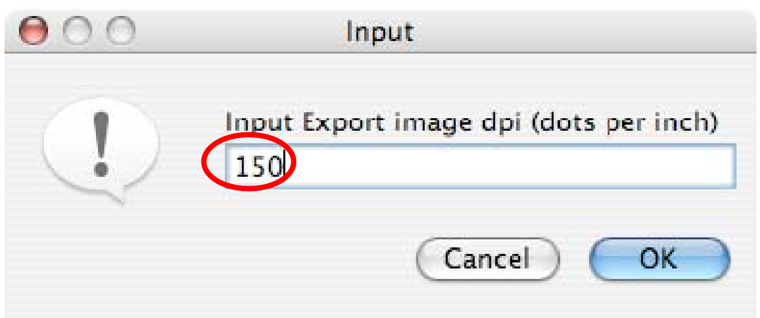
Because AEJEE does not reliably save map layouts, the only way to preserve your final map is to convert it into a graphics file. We will use a JPG format.

Your map can then be printed, added as a picture into a word processing document, or used as a graphic image in presentation software like MS PowerPoint.

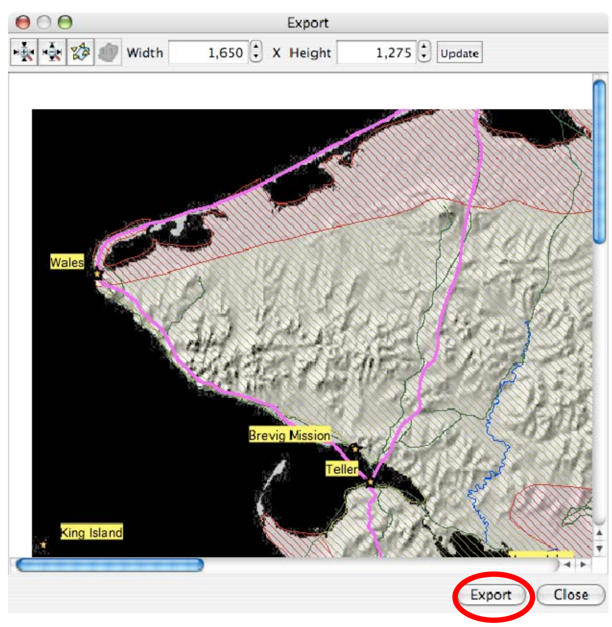
1. **Choose File/Export to image from the AEJEE menu.**



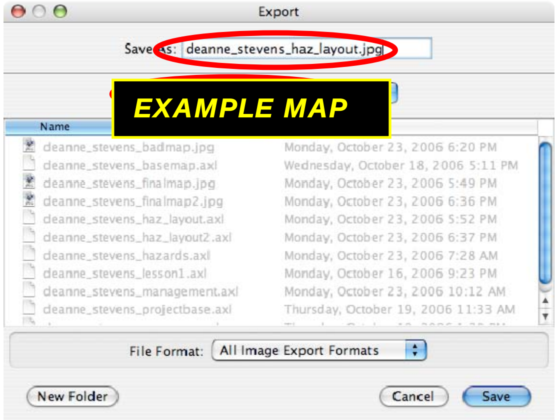
2. **Choose File/Export to image from the AEJEE menu.** A dialogue box will appear and require a number for dots per inch (dpi) to specify the resolution of the output file. **Use 150 dpi**.



3. ***Wait*** patiently **until a new window appears**. It can take a couple of minutes. **In the Export window, click "Export."**



4. **Save the image** into your **MapTEACH_Work** folder as a JPG. **Name the file to include the extension ".jpg"**. Otherwise it will not save. Wait a minute or two while the computer exports your map.



5. **Wait a moment to allow AEJEE to complete the export process, then close** the **Export window** and **exit AEJEE.**

Print Your Map Layout
Once the map image is saved, it can be imported to word processing documents (MS Word), graphics presentations (MS PowerPoint) or any image processing application. The exported map can also be emailed anywhere as an attachment. **You may be able to just open your JPG map directly by double-clicking on the file, and then print it from your computer's picture viewer.**

Show your printed map to a teacher.

Teacher sign-off: ___________________________

1) Set up your GPS unit for the track log activity by executing the following steps on your GPS unit:

Go to MENU page
Select TRACKS
On TRACK LOG page
Select CLEAR
Select YES to the question "Do you really want to clear the track log?"
Select SETUP
Set RECORDING to ON
Set RECORD INTERVAL to DISTANCE
Set VALUE to 10.0ft
Set WRAP WHEN FULL to NO
Exit the TRACK LOG page by pressing the Page button

You are now collecting a track log with your GPS unit.

2) When you have completed your trip:

Go to MENU page
Select TRACKS
On TRACK LOG page
Select SAVE

You can name your track log by selecting the date of your trip from the SAVED TRACKS section of the screen. The track will now appear on your screen, and you can select the name/date at the top of the page and change it to whatever you would like to name it.

Generalized Instructions for using the Track Log Function on your GPS:

Tracks Page

The eTrex draws an electronic Track Log on the Map page as you travel. The Track Log contains information about each point it plots, including time and position. Review the saved Track Log on the map, turn recording on or off, and change the way tracks are recorded.

The Track Log starts recording as soon as the unit gets a location fix. Save the current Track Log and clear it before you start traveling. The percentage of memory used by the current Track Log is displayed at the top of the Tracks page. When the display shows 99%, it starts overwriting the beginning track points, you should save the Track Log before it reaches 99% of memory usage.

After a Track Log is saved, the saved track will have a BEGIN and END point. You can save 10 Track Logs.

To save the current Track Log:
1. From the Menu page, select **TRACKS** > **ENTER**.
2. Select **SAVE** > **ENTER**. The Save Back Through window appears giving you a time frame for saving a track or ENTIRE LOG.
3. Select the preferred option > **ENTER**. The saved track appears graphically on a sub-page.
4. Select **OK** > **ENTER**. The track is now saved and appears in the SAVED TRACKS list on the Track Log page.

To clear the current Track Log:
1. With the Menu page displayed, highlight **TRACKS** > **ENTER**.
2. Select **CLEAR** > **ENTER**.
3. A message asks DO YOU REALLY WANT TO CLEAR THE TRACK LOG?, select **YES**.

To show a map of a saved track:
1. With the Track Log page shown select a **SAVED TRACK** > **ENTER**.
2. When finished viewing the saved track, select **OK**.

To rename a saved Track Log:
1. With the Menu page displayed, select **TRACKS** > **ENTER**.
2. Place the highlight on the preferred saved track > **ENTER**. The saved track is shown on a map with a default track name.
3. Select the name > **ENTER**.
4. With the Edit Track Name page shown, press **DOWN** to move the highlight to the next place in the name field. When the location is selected, press **ENTER**.
5. Select the correct character > **ENTER**. When the name is entered select **OK** > **ENTER**.

Two other options are: **TRACBACK** and **DELETE**.

To start TracBack Navigation:
1. With the Track Log page shown select a **SAVED TRACK** > **ENTER**.
2. Select **TRACBACK** > **ENTER**. Decide if you want the destination to be at the beginning of the track or the end of the track.
3. Select a destination point. The Pointer page guides you to the destination you selected.

To delete a saved track:
1. With the TRACK LOG page shown select a **SAVED TRACK** > **ENTER**.
2. Select **DELETE** > **ENTER**. Select **YES** > **ENTER**.

To delete all tracks:
1. From the Track Log page, select **DELETE ALL** > **ENTER**.
2. Select **YES** > **ENTER**.

Track Setup

Use the Track Setup page to customize the way tracks are recorded.

- **Recording**—select **ON** to record tracks or **OFF** to stop recording.
- **Record Interval**—set the type of interval for recording tracks: Distance, Time, or Auto.
- **Resolution/Value**—this field works with the Record Interval to set how often to record points. If you select Auto, select a resolution for recording track points. If you select Distance or Time, enter the distance or time.
- **Wrap When Full**—select **YES** to overwrite the beginning track points when the Track Log is full. Select **NO** to stop recording when full.
- **Defaults**—restores the factory default settings.

To use the Track Setup page:
1. From the Track Log page, select **SETUP** > **ENTER**.
2. Select the preferred fields > **ENTER**. Make the preferred changes to the fields, then press **ENTER** to save the changes.
3. To restore the default Track settings, select **DEFAULTS** > **ENTER**.

MapTEACH:

Geographic Information Systems (GIS)

GIS Lesson 1
MANY LAYERS MAKE A MAP
TEACHER INFORMATION

Lesson Summary: Students brainstorm a list of information portrayed on topographic maps, sort that information into categories or themes and then trace a few layers onto mylar in imitation of GIS layers/themes.

Objectives: Students will become familiar with the concept of layers or "themes" in GIS and review basic topographic map reading.

Estimated Time: 1 hour

Correlation to Alaska Standards:

Cultural E-2	Understand the ecology and geography of the bioregion they inhabit.
Geography A-2	se maps and other geographic representations.
Science A-1	Understand the processes of scientific inquiry.

BACKGROUND FOR THE TEACHER

Maps provide a bird's eye view of the Earth and are created for many different purposes. Some maps may show roads, towns and cities, while others show elevation features, rivers and lakes, weather forecasts, or park boundaries and still others are much more specific, such as a map of earthquake epicenters in Alaska. There can be many different maps of the same place and not all information about a place can be put onto one piece of paper. Every map serves a specific purpose and is the result of conscious design decisions. Cartographers decide how to use lines, symbols and color to symbolize what they are trying to show. They select features to show and omit other features and often generalize the data, simplifying the information so that the map is easier to read.

Because there are so many different types of information that can be included on a map, individual layers of information are separated in a GIS into individual pieces. These layers can then be selectively combined into a map that fits the selected purpose.

MATERIALS

For each student

- 8½ x 11 inch prints of 1:63,360 topographic maps of community
- USGS Topographic Map Symbols guide (Available in MapTEACH DVD appendix or by download from: http://erg.usgs.gov/isb/pubs/booklets/symbols/topomapsymbols.pdf)
- 2-3 sheets of mylar
- colored pencils
- paper clips

For Activity Introduction

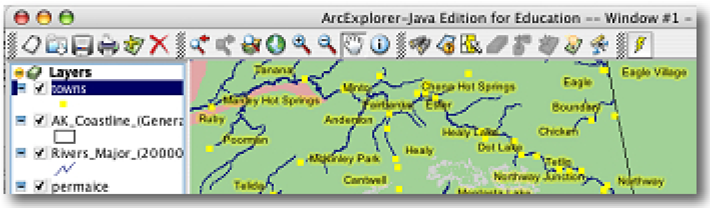
- chart-sized 1:63;360 topographic map of community
- half-sheets of paper taped to board
- masking tape
- felt marker

INSTRUCTIONAL PROCEDURES

- Hand out topographic maps and legend guides to students
- Lead a brainstorming session in which students name many of the features they observe on their maps (rivers, creeks, mountains, roads, runways, swamps, schools etc). As students name features, write each one down on a separate ½ sheet of paper. Use chart-map on board to prompt observations.
- Lead a classification activity in which these features are physically sorted by theme. For example create a “water” theme and then group all streams, rivers, lakes, and ocean under that theme (physically moving the brainstormed ½ sheets under theme headings).
- After all of the features have been sorted, explain that students will now use mylar to create theme layers using their maps. Model the student activity using the wall map to demonstrate the steps:
  - secure mylar to topographic map with paper clips
  - “register” corners of topographic map by drawing corners on mylar layer
  - examine topographic map closely to get oriented and get a sense of all the colors, lines and symbols on the map
  - find and trace features from one of the themes developed during the group classification exercise onto the mylar overlay
- Students work to create several layers, one theme per layer.
- Discuss why the ability to pick and choose layers would be helpful for creation of maps and explain that this layering idea is integral to creating a GIS project.

GIS Lesson 2
INTRODUCTION TO GIS USING AEJEE
TEACHER INFORMATION

(GIS = Geographic Information Systems
AEJEE = ArcExplorer Java Edition for Education)



Lesson Summary: Students are introduced to the use of GIS as a way to make customized maps. It assumes that students are familiar with using personal computers, can navigate menus, follow steps shown through a series of screen shots, and find data files.

Objectives: Students will understand that Geographic Information System (GIS) maps are one way for people using computers to document mental maps, and to display geospatial information. This introduction to GIS will enable students to view Alaskan map layers.

Estimated Time: 1 hour

Correlation to Alaska Standards:

Geography A-1 Use maps and globes to locate places and regions.

Technology E-4 Demonstrate ethical and legal behavior regarding intellectual property, which is the manifestation of an original idea, such as computer software, music, or literature [including oral stories].

BACKGROUND FOR THE TEACHER

Geographic Information Systems provide an exciting way for students to explore and document the world around them. Though AEJEE is one of several free GIS software and online services that can be used by students, it has some distinct advantages over others. To start, AEJEE runs on both Macs and PCs, is a stepping-stone to GIS software used by professionals, and can keep maps that show private locations or trails off the Internet.

Maps provide a graphic way to help tell stories about the land and about important places. These stories can come from traditional elders, local sourdoughs, geoscientists, other experts, and the students themselves.

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).
    - Windows: Win2000 or WinXP, 100 MB (plus 400 MB for data) hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data can also be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student lesson activity-directions
- USB flash drive (optional), a.k.a. thumb drive, with 1 GB+ RAM, for storing and transferring files

INSTRUCTIONAL PROCEDURES

Getting Ready

The preparations required to set up GIS experiences for students are both substantial *and* rewarding.

The first critical step is **to obtain computer administrative privileges and/or install software and data many days in advance.** Being assured that computers, applications and networks are working well allows you to focus on more rewarding tasks. And once the resources are set up, students and teacher have powerful tools at hand for learning.

- Check and maintain student computers so they are working well: update operating systems and software, clean out temporary and/or unnecessary files or applications.
- Check for, and **uninstall** any earlier versions of AEJEE.
- Install the current version of AEJEE (2.3 as of this writing) using the instructions below.
- Transfer GIS data into each computer by copying the folder *Data_MapTEACH_WGS84* into the /ESRI/AEJEE/Data folder. If your

computers are not part of a fast network, a USB ‘thumb drive’ can store and copy MapTEACH data.
- Set up a user account called “student” that does not have administrative privileges.
- Make a new folder for the “student” user named MapTEACH_Work as users/student/MapTEACH_Work.
- Prepare materials for the lesson and **try out all the activities well before the students work through them.**

How to Download and Install AEJEE: ArcExplorer Java Edition for Education for Macs or PCs

AEJEE GIS software is developed by ESRI for educational use. Download the latest version of the software from ESRI per the instructions below, or contact us via www.mapteach.org and we will mail you a copy on a CD.

The following instructions for installation are copied from ESRI’s “Intro to AEJEE” PDF document. We thank ESRI for their generous support.

Installing ArcExplorer—Java Edition for Education

AEJEE is a stand-alone package of software that includes a Java Runtime Engine in the installation. AEJEE is a free tool designed for use particularly in education environments. It is meant to be installed and used on individual computers rather than from a server.

1. **Check the system specifications**
   a. **Windows**: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
   b. **Macintosh**: MacOS 10.3 or above, 100 MB hard drive space, Internet connection; recommend G4 or faster processor and more than 64 MB RAM
   c. On both platforms, AEJEE will install its own Java Runtime Engine.
   d. See also www.esri.com/software/mojava/about/sys-reqs.html for fullest detail.
2. **Before installing a new version of AEJEE, uninstall any previous version.** Navigate to the software location (typically [hard drive]/ESRI/AEJEE), open the folder UNINSTALL_AEJEE, and engage the uninstaller. The uninstaller will delete only the core files, not any user-installed files such as data or projects.
3. **Download AEJEE** from **www.esri.com/software/arcexplorer/download-education.html** Choose Windows or Macintosh. Use your file compression software to uncompress the downloaded installer, placing it in a folder where you can

find it. **To install, you must be logged in to the computer with administrative privileges**.

4. **WINDOWS INSTALLATION**
   a. Using Windows Explorer, navigate to the uncompressed installation file,"install.exe".
   b. Double-click the installer and follow the instructions. AEJEE defaults to install in C:\ESRI\AEJEE. The text in this tutorial will use the default directory.
5. **MACINTOSH INSTALLATION**
   a. Using Finder, navigate to the uncompressed installation file "Install."
   b. Double-click the installer and follow the instructions. AEJEE defaults to install in [hard drive]/ESRI/AEJEE. The text in this tutorial will use the default directory.

Gear-up

- Welcome your students to the world of computer mapping and GIS! By jumping straight into working with GIS, they will start out *using* the technology, not just seeing it or hearing about it.

- Explain to the students that very few students have done a course like this one. Rarely have students their age been able to focus this technology on Alaskan issues, using Alaskan data to explore Alaskan problems.

  Almost all the GIS lessons available for secondary students focus on the Lower 48. If they want to learn more about where corn grows, there are other GIS lessons for that. If they want to use new technology to show challenges, resources and possibilities for their own Alaskan communities, this is a better way to go.

  These lessons are designed just to get them started on a path that can lead to new ways to explore their own world.

- Remind your students to follow the instructions carefully, even painstakingly in the beginning. In that way, they will be able to minimize effort and maximize their progress. As they become comfortable with GIS, it will be easier to be creative with it.

- As you hand out lesson exercise worksheets, make sure the students know that you or another teacher must sign off at the end of each activity when it has been completed successfully

Tips:
- *Monitor students' progress at the back of the room* where you can see where they are on their monitors. This also cuts down on the temptation for them to engage in Internet social networking (Facebook, MySpace, chat or just email).
- When you need them all to pay attention at the same time, have them *turn off their monitors*.

TEACHER RESOURCES

The MapTEACH web site has a gallery of student maps and pictures, career and job information, a FAQ page (Frequently Asked Questions with answers to AEJEE questions), resources, an overview and contact information.

Email us with questions, comments or suggestions. We always appreciate your help and expertise in challenging us to do better, especially with the insights you have from working day to day with students all over Alaska. MapTEACH: Mapping Technology Experiences with Alaska's Cultural Heritage project at www.mapteach.org

ESRI's "Introduction to ArcExplorer—Java Edition for Education" available as an Adobe Acrobat PDF: http://www.esri.com/software/arcexplorer/download.html

GIS Education Community: ArcExplorer Java Edition for Education (AEJEE)
- includes overview/introduction, tutorials, selected lessons, support FAQ and user forum
http://edcommunity.esri.com/software/aejee/

Information privacy is an important issue! We recommend that teachers and students follow the Guidelines for Educators found within the Guidelines for Respecting Cultural Knowledge published by the Alaskan Native Knowledge Network. ANKN has a wealth of resources at www.ankn.uaf.edu

While the use, and usefulness, of geospatial information technology continues to grow rapidly, its power to share and display information requires that it be applied with care.

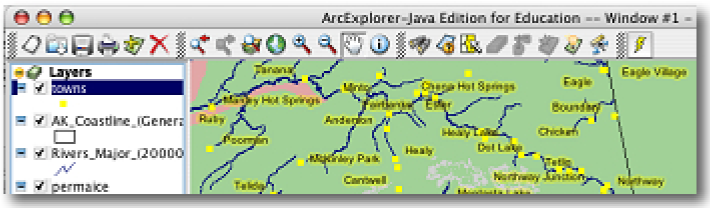
Many people will not want their personal knowledge or stories about the land recorded and made freely available via the Internet or by other means. Hunters, gold miners and Traditional Elders are all groups who have good reasons to keep some information private and for protecting their intellectual property rights.

Before recording information and stories about land and resources in digital form on a computer, students and teachers need to act in accordance with the rights of those who are sources of this information. In MapTEACH lessons, specific guidance is provided to teachers and students on how to respect rights and protect privacy. For example, students should ask Elders' permission before sharing their stories about the land, whether it is recorded in writing or on a map.

On the other hand, government agencies share out information and GIS data for public use to everyone. This is the source of most information used by students during MapTEACH lessons.

Name: ____________________

GIS Lesson 2
INTRODUCTION TO GIS USING AEJEE
STUDENT EXERCISE



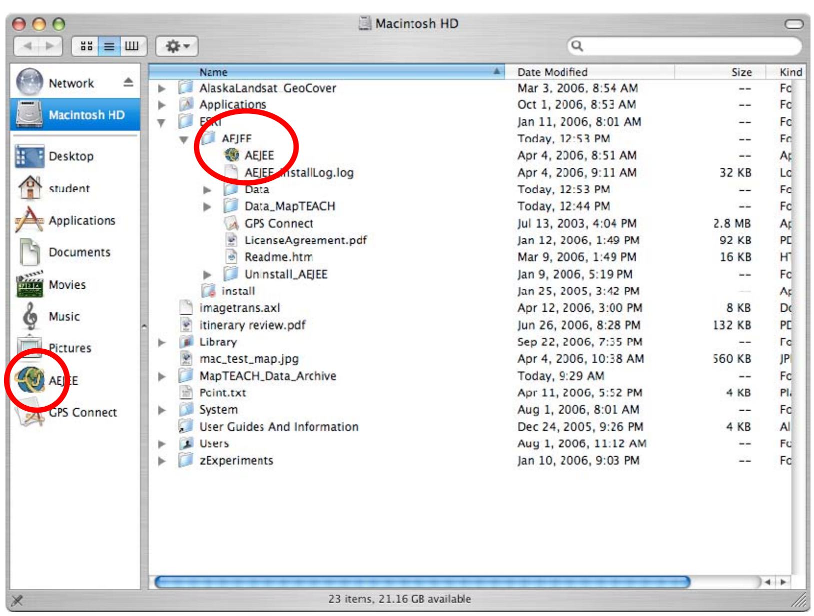
(GIS = Geographic Information Systems
AEJEE = ArcExplorer Java Edition for Education)

Explore 1: Starting up an AEJEE GIS

There are two steps to start an AEJEE map, adding a first layer and selecting a projection.

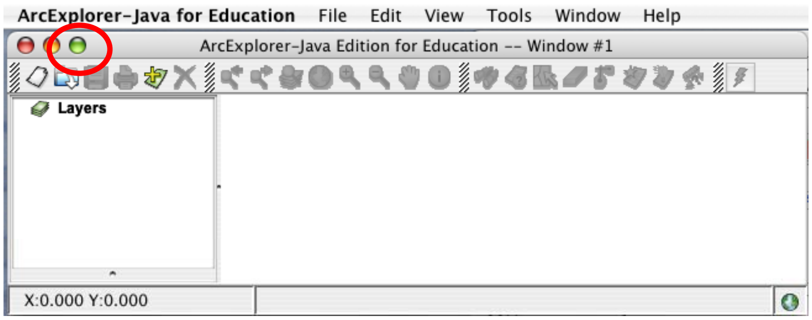
I. Add a first layer

1. **To add a layer first start up ArcExplorer-Java Edition for Education (AEJEE)**
   You can launch AEJEE from the dock on a Mac, or from its icon on your desktop. Or you can find it in the "ESRI" folder at the root level of your hard drive. On a Mac, look in the Finder and click on the AEJEE icon. On a PC, click start and find it listed in Programs.



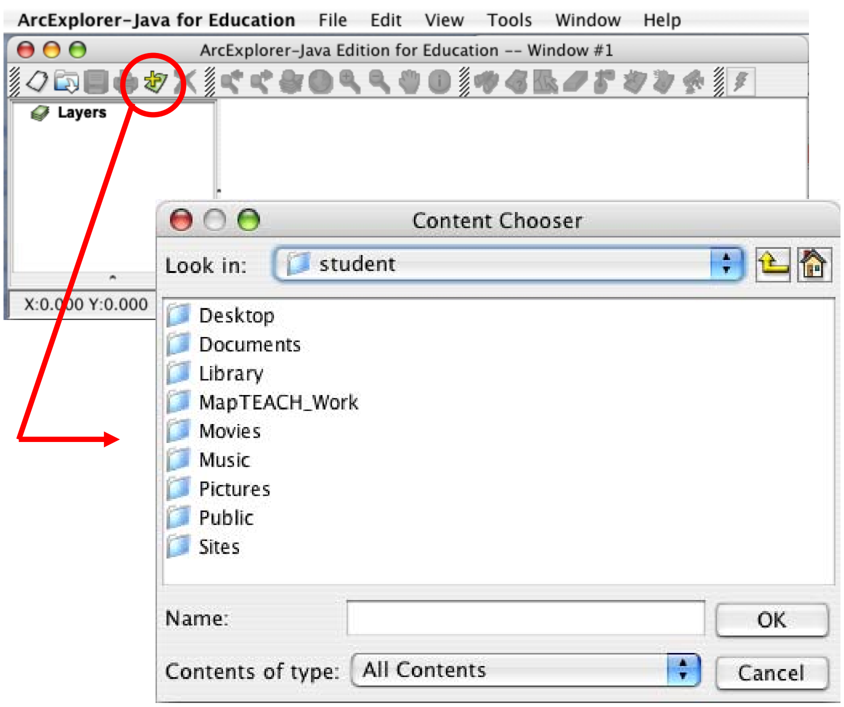
Once started, the window should look like the first one. (Mac and PC versions look slightly different from each other.)

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



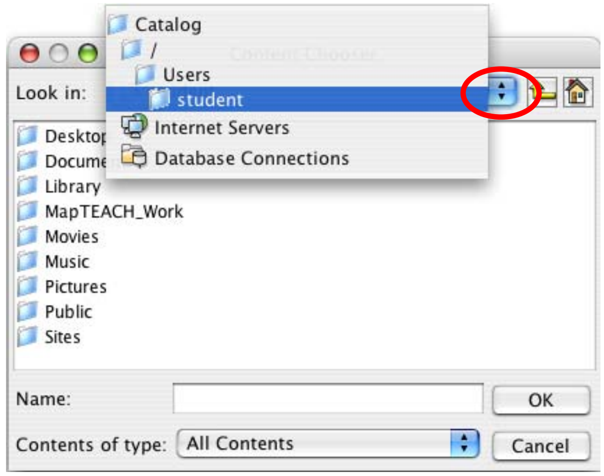
3. Add data **to your map by finding the base layer you want and opening it. One way to open a new map layer is** to click the Content Chooser button .

   The “Content Chooser” window will appear.

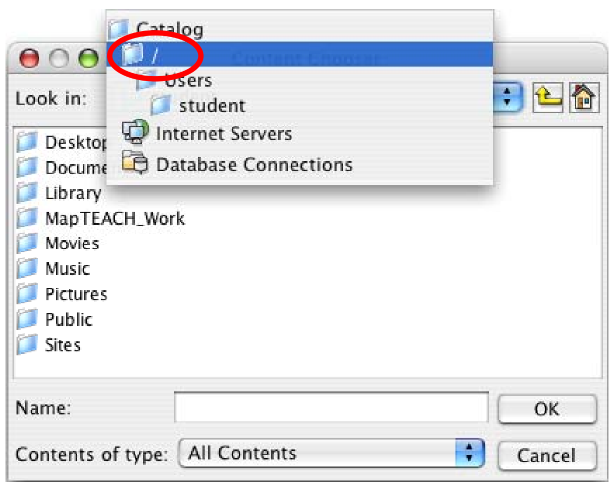


4. Navigate to the folder **/ESRI/AEJEE/Data/Data_MapTEACH_WGS84** and **choose *Base_Data*.** Below are detailed steps if you are not sure how to do this.

Click on the blue arrow to get the dropdown menu for **"Look in:"**



Then **Double-click on the** / to open the root directory.



From here, **double-click** ESRI to open the ESRI folder,

double-click AEJEE**,**

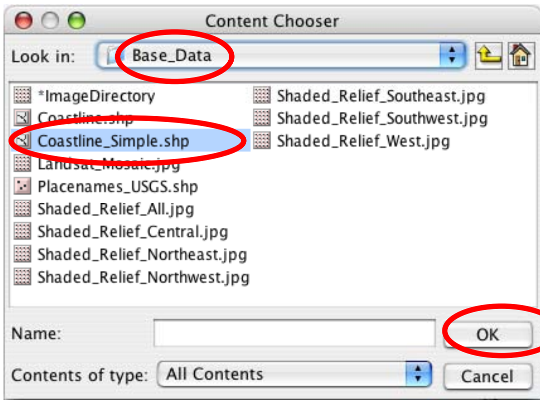
double-click Data **,**

double-click Data_MapTEACH_WGS84**,**

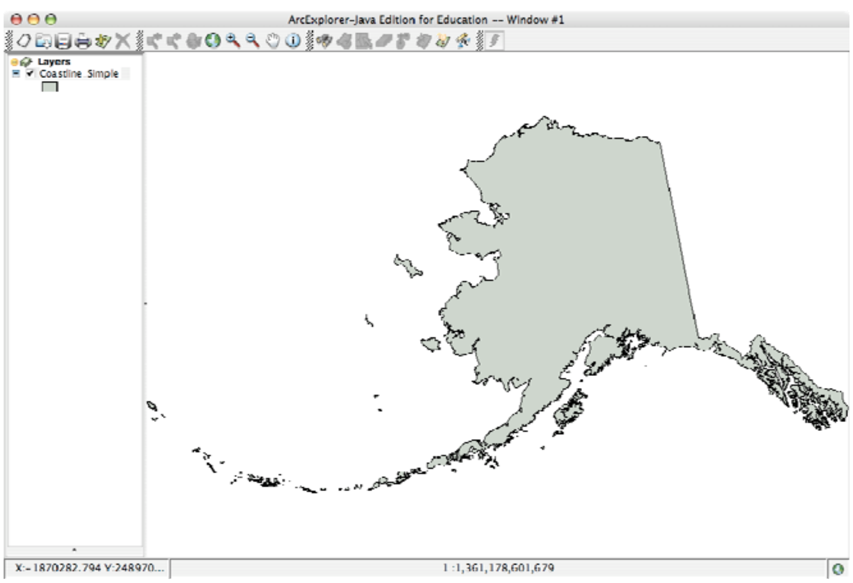
and select the data folder we are looking for with a **double-click** on Base_Data.

5. Inside the Base_Data folder **select the file *Coastline_Simple.shp***. This is a shapefile, a special kind of data type used by GIS to contain geographic information. Shapefiles have the extension *.shp* at the end of the file name. A shapefile is a data layer that is made of points, lines, or polygons (shapes).

6. Finally, **click on the "OK" button.**



When the ArcExplorer window looks similar to the one here, you have added your first GIS map layer!



II. Select a projection

This second essential step makes sure that your map is oriented to an Alaska point of view. Selecting a common projection will make your map layers line up neatly, one on top of another.

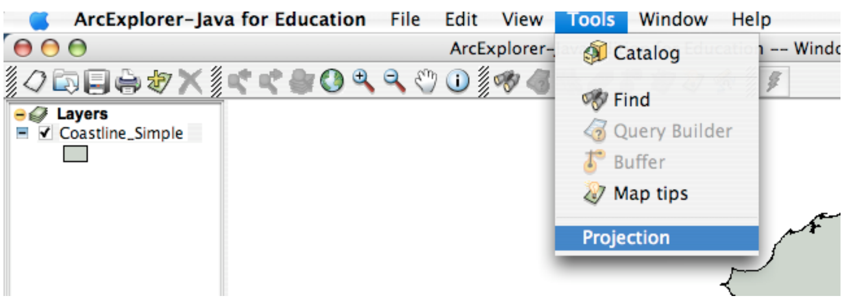
1. **Start** by **clicking on "Projection"** in the Tools **menu. The "Select Coordinate System" window will appear.**

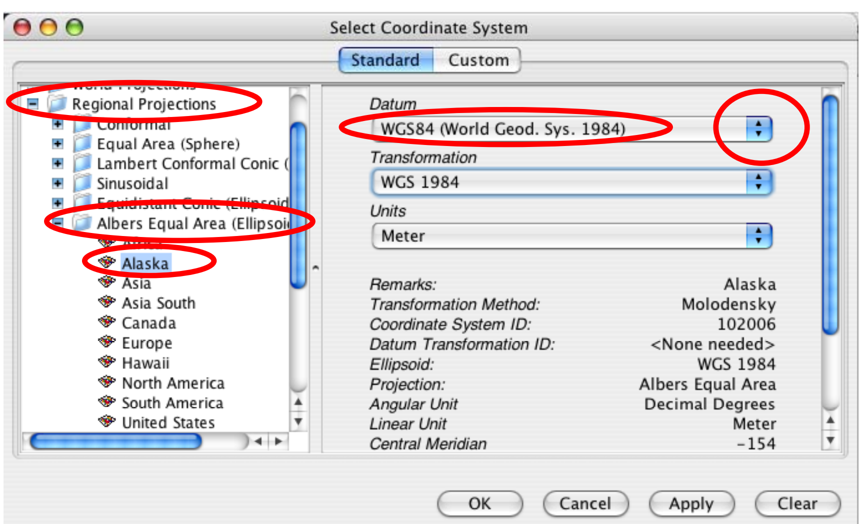
2. Choose Regional Projections/Albers Equal Area (Ellipsoid)/Alaska **in Systems.**

3. Click the blue arrow button under the "Datum" heading **to get a dropdown list and scroll way down to** select WGS84 (World Geod. Sys. 1984).

Click "OK" **and you are set.**

The map in the ArcExplorer window still looks the same but you have improved it in a very important way - by giving it a base projection. All it takes is **two first steps** before doing anything else: **choose a base layer and a projection.**





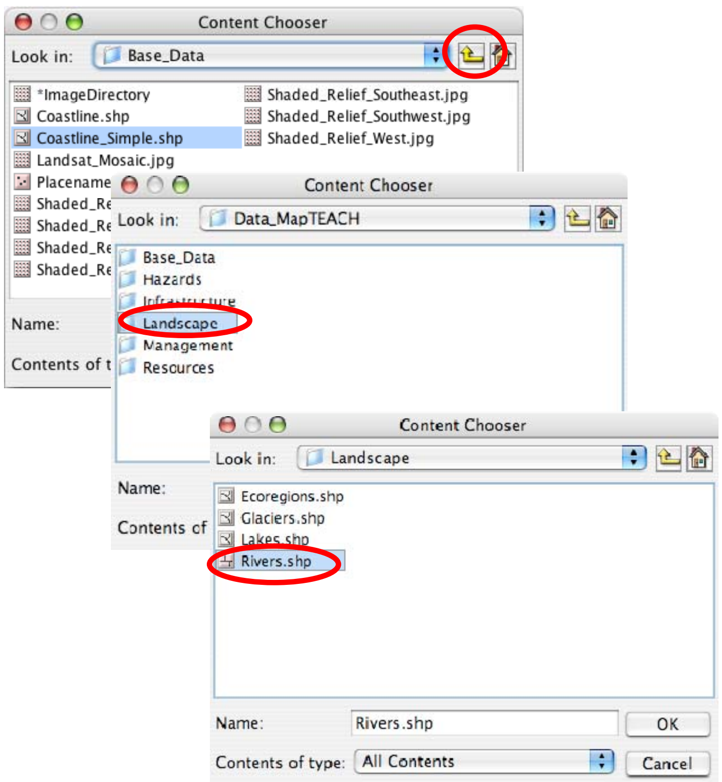
Show your projected map and the Select Coordinate System window to a teacher.

Teacher sign-off: ______________________________

Explore 2: Adding more layers and changing the look of your map

Add another layer by clicking on the **Add Data** icon and using the Content Chooser window just like you did before.

Navigate back to the ***Data_MapTEACH_WGS84*** folder by clicking the "Up One Level" icon, find the ***Landscape*** folder, and open the ***Rivers*** shapefile. The rivers should show up as lines on top of the shape of Alaska.

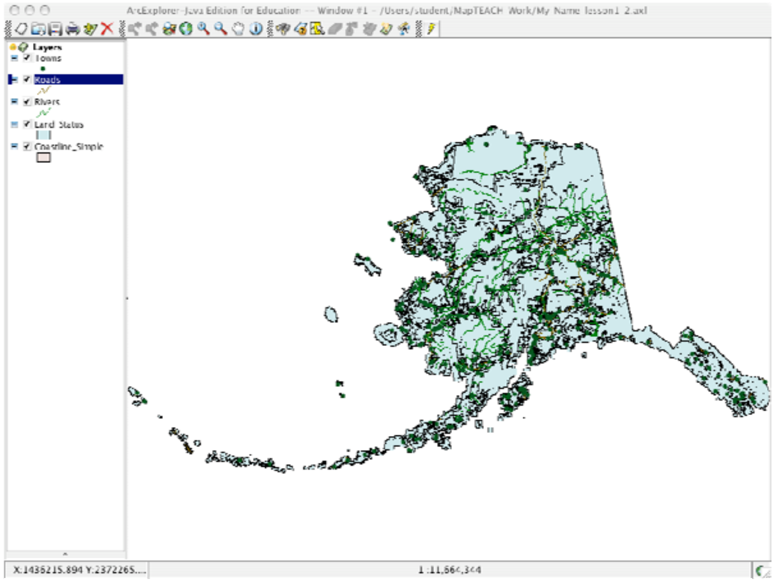


Add a third layer by navigating to the ***Infrastructure*** folder and choosing the shapefile ***Roads***.

Add a fourth layer from the ***Infrastructure*** folder by selecting the shapefile ***Towns***.

Finally, **add a fifth layer** by navigating to the ***Management*** folder and choosing the shapefile ***Land_Status.***

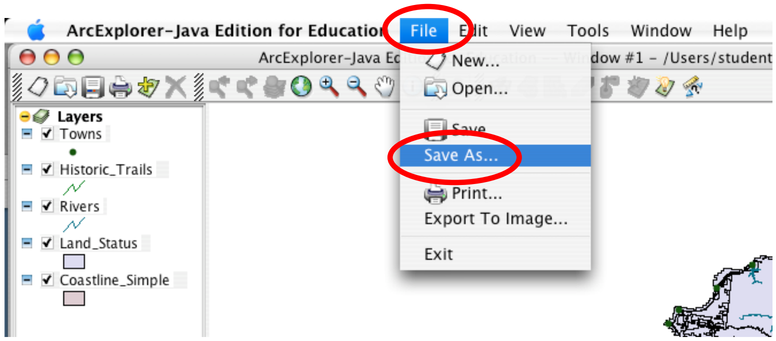
The colors may be slightly different but your map should now look like this:



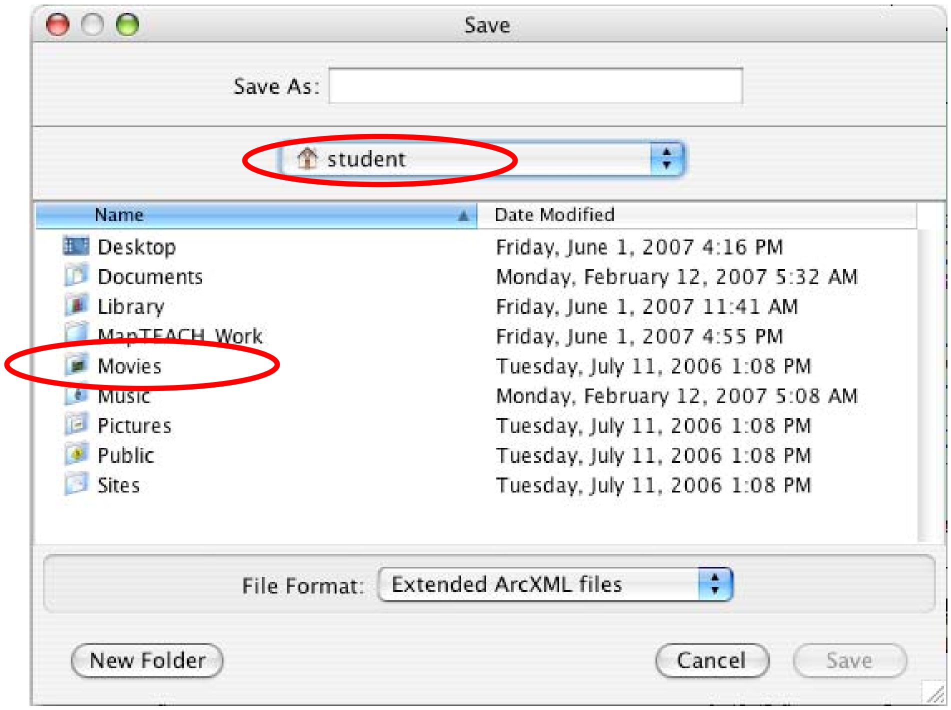
Looks a little strange, doesn't it? The colors are bland and there are lines all over the place. We're going to make things look a lot better, but **first you need to save your map project** so you can go back to the saved version just in case something malfunctions later on.

Save your map project.

1. **Click** on **"File"** in the Menu Bar.
2. Select **"Save As."**



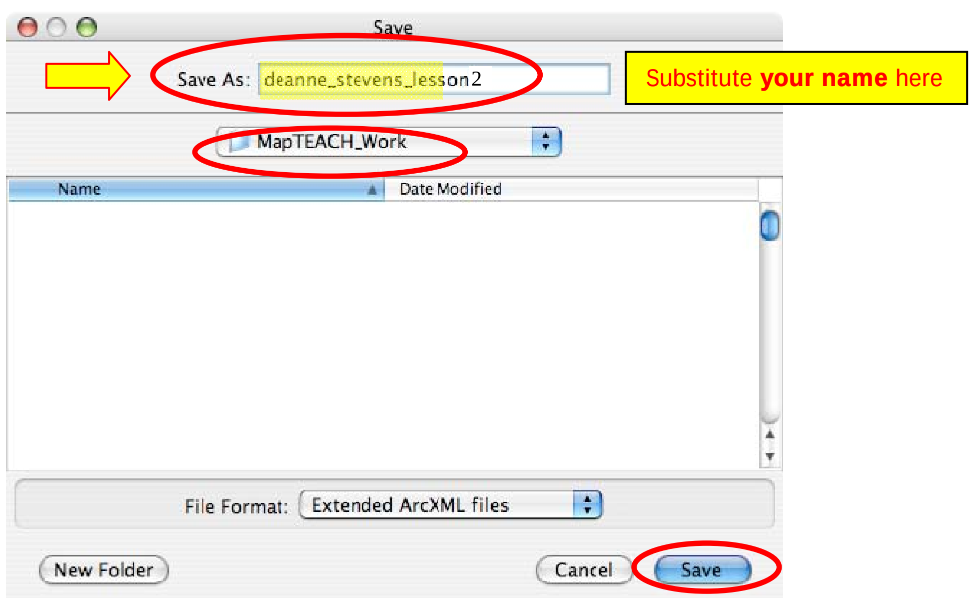
3. **Navigate** to the **users/student/MapTEACH_Work** folder.



4. **Name the project** using your full name and the lesson name: **firstname_lastname_lesson2.**

5. **Click "Save."**

Remember to save your map often as you work. *If the computer crashes or AEJEE freezes, you will always be able to start again from the last saved version of your map.*

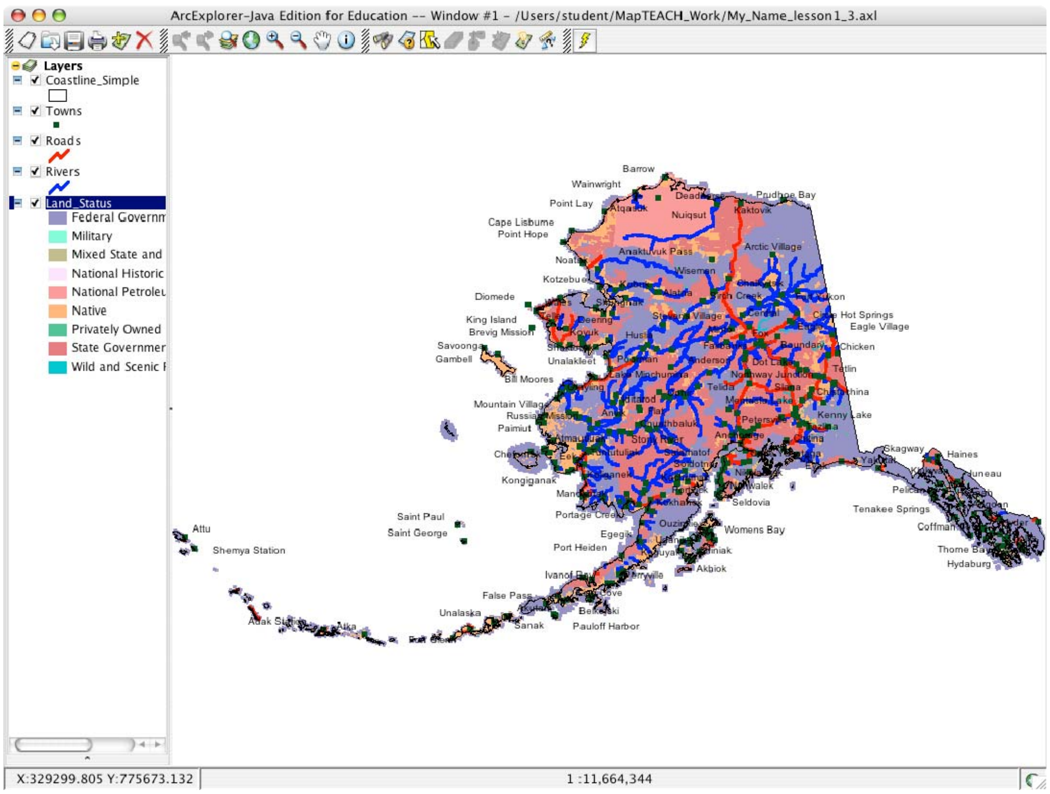


Explore 3: Improve the appearance of your map

Challenge: This map shows the ways that rivers, towns and historic trails are connected around the State of Alaska. ***Can you make your map look like this map by:***

- finding ways to move the layers up and down,
- changing symbols for each layer in the properties window, and
- labeling the features in layers within the properties window?

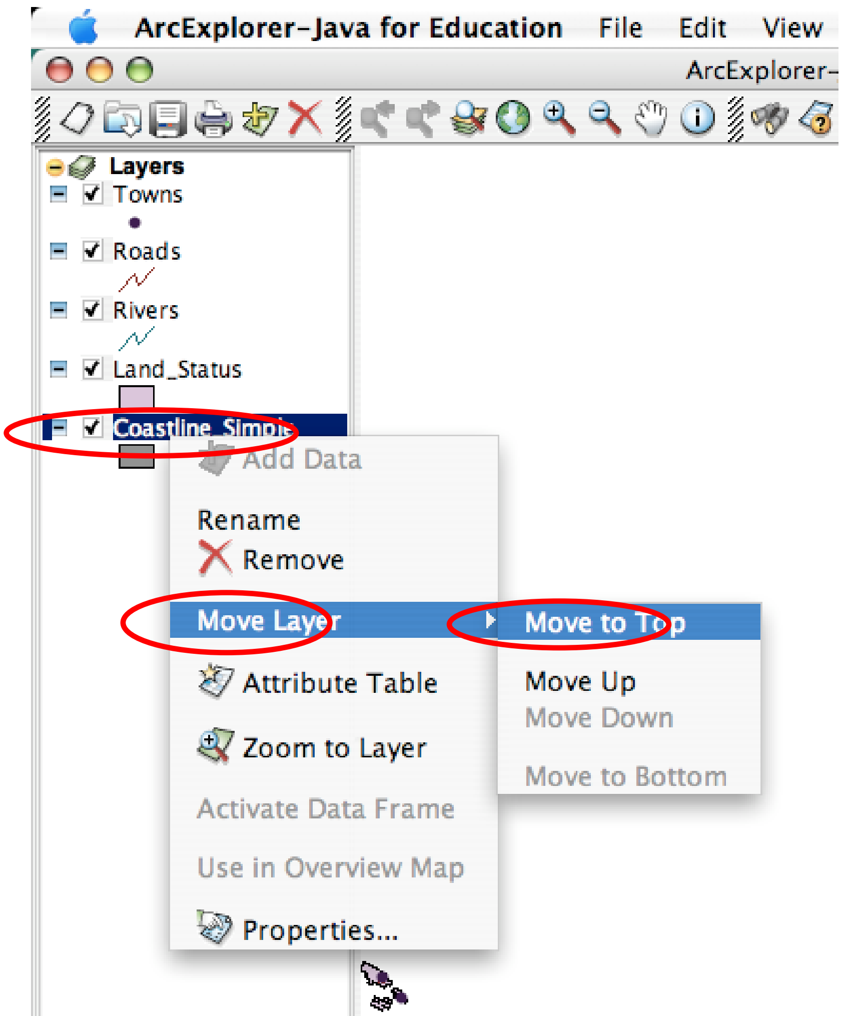
Go to the next page to find out how to do these tasks!



Here are the steps to make the map:

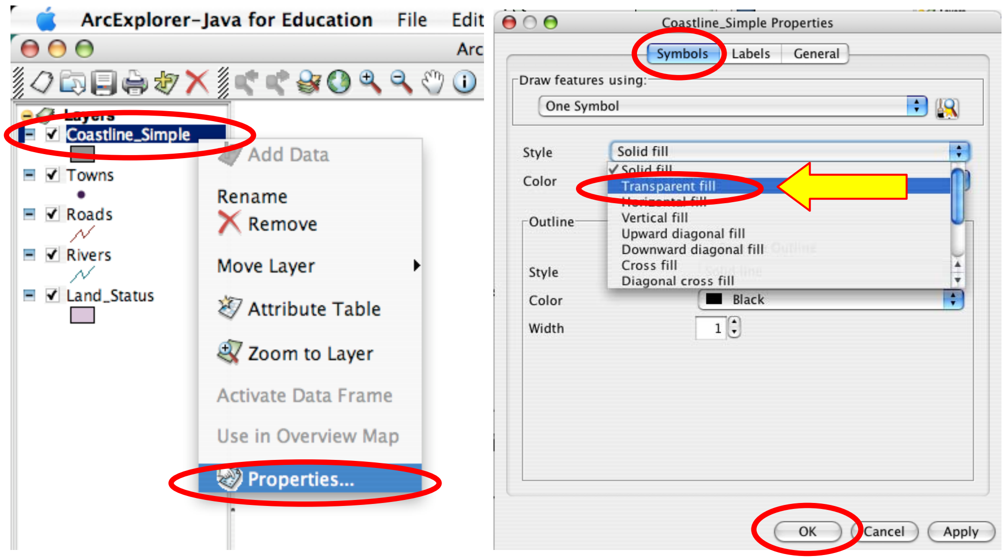
1. In the Table of Contents frame on the left side of the ArcExplorer window: **Ctrl-Click** on the ***Coastline_Simple*** layer, **navigate** to **"Move Layer"** and **click** on **"Move to Top."**

   This moves the coastline layer on top of the other layers. Because the entire area within the coastline of Alaska is filled in with a color, this layer covers up the other layers right now. In the next step we will change it so the filled-in part becomes transparent (see-through) and the layer only shows the lines for the coast.



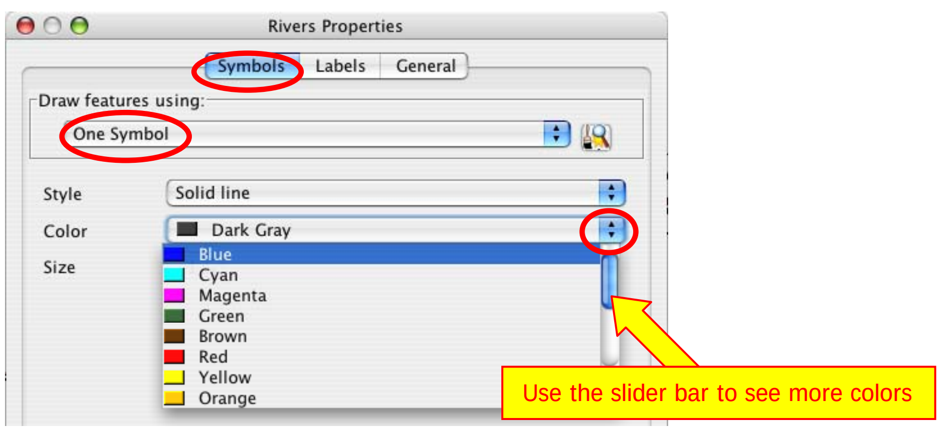
2. **Ctrl-Click** on the ***Coastline_Simple*** layer, but this time **open** the **Properties** window.

   In the **Properties** window, use the **Style** box and its pull-down menu to choose **"Transparent Fill"** and **click** on the **"OK"** button.

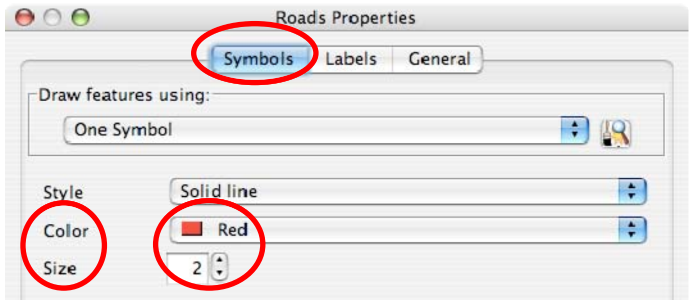


3. Now let's make the rivers appear as heavy blue lines. **Ctrl-Click** on the ***Rivers*** layer and **open** the **Properties** window. In the **Properties** window, use the **Symbols** box and the pull-down menu for **Color** to scroll up to **"Blue."**

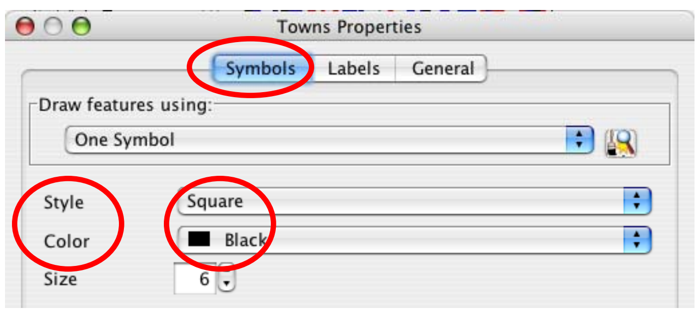
   While still in the **Rivers Properties** window, make the **Size** of the rivers **"2"** and **click** the **"OK"** button. The window will close and make the changes on your map.



4. The roads will be heavy red lines. **Ctrl-Click** on the ***Roads*** layer and **open** the **Properties** window. In the Properties window, use the **Symbols** tab and the pull-down menu for **Color** to choose **"Red,"** change the **Size** to **"2"** and then **click** on the **"OK"** button.

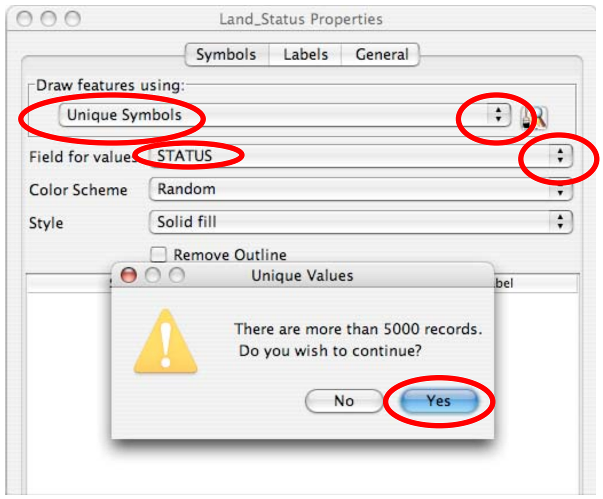


5. The towns will be black squares. **Ctrl-Click** on the ***Towns*** layer and **open** the **Properties** window. In the **Properties** window, use the **Symbols** tab and the pull-down menu for **Style** to choose **"Square,"** and for **Color** to choose **"Black." Click** on the **"Apply"** button to apply the change without exiting out of the Properties window (this saves you the step of re-opening the Properties window to make the next change in step 6, below).

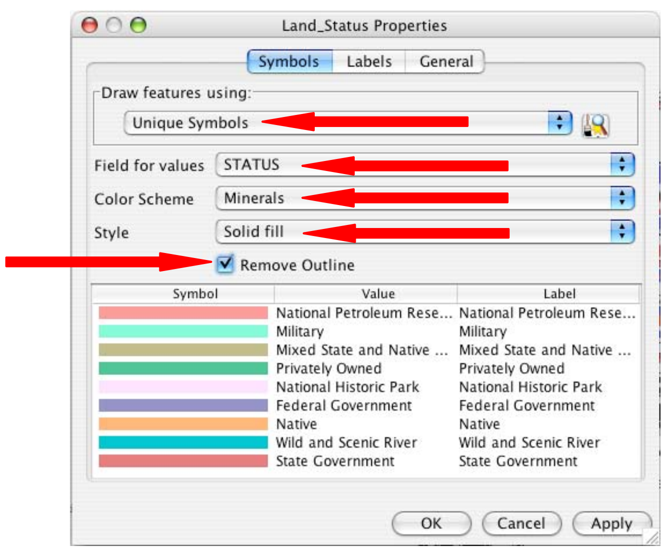


6. Now let's label the town names. **Click** the **Labels tab** at the top to open the **Labels** box. To label each town, you can choose **Name** from the "***Label features using***" drop down menu. **Click** the **"OK"** button.

7. Finally, **Ctrl-click** on the ***Land_Status*** layer. To color each stakeholder (landowner) group differently:
   a) On the **Symbols** page use the pull-down menu for "Draw features using:" to select **"Unique Symbols."**
   b) In the "Field for values" box, choose to symbolize **"Status"** instead of "None." A warning message will appear. Click **"Yes."**



   c) For **"Color Scheme,"** choose **"Minerals,"** and for **"Style"** choose **"Solid Fill."** Last, make sure the **"Remove Outline"** box is checked – this will make the map easier to read. **When your map looks like the one at the beginning of this section, you're done!**



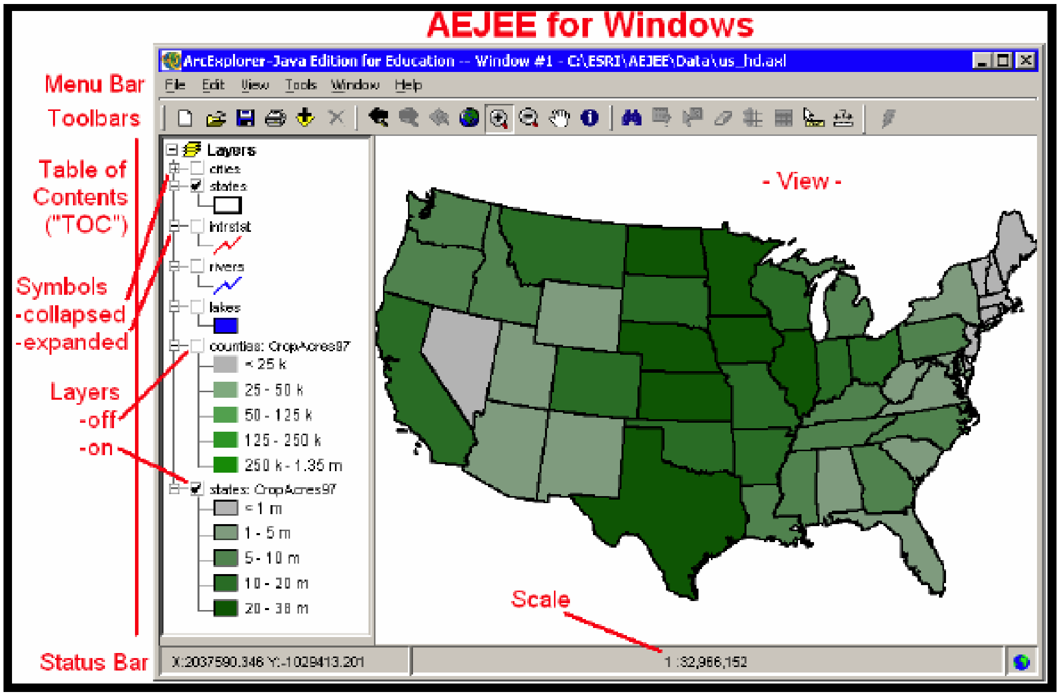
8. **Save** the map and show it to your teacher.

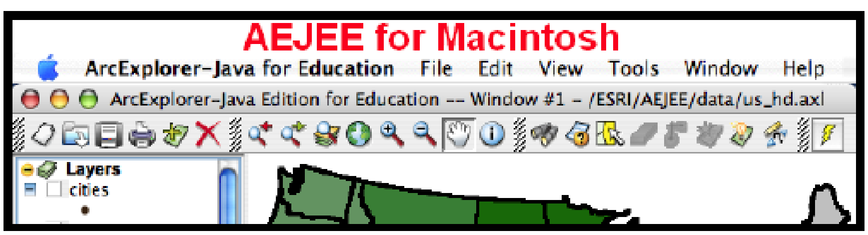
Teacher sign-off: ______________________________

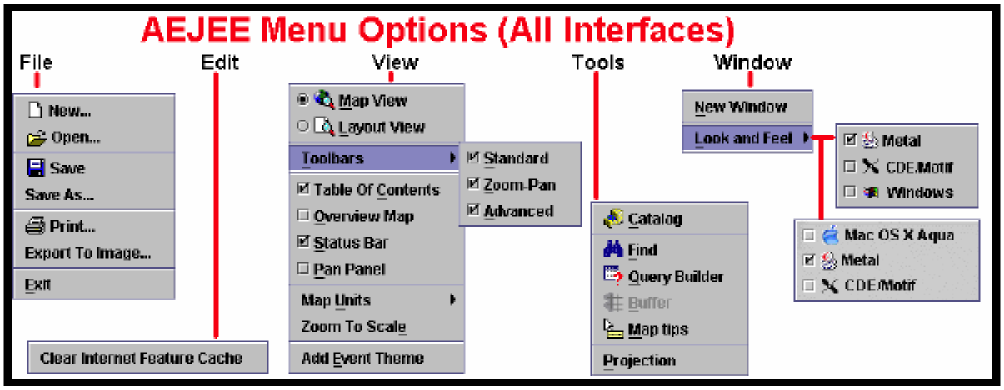
Appendix Lesson 2
Reference Terms and Diagrams for the AEJEE GIS Interface

Every technology has its own specialized language; whether it's fish wheels, snow machines or GIS. And some experts organize their knowledge more by seeing than by naming. Other experts know the name of everything. Choose the way or combination that works best for you.

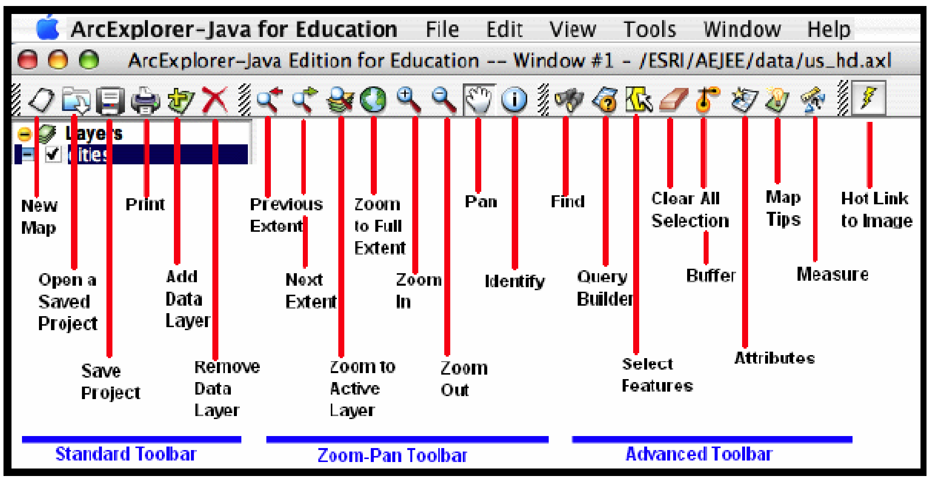
The following diagrams and text are from **ESRI's "Introduction to ArcExplorer—Java Edition for Education."** Find the entire reference at /ESRI/AEJEE/Data/lessons/aejee23.pdf, or on the web page at http://www.esri.com/software/arcexplorer/download.html



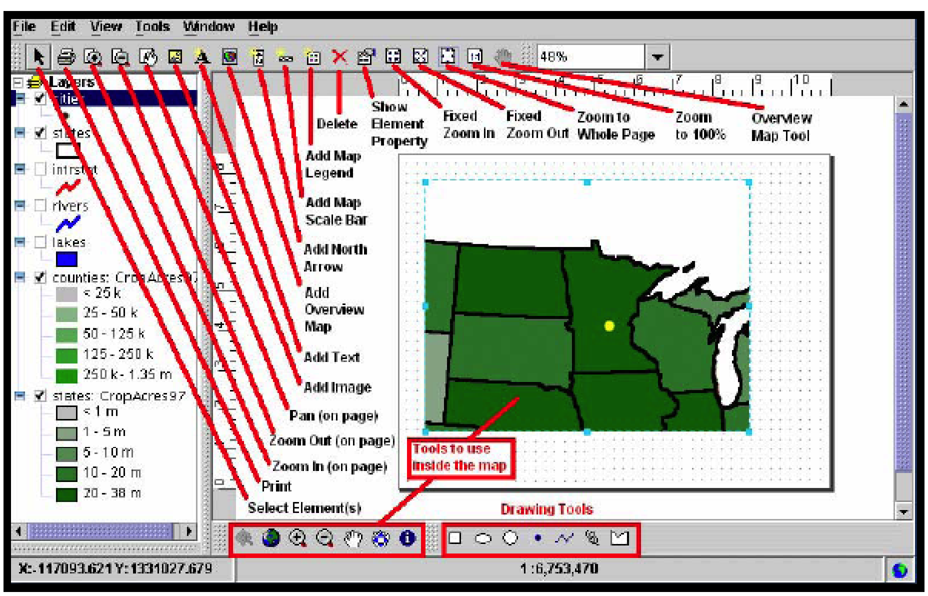




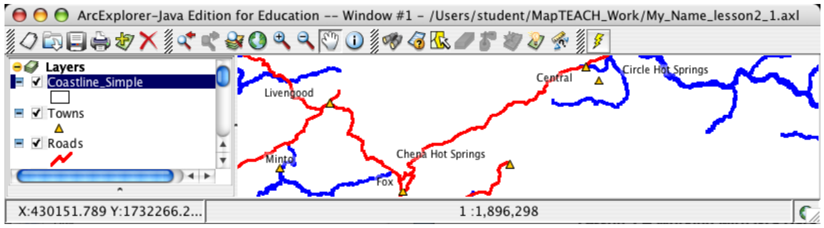
All AEJEE interfaces in “Map” view use the same set of toolbars, with about 20 buttons.



The “Layout” view (shown here from a Windows PC in “Metal” mode) includes special tools for customizing output.



GIS Lesson 3
WORKING WITH GIS DATA: VIEW, LABEL, MEASURE AND IDENTIFY
TEACHER INFORMATION



Lesson Summary: During this lesson students learn some of the key qualities of GIS that make it more dynamic and powerful than paper maps. They learn new ways to view the information held in a GIS, and begin asking questions and solving problems. While the lesson is written in language more accessible to the students, the reality is that as they view, measure and identify information they are also starting to make queries of a relational database with user-friendly tools. Little by little they are building a foundation of geospatial information technology skills and knowledge.

Objectives: Students will view, label, measure and identify information in GIS data layers. They will apply these skills to answer questions about unique characteristics of Alaskan geography.

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

Students begin to practice basic competencies in interpreting and displaying geospatial information through the skills and operations they learn in this lesson. While the students can follow the directions mechanically and obtain desired results, they will likely not find the GIS 'interface' very intuitive, in spite of any previous experiences with online mapping. Working with GIS data requires many new skills not found in the usual 'what you see is what you get' (WYSIWYG) interfaces of more popular software.

We help students to become more comfortable with GIS by working within a familiar and meaningful context, i.e. Alaskan geography, and by helping students to find out information about their own communities within this context. Simply put, we are trying to help them build from what they know to what they can do with GIS data and techniques. We also connect the more technical and accurate terminology of GIS to the students' everyday use of terms like view, label or identify. Abundant screenshots provide graphic cues for how to carry out each step needed to interpret and display information contained in the GIS data layers. This is especially helpful to students with strong visual learning orientations.

As the teacher, one of the best ways you can help the students is to ask them to show and describe what they are doing and trying to do with the computer and AEJEE as they work through the lesson. As with other laboratory learning, whenever a student physically 'shows and tells' you or other students, he or she will be moved to greatly improve and organize his or her own understanding.

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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data can also be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions for the lesson

INSTRUCTIONAL PROCEDURES

Getting Ready

Try out all the student activities on a classroom computer before they do. You will better anticipate tasks your students might find challenging, and feel much more comfortable giving directions and answering questions.

Make any modifications needed to cope with the way your computers are set up and organized.

Gear-up

- Encourage the students to look forward to finding out new ways to make sense of GIS and to use it to make interesting Alaskan maps.

- Remind the students to follow the instructions carefully. Explain that today they will also begin to use GIS to answer questions and to solve problems.

TEACHER RESOURCES

GIS and Geography. eSchool News presents a collection of news stories, best practices, and other resources--all designed to help teachers integrate GIS and other geospatial technologies into classrooms.
http://www.eschoolnews.com/resources/reports/gis/

GIS Education Community: ArcExplorer Java Edition for Education (AEJEE)
- includes overview/introduction, tutorials, selected lessons, support FAQ and user forum
http://edcommunity.esri.com/software/aejee/

Geospatial Education for 4-H. Geospatial education modules (GIS project books) for 4-H participants cover the fundamental concepts of GIS including map making principles, GIS data types basics, GIS application in every day life and the basic GIS program interface. This module uses the free GIS software called ArcExplorer 9 [Note: not AEJEE] as the primary program for its exercises and activities.
http://lal.cas.psu.edu/Research/edTraining/4h_GISprojectBooks.htm

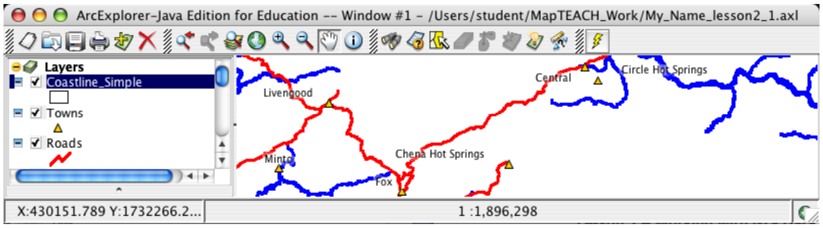
ESRI's "Introduction to ArcExplorer—Java Edition for Education" for AEJEE 2.3 available as an Adobe Acrobat PDF:
http://www.esri.com/software/arcexplorer/download.html

TEACHER REFERENCES

GIS Dictionary. Online at ESRI Support, includes ArcExplorer terms and an exhaustive, technical list of GIS terms, some with graphics.
www.esri.com/library/glossary/glossary.html

Name: ____________________

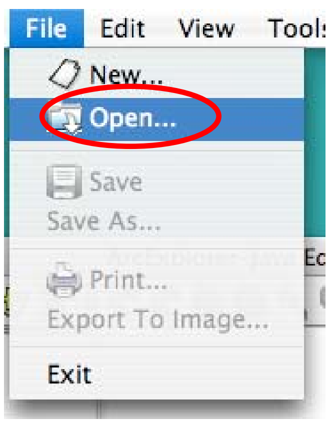
GIS Lesson 3
WORKING WITH GIS DATA:
VIEW, LABEL, MEASURE AND IDENTIFY
STUDENT EXERCISE

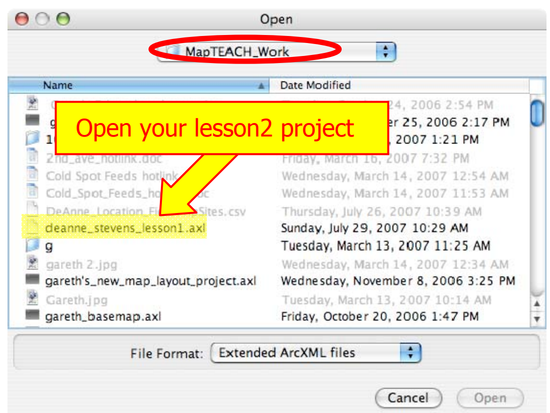


Explore 1: Open a Saved Project

1. **Start up the AEJEE application.**

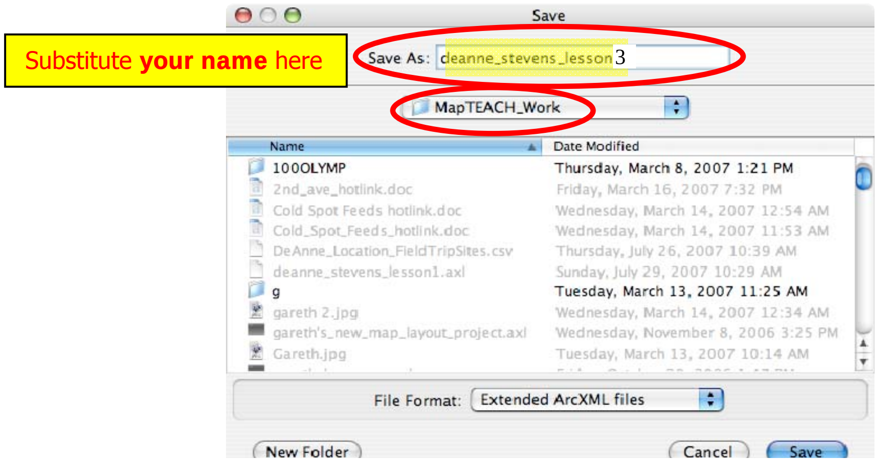
2. **To open the map project** you saved at the end of the last lesson, **choose Open from the File menu** or click on the icon in the toolbar.





3. **Navigate** to **users/student/MapTEACH_Work and open** the **AEJEE project** file labeled with your full name and the lesson number: **firstname_lastname_lesson2**.

4. Take time now to "**Save As**" your project file as **firstname_lastname_lesson3.**

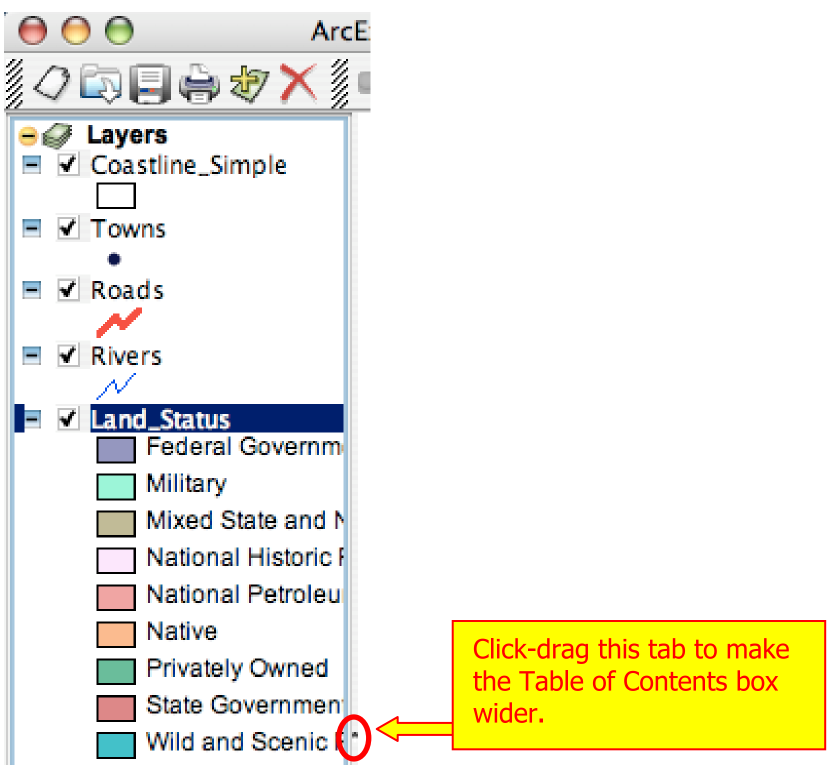


Explore 2: Looking at the Data

1. Notice that there is a list of information in the **Table of Contents** window for **Land_Status** on the left side of the AEJEE screen.

2. This is the **data** you **symbolized and labeled** on your map at the end of the last lesson. The colors and symbols correspond to the colors on the map.

3. You can make the Table of Contents window wider by **click-dragging on the little tab** in the middle of the bar separating the Table of Contents from the map window.



What are the major stakeholder groups included in the Land_Status data set for the State of Alaska (these groups are represented by the different colors)?

1. ______________________________ 6. ______________________________

2. ______________________________ 7. ______________________________

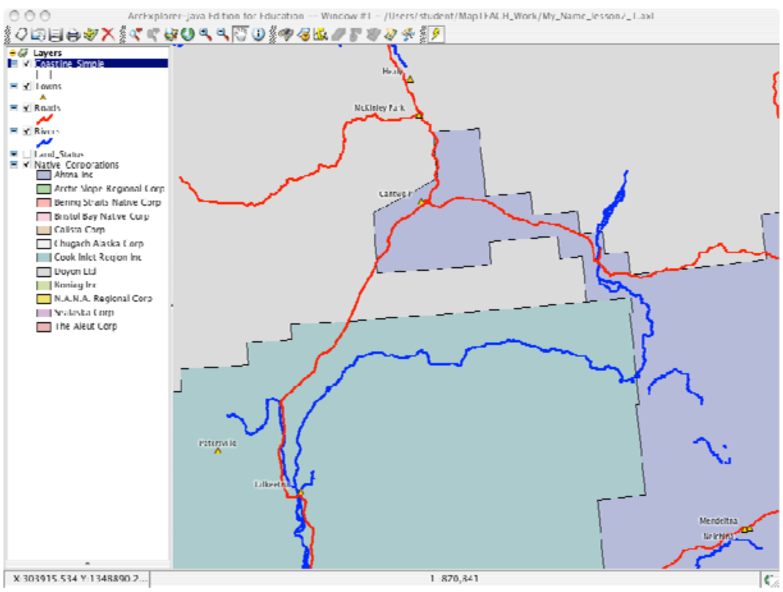
3. ______________________________ 8. ______________________________

4. ______________________________ 9. ______________________________

5. ______________________________

Challenge: This map shows the distribution of Native Corporation boundaries around Cantwell. *Can you make your map look like this one by:*

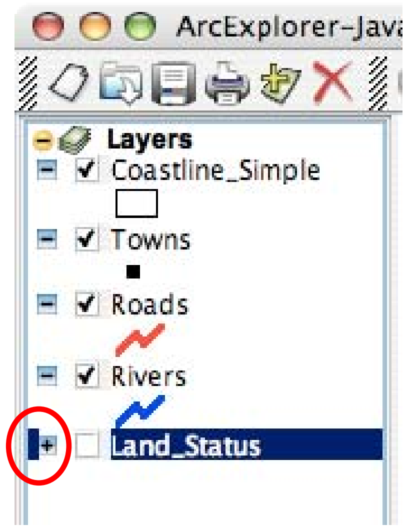
- adding a layer and turning layers on or off,
- symbolizing and labeling the features in layers using the properties window, and
- changing the scale and location of your map view by using the zoom and pan tools?



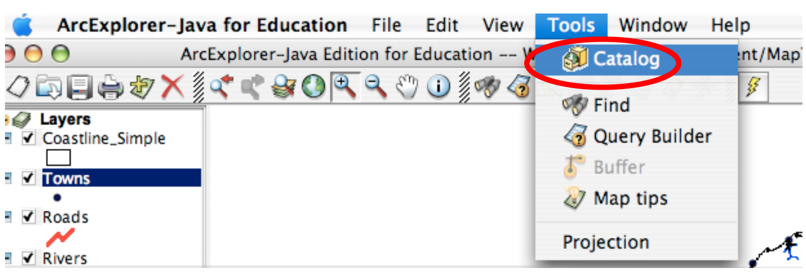
Here's how to make this map:

1. You can speed up the time taken to redraw the map by **unchecking the box** next to the **Land Status layer** in the Table of Contents window. This is a really big data set and will slow down the computer if you leave it on while you are zooming and panning. You can turn it back on later by checking the box next to the name.

2. **Hide the list** for Land Status **by clicking the box with the minus sign** next to the layer. This makes the Table of Contents window less cluttered (and we're not going to be looking at the Land Status layer right now, anyway).



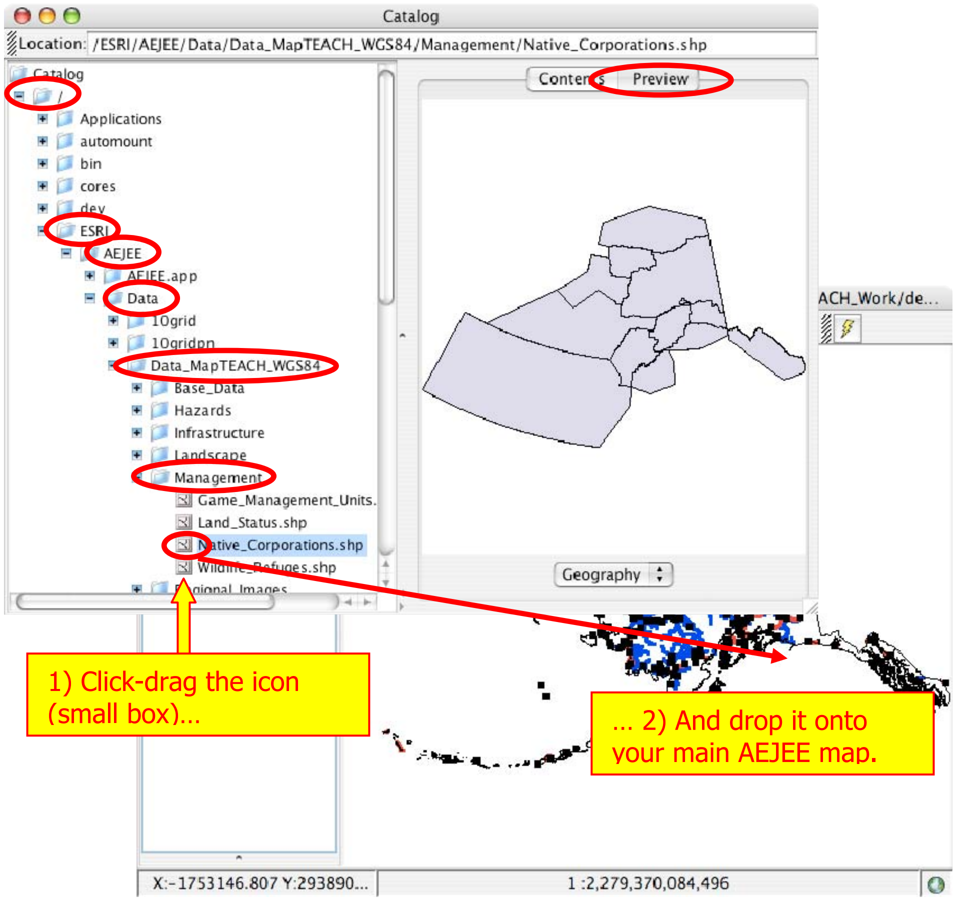
We're going to try out a different way to load a data layer instead of the Content Chooser button  . **Catalog** provides a fast way to add more layers. **Select Catalog** from the **Tools** menu and a new window will appear.



3. **Navigate** to the **/ESRI/AEJEE/Data/*Data_MapTEACH_WGS84* folder, navigate** to the ***Management* sub-folder**, and **select *Native_Corporations.shp***.

4. **Select "Preview"** and Catalog will show what the layer looks like before you add it to the map.

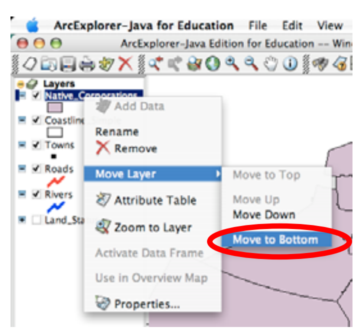
5. **Drag and drop the icon for *Native_Corporations.shp* onto the AEJEE map.** The Native Corporations layer will be added at the top of the Table of Contents.



*Tip: If you would like to pan and zoom **in the Catalog Preview** window, **select View, Toolbars** and then **Pan-Zoom**.*

Have you taken time to **save your map**? Do so now.

Exit the Catalog window by **clicking the red dot** on the top left of the window.



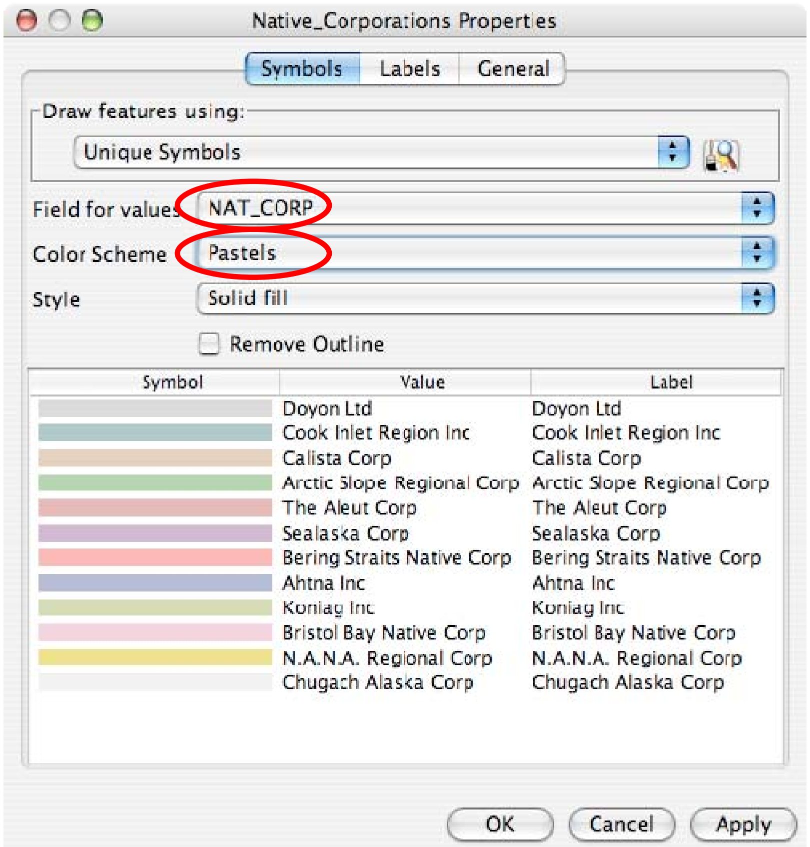
6. **Move** the **Native Corporations** layer **to the bottom** using **Ctrl-Click** on the layer name to get to **Move Layer**.

7. Use **Ctrl-Click** to get to **Properties** and assign colors using **“Unique Symbols”**: use **NAT_CORP** as the **“Field for values,”** and **Pastels** for **“Color Scheme.”**

Click **"OK."**

*(Remember to **save your map often.**)*

To **fine-tune the appearance of labels** for features on a map, you can also **adjust the font, color, effects, placement and rotation angle**. We will work with some of these options in the next steps.



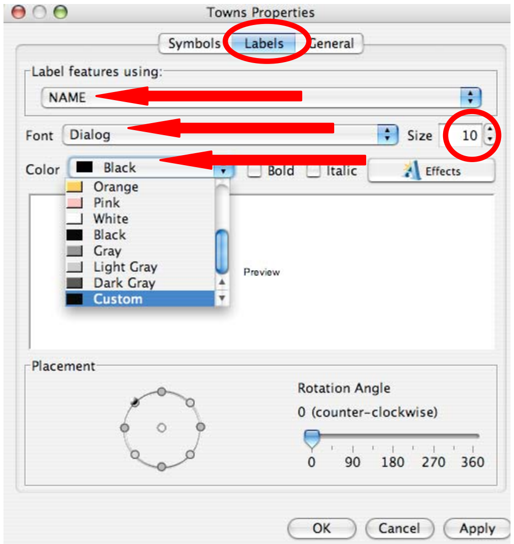
8. **Open the Properties Window** for **Towns** by **Ctrl-Clicking** on the layer to get started. **Choose** the **Labels** tab.

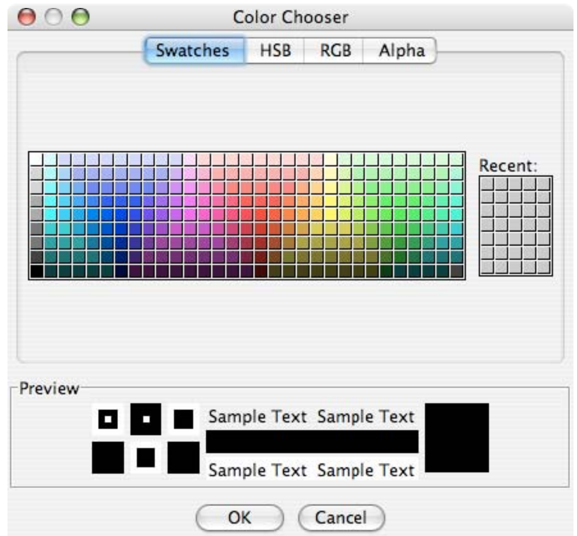
   Here the feature is being labeled by **"NAME,"** the **Font** is **Dialog**, the **Size** is **10** and the **Color** is **Black**.

   Use the **"Apply"** button to **preview your changes**.

9. **Before** you click "OK" **try making a custom color** for the label by choosing the color at the very bottom of the scroll-down menu (**Custom**).

   The Color Chooser window will open. On the rainbow palette, **select a dark color of your choice**.

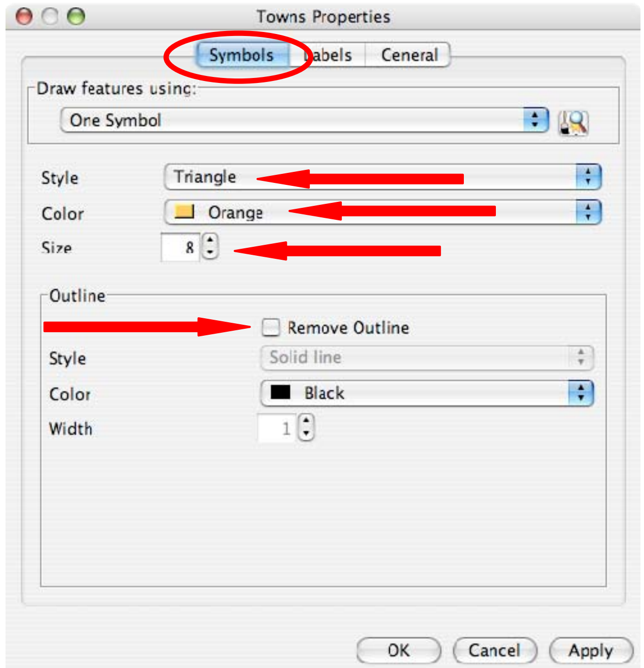




10. **Select the Effects button** to bring up a new window, and change the **Effects** to make the names of the Towns stand out more on the map. **Select "Glow"** with the color **"White."**

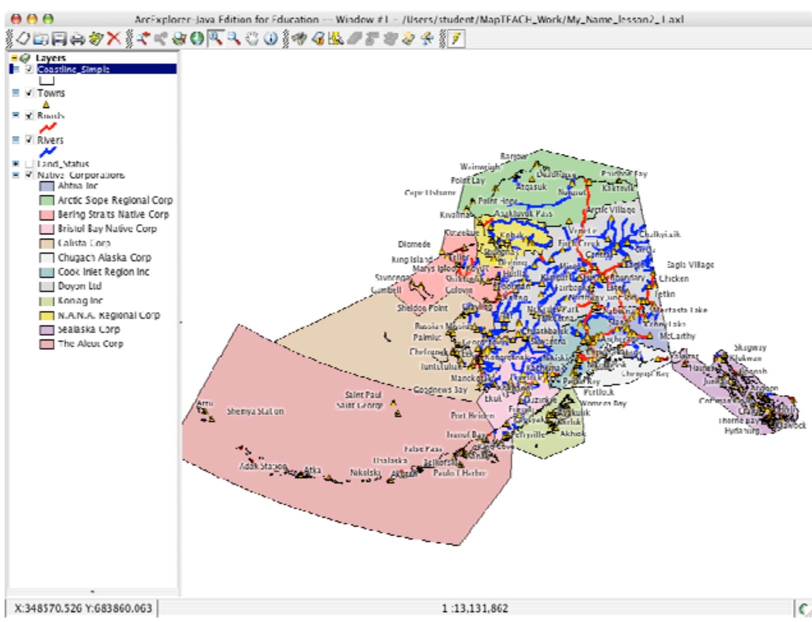
11. **Customize the symbol color and shape** for all the towns by changing the feature's "Style" and color. Go to the Symbols tab and **change the symbols to orange triangles of size 8, with outlines**.

    To make sure that the orange triangles have an outline, **leave the little box blank** for "Remove Outline."



NAVIGATING AROUND THE MAP

Your Alaska map should now look like this one.



12. Here are some ways to meet the challenge of zooming in on the Cantwell area, 107 miles SW of Fairbanks:
    a) You can zoom quickly to the full extent of the coastline shapefile by **control-clicking** on the **Coastline_Simple layer** in the Table of Contents, and then selecting **"Zoom to Layer."**

b) You can show everything from every layer on the map by clicking on the blue **'world' icon** on the Tool Menu to **"Zoom to Full Extent**."

c) To **zoom in** to a specific area, use the magnifying glass with the "+" sign to click on the place that you want to be the center of your "zoomed in" view, or to draw a box around the area you want to zoom in on.

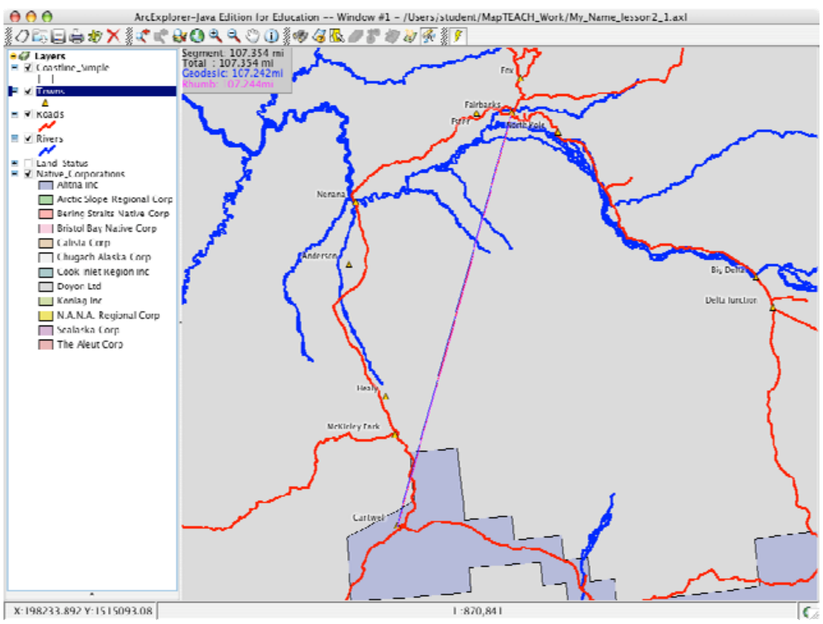
d) To **zoom out**, use the magnifying glass with the "-" sign and click on the area that you want to be the center of your "zoomed out" view.

e) If you make a mistake zooming, you can always go back to where you were by using the **previous extent** button.

f) Use the hand **pan icon** to pan around the map, the same way that panning is done with other image and graphics applications.

13. To meet the challenge, zoom and pan until you can make your map look very similar to this one.

Note that there may be some differences in the area of your map depending on the size of the entire AEJEE window.



Have a teacher inspect your carefully symbolized map of the Cantwell area showing the location of Native Corporation Boundaries.

Teacher sign-off: ____________________________

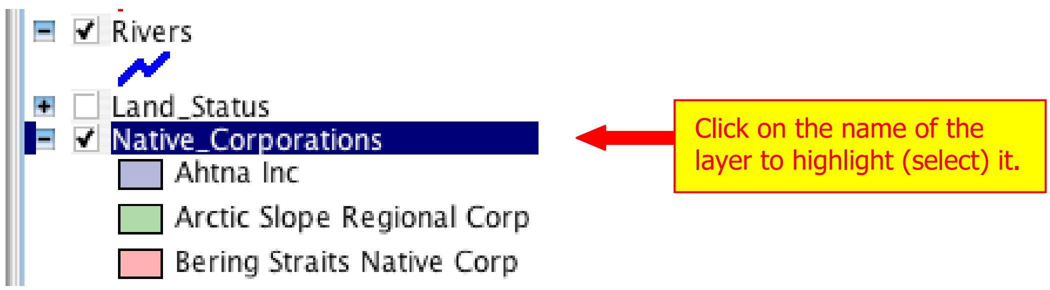
Explore 3: GIS Information

One of the great things about GIS is that you can not only make maps, but you can find out information from the data stored inside the GIS layers. In this section of the lesson, you will find new ways **to gather information with GIS**.

IDENTIFY TOOL – Find out more about your data

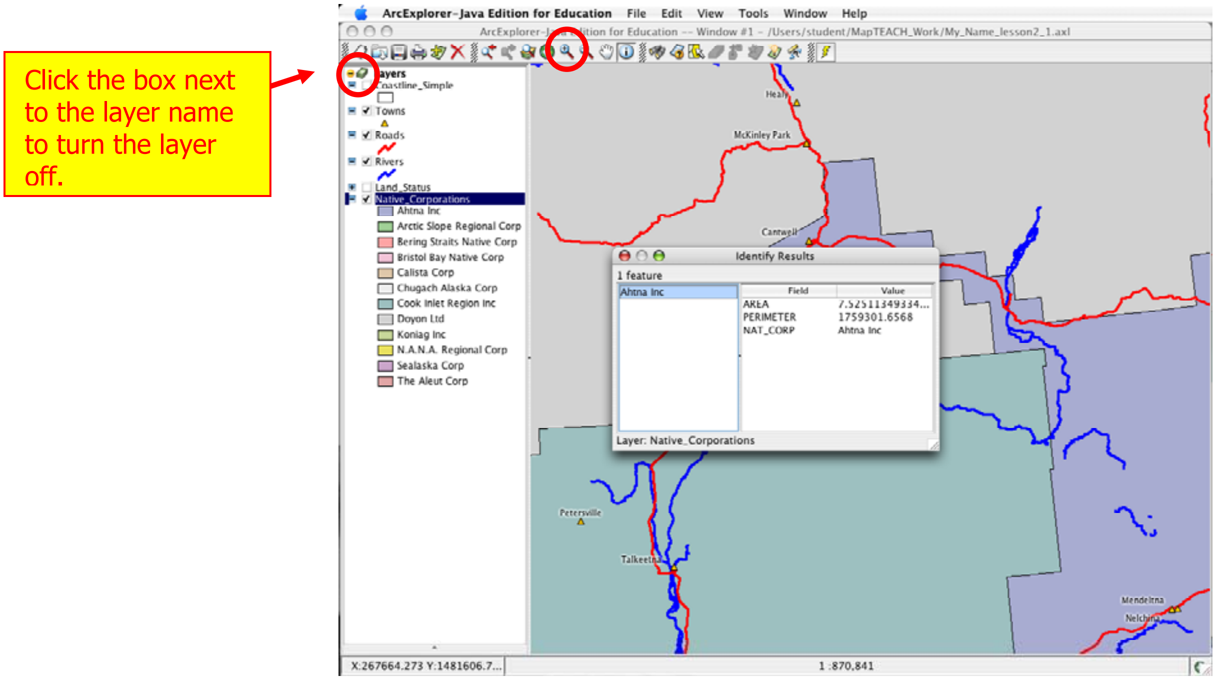
1. First, turn off the **Coastline_Simple** layer by unchecking the box next to the layer name. We aren't going to use it for the rest of this lesson and it will get in the way because it's on the top of the stack of layers.

2. **Make the Native_Corporations data layer "active"** by selecting the layer in the table of contents. The layer name will turn blue.



3. **Click on the "Identify" tool**  and put the pointer on one of the colored areas with no writing or roads and **click** to **"Identify Results"** of your information query. The selected feature will flash a different color.

   You will get a box with the name of the Native Corporation that your click was in.



What Native Corporation has jurisdiction over the area including Cantwell?

____

What Native Corporation has jurisdiction over the area including Denali National Park?

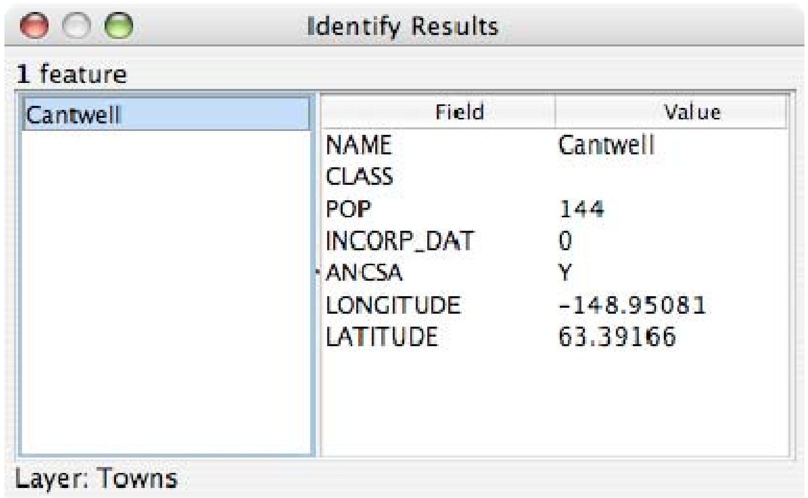
____

What Native Corporation has jurisdiction over the area including Petersville?

____

4. Now **make the Towns layer active** and **click on Cantwell** to **"Identify Results"** of your information query. You may have to click more than once to get the point right at Cantwell.

   By confirming the name field and the population field (in what GIS terminology is an *attribute table*), you can see that the population of Cantwell is listed as 144 people.



Zoom around and use the identify tool to find out the population of a village or town in Alaska that you are interested in.

Town/Village (NAME):______________________

Population (POP): _________________________

Do you think this number is accurate?_________

Why or why not?____

____

Where do you think these numbers came from? ______________________

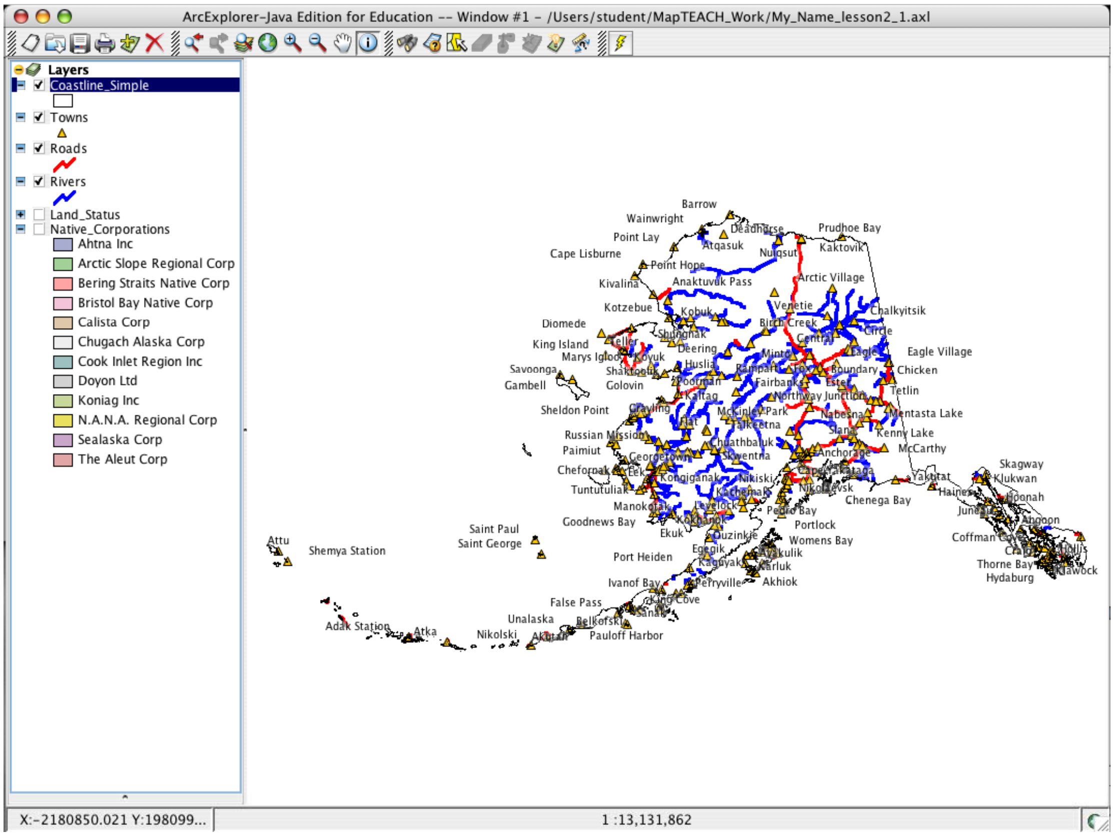
____

Another piece of information that is attached to the *Towns* layer is the location in latitude and longitude.

What are the coordinates of your chosen community?

Longitude:_______________________________

Latitude: ________________________________



Evaluating Data Quality

1. **Zoom and pan around until you have Fairbanks, Cantwell, Lake Minchumina, and Manley Hot Springs all in your map view.**

   Can you drive from Fairbanks to Cantwell? ______________________________

   Can you drive from Fairbanks to Lake Minchumina? ______________________

   How do you know? ____

   ____

   ____

   ____

What other ways could you get there?______________________________

Trick Question: Can you drive from Fairbanks to Manley Hot Springs? _____

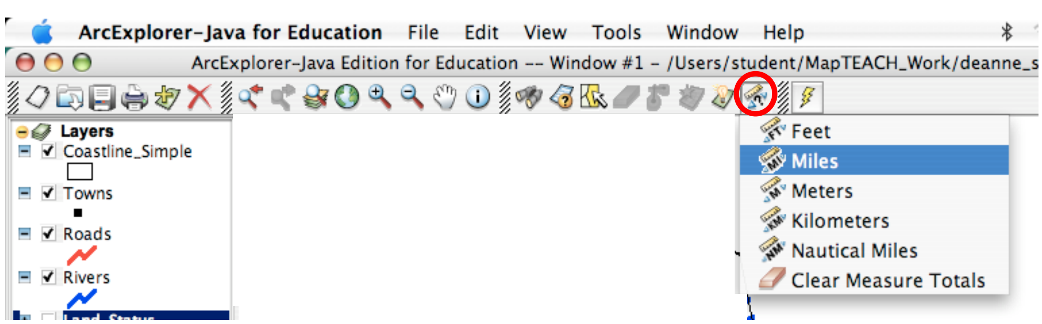
Why is this a trick question? ______________________________

What does that tell you about the *Roads* data layer? ________________

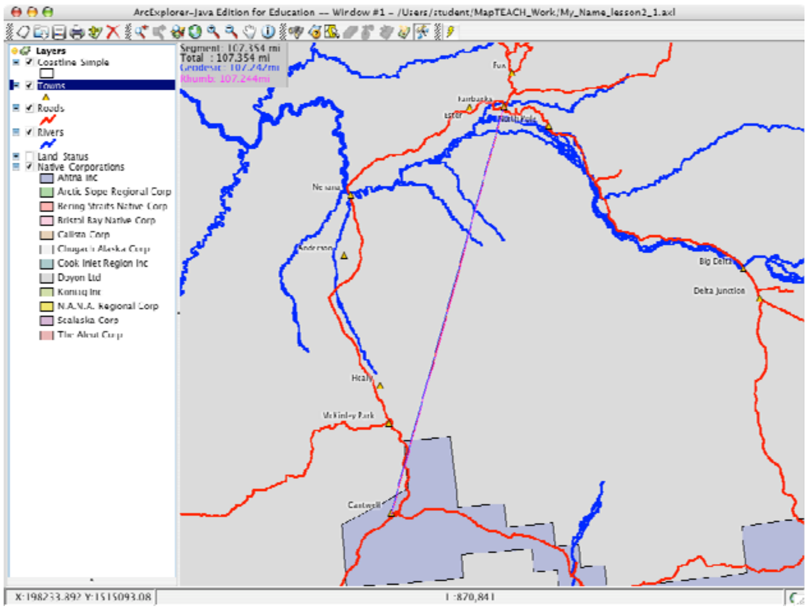
Measuring Distances

Use the Measure icon on the Tool Bar to measure the straight-line distance between places.

1. **Click on icon that looks like a ruler with a question mark** . Choose miles for the units.



2. **Click on Fairbanks and, while holding down the button, stretch the line out to Cantwell and release the button.** You should get a segment distance of approximately 107 miles. You can **clear the measurement screen** by clicking on the measure tool button again and selecting **"Clear Measure Totals."**



How far is it from Fairbanks to Nome?_______________ miles
(The total length of almost every other state in the union is smaller than that!)

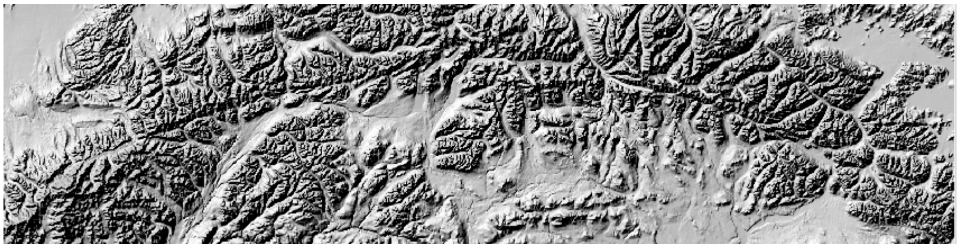
How far is it from Fairbanks to your selected community? _______________

Community: ______________ is _________ miles away.

Can you drive there?_____________

Teacher sign-off: ___________________________

GIS Lesson 4
MAPS WITH RASTER IMAGES I: STATEWIDE SHADED RELIEF
TEACHER INFORMATION



Lesson Summary: A shaded relief image of Alaska will be loaded into AEJEE and students will answer questions about what they can observe.

Objectives: Students will learn to use raster imagery in AEJEE.

Estimated Time: 30 minutes

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

A "pixel" (short for "picture element") is the smallest discrete component of an image or picture on a computer screen. A "raster image" is an image that is composed of a collection of pixels arranged in a rectangular array, with each pixel having a separate color value. The image on a television screen is a good example of a raster image, where the picture you see is composed of thousands of tiny squares of different colors arranged in a grid that together form an image. Raster images such as digital air photos and satellite images are pictures of the earth from above. Raster images bring GIS alive in wonderful ways. They are often used to reveal landscape features or situate vector layers - points, lines and polygons - on a map. Image layers are typically used as the bottom or "base layer" in a GIS map, providing a rich visual context for making sense of vector layers. In AEJEE, a user can see a raster image in or under the rest of the map, but not change the appearance of the pixels that make up the picture.

Images are often large files made up of thousands of pixels and, since each pixel must be precisely located by the computer, careful technique is required to add them into the GIS. The sheer size of raster files and the number of calculations required for AEJEE to precisely locate each pixel on the map makes a school computer work very hard. This means that there may be long pauses when a raster layer is added, or when it is projected into a new coordinate system.

The raster images included in MapTEACH data are carefully prepared and tested so they will work well when using a school computer. If it takes more than two or three minutes to redraw a map, you may need to quit AEJEE and start over, quit other programs, or use a different (smaller) raster file during your lesson.

Some Important Concepts and Tips for Success:

- Shaded relief images are raster files that display hills, mountains, valleys and flat areas, that is, the topography of the landscape. The images are generated from elevation data.
- Vector layers are GIS data stored as points, lines or shapes. For example, towns, rivers and states are each stored in separate vector layers.
- Shapefiles are a specific kind of vector data file that can be read and displayed by ArcExplorer and other GIS software produced by ESRI.
- Raster image layers are stored like digital pictures - as a rectangular grid of pixels stored in rows and columns. Raster files are generally larger than vector files.
- AEJEE can only handle raster files up to about 4 MB in size, or 2500 by 2500 pixels in size.
- If the total size of files making up a set of data layers being used to make a map in AEJEE exceeds 10 MB, the program may freeze up. This capacity varies greatly depending on the version of AEJEE being used, RAM, CPU speed and other factors. The only way to find out for sure is to try it out.
- The statewide shaded relief image data set used in this lesson is stretching the capability of AEJEE about as far as it will go. Students will not be setting a projection for the project like they would usually do. This is all right for this particular lesson because they will not be using any other data layers with the statewide shaded relief raster.
- Because a projection is not being set in this lesson, the image doesn’t know where it is or what scale it is; therefore, the scale displayed at the bottom of the AEJEE window is not correct, and the measure tool can not be used.

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
    - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM

- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data can also be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions 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

- Ask students if they have ever worked with digital images before – say, pictures taken with a digital camera, or the image on a television screen. Ask them what the picture looks like when they zoom way in, or get really close to the TV screen. If they get zoomed far enough in, the picture will be seen to be made up of many small squares, or pixels, each of which is a different color. A digital photograph is a raster image. So are satellite images and digital aerial photographs.
- Explain that raster images such as satellite pictures can be used in GIS if the image has information that the computer can understand that tells it where the image is located on the surface of the earth. Vector data layers can be combined with the raster data layer to make really useful maps.
- Explain that the data set they will be using in this lesson is stretching the capability of AEJEE about as far as it will go. They will not be setting a projection for the project like they would usually do. They don't need to because they will not be using any other data layers with the statewide shaded relief raster.
- 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.

TEACHER RESOURCES

Raster and vector data are succinctly described and contrasted in Wikipedia at http://en.wikipedia.org/wiki/Geographic_information_system#Data_representation and in ESRI's "Introduction to ArcExplorer—Java Edition for Education" for AEJEE 2.3, available as an Adobe Acrobat PDF:
http://www.esri.com/software/arcexplorer/download.html

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/

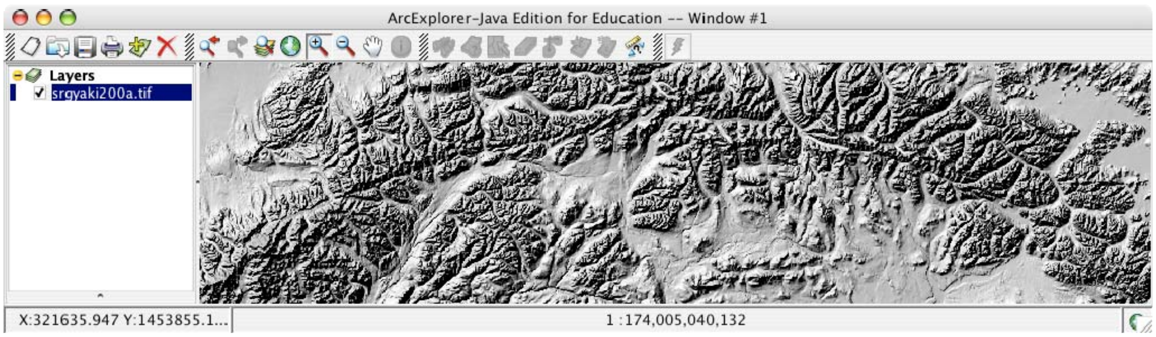
Earth Observatory (NASA) provides public access to new satellite imagery (raster data) and scientific information about our home planet [search for Alaskan images] at http://earthobservatory.nasa.gov/

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.
www.esri.com/library/glossary/glossary.html

Name: ____________________

GIS Lesson 4
MAPS WITH RASTER IMAGES I: STATEWIDE SHADED RELIEF
STUDENT EXERCISE



Objectives: Students will learn to use raster imagery in AEJEE.

Estimated Time: 30 minutes

Base Maps

Base maps are maps that have some very basic information on them to help you locate and orient yourself, but don't necessarily have a theme. *Topographic maps* are often used as base maps, and people then add additional information onto them that is of particular interest to them. For example, wildlife biologists draw arrows showing caribou migration routes on topographic base maps.

We are going to explore another kind of base map using image data available in GIS: a *shaded relief* base map. A shaded relief map is a pictorial representation of the topography, or land surface, on which you can easily see hills, mountains, valleys, and other landforms that make up the landscape.

Image files like the shaded relief map used in this lesson are not shapefiles like you have been using in AEJEE so far. They are called *raster* data sets, and are more like digital photographs instead of the simple lines, dots, and shapes that you have worked with already.

These raster data sets are quite large, so you need to be patient while AEJEE is loading, processing, and drawing them.

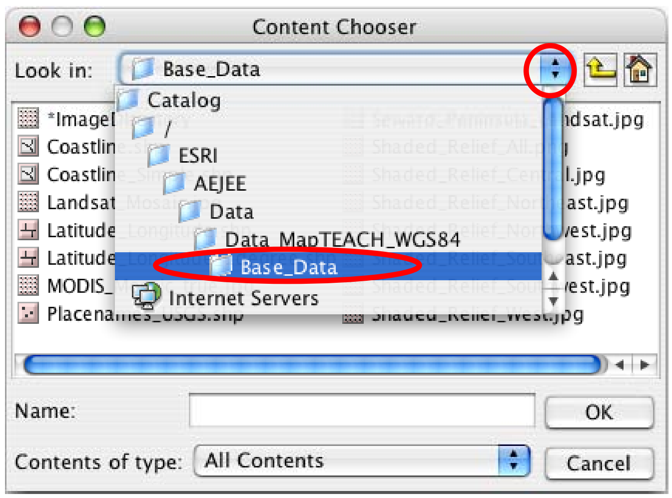
Explore 1: Load the Shaded Relief Raster Image

Start up ArcExplorer-Java Edition for Education (AEJEE)

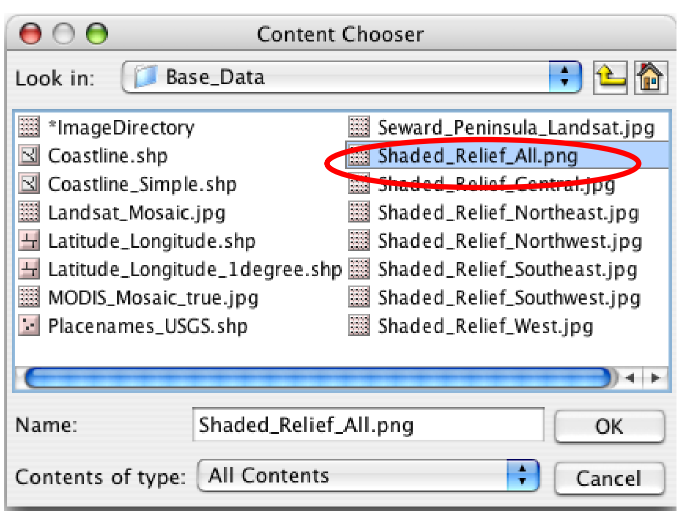
1. **Open AEJEE** and then make your window bigger **by clicking on the green button in the top left of the window.**

2. **Click the Add Data button** and open the Content Chooser window, or use Tools/Catalog to open the Catalog.

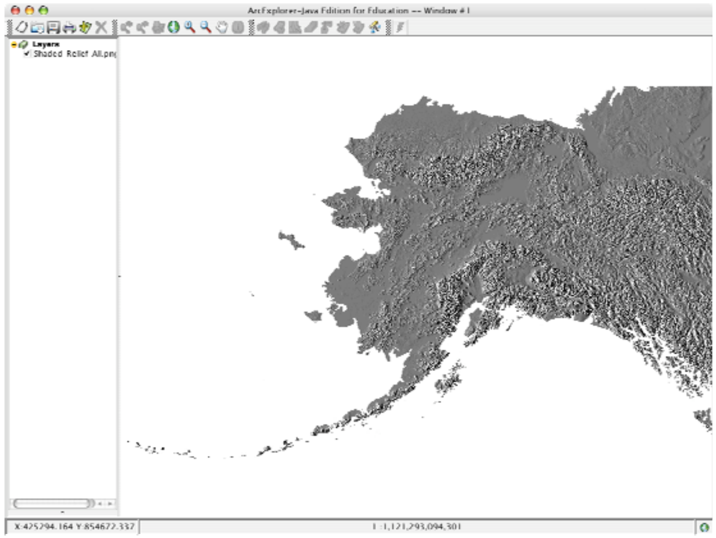
3. **Navigate to *ESRI/AEJEE/Data/Data_MapTEACH_WGS84* and choose the *Base_Data* folder.** To do this, click on the blue arrow icon and then click on each folder down the directory tree until you get to Base_Data.



4. Open Base_Data and **select the file *Shaded_Relief_All.png*.** Raster data sets for this lesson have the extension *.png or .jpg* at the end of the file name. **Wait patiently** for the file to load.



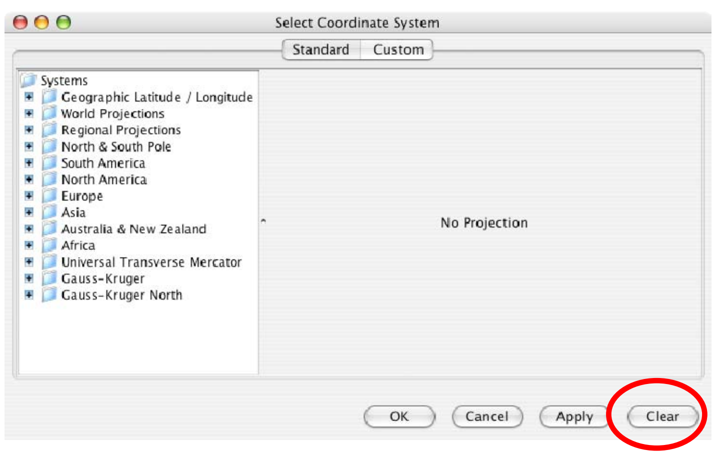
Your screen should look like this:



IF the map does NOT show all of Alaska, Clear the Projection
It may be necessary to clear the projection because AEJEE handles raster data differently from the way it handles shapefiles. This file is especially large and difficult to process. We are going to use it anyway because it shows some really interesting things about Alaska. Normally, you would always set a projection!

1. If you need to clear the projection, start by **clicking on "Projection"** in the **Tools** menu.

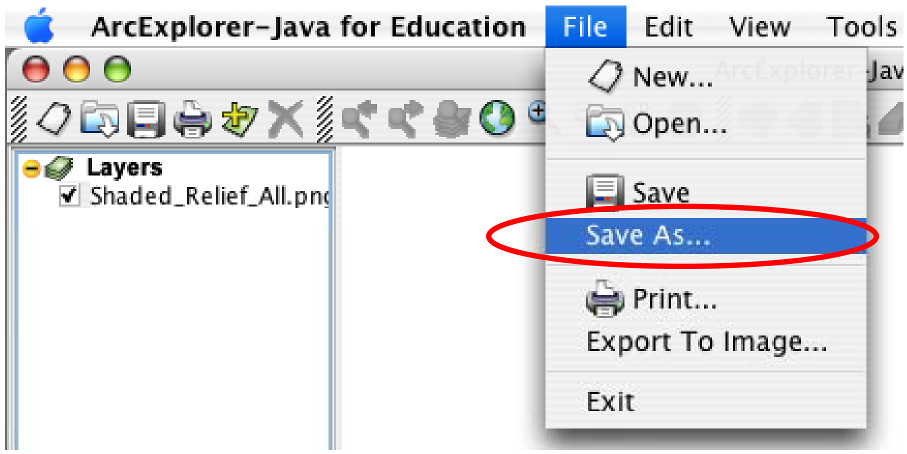
2. The **"Select Coordinate System" window** will appear: Click on the **"Clear"** button. Click **"OK."**



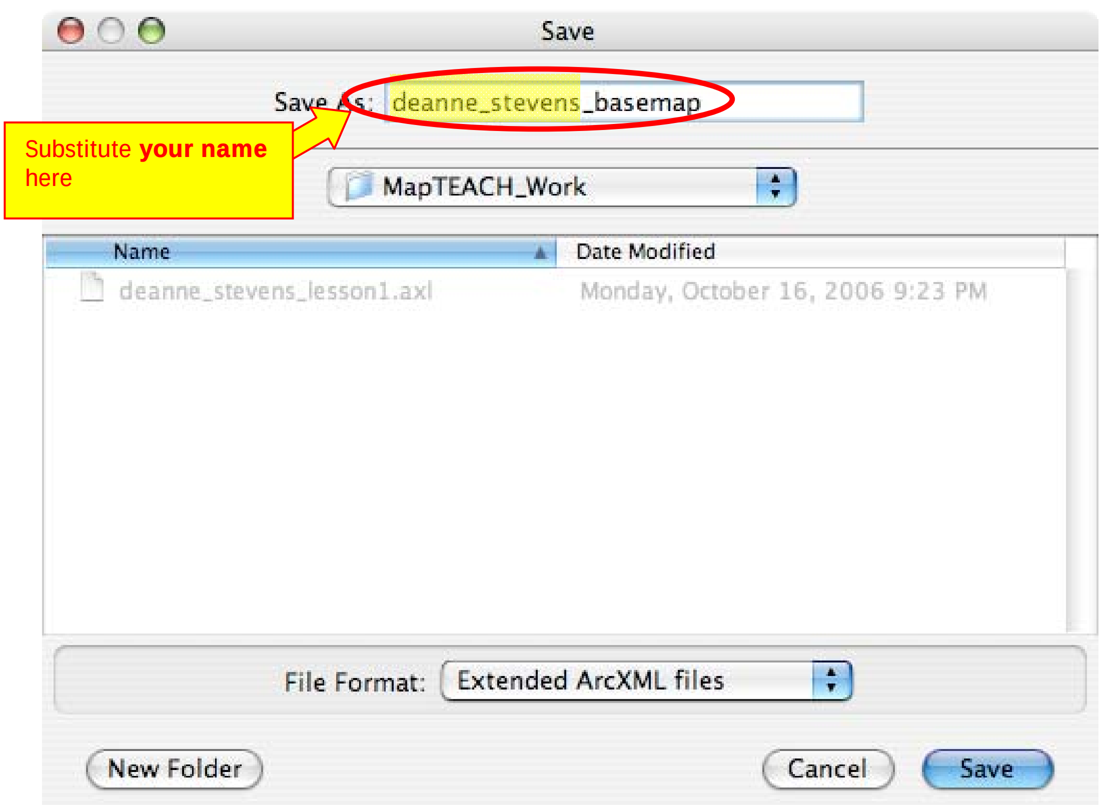
To make the map display correctly with the projection cleared, you may need to SAVE and RE-OPEN your project.

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 "basemap": **firstname_lastname_basemap**

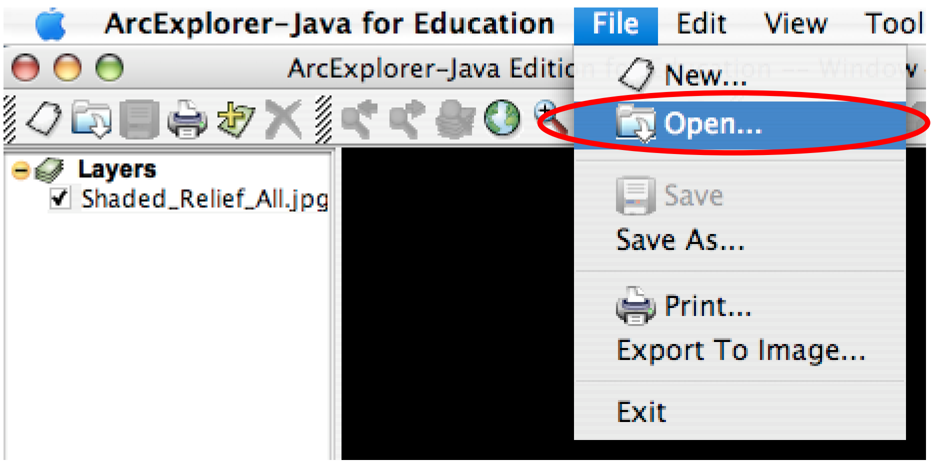


- Click **"Save"**
- ***Remember to save your map often as you work.*** *If the computer crashes or AEJEE freezes, you will always be able to start again from the last saved version of your map.*

To **Re-open** your saved file:

1. **Click** on **"File"** in the Menu Bar.

2. Select **"Open."**



3. **Navigate** to the **student/MapTEACH_Work** folder.

4. **Click** on the file name **firstname_lastname_basemap.axl** and **click "Open."**

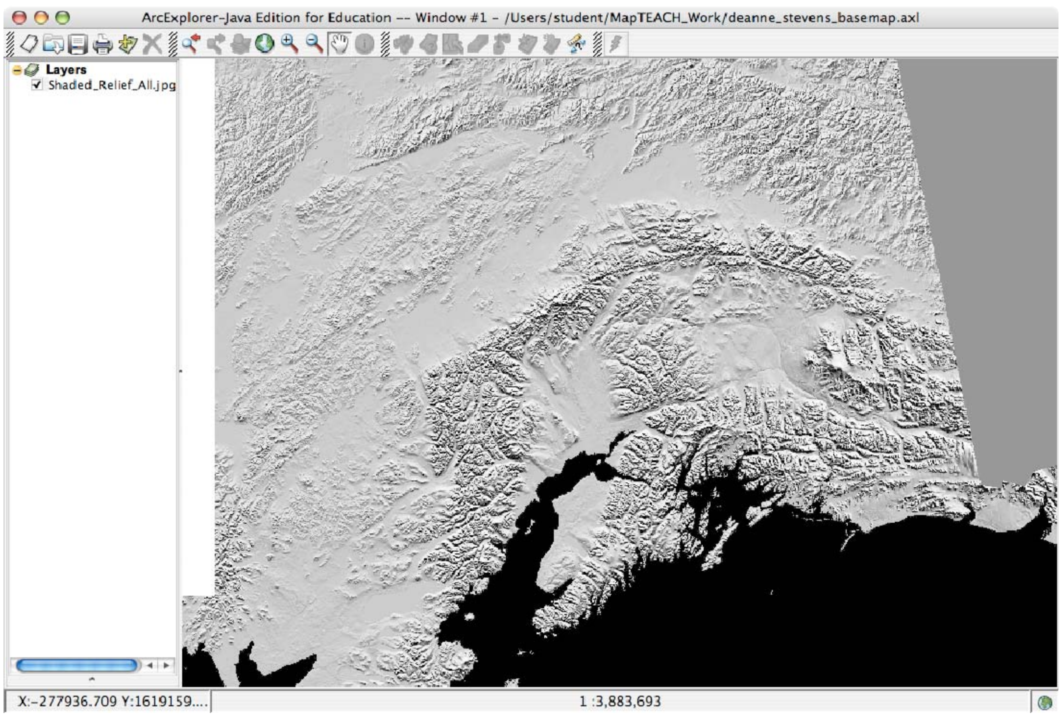
5. Wait a few minutes while your map re-loads.

Explore 2: Interpreting the Shaded Relief Raster Image

Zoom in to the Alaska Range by using the Zoom tool to drag a box around the mountains. (*Hint: The Alaska Range is the big east-west trending mountain range in the south half of Alaska)*

Remember, this is a ***really big*** data set, so the computer will be pretty slow. You also can't zoom in much farther than this because the data layer doesn't have very much detail (the *resolution* is low).

Your map should look something like this:



The Alaska Range has the tallest mountains in Alaska, and includes Mount McKinley (Denali), which is the highest peak in North America. There is a large *fault* (a break in the ground where big pieces of the earth's surface are sliding past each other) that is very visible in this shaded relief map.

Can you see the fault?______________

Trace it or pencil a line around it.

What does it look like? ____

____

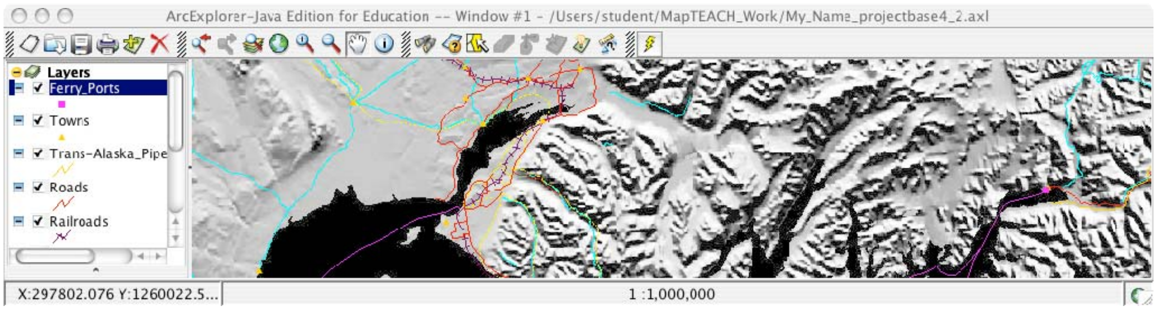
Can you see any other possible faults in this view? ________________________

Save your map project.

Show a teacher some of the other faults you think you can see.

Teacher sign-off: ___________________________

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: Mac OS 10.3 or above, 100 MB hard drive space, Internet connection; recommend G4 or faster processor and more than 64 MB RAM
  - -Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions 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/Geographic_information_system#Data_representation

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

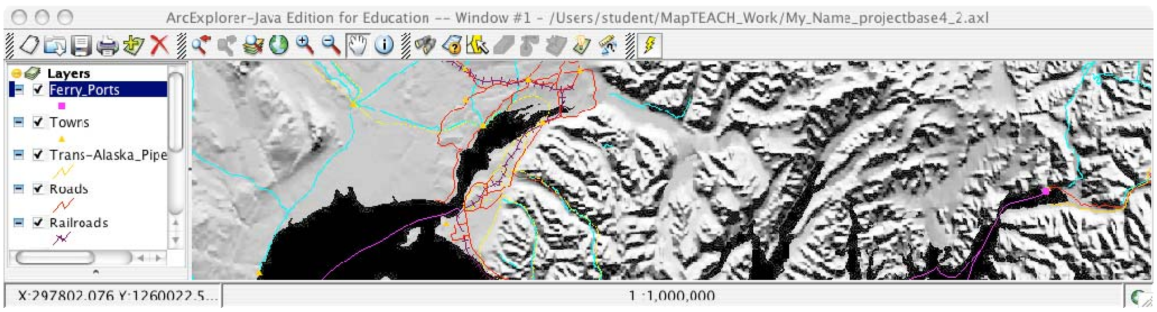
Earth Observatory (NASA) provides public access to new satellite imagery (raster data) and scientific information about our home planet [search for Alaskan images] at http://earthobservatory.nasa.gov/

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 experiences to illustrate basic remote sensing concepts.

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 points 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*.

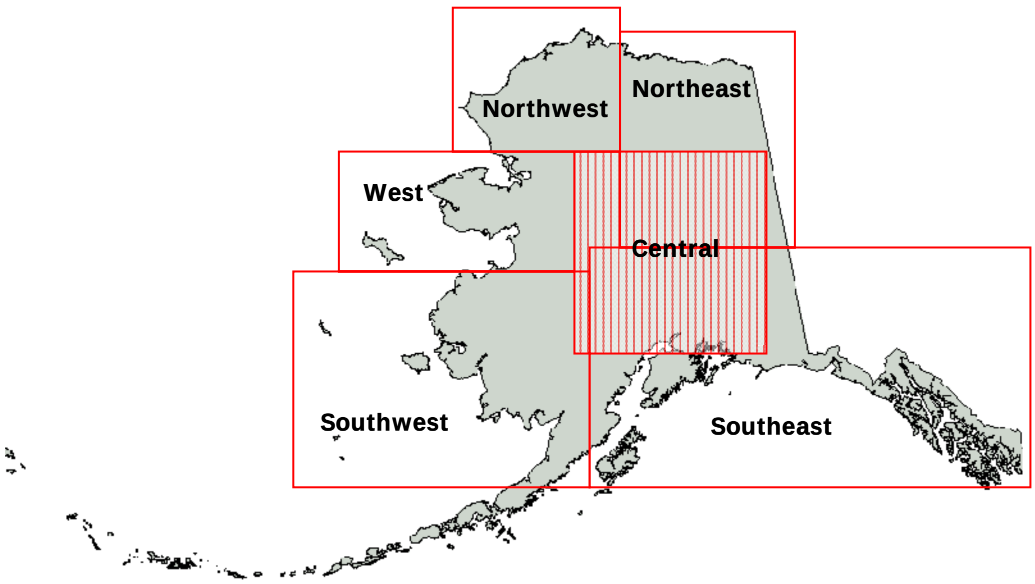
Explore 1: Load Your Data

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

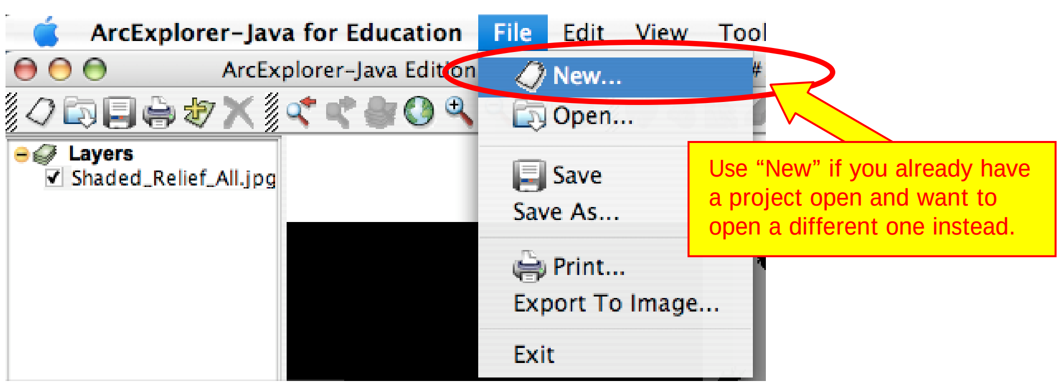
1. **Choose a good raster data layer for your base map and project community** by looking at the picture below. Your teacher can help you.

   What is your Project Community? ________________________________

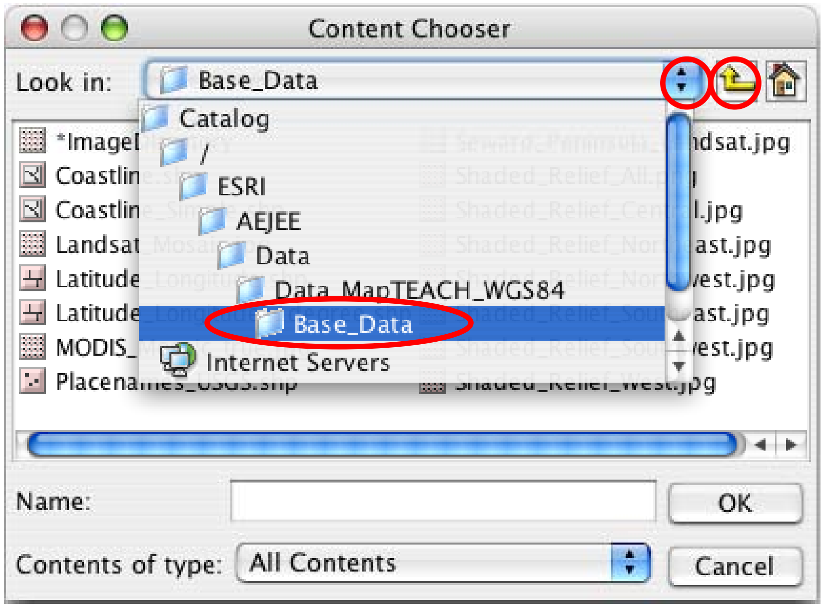
   What region is your Project Community in? ___________________________



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.



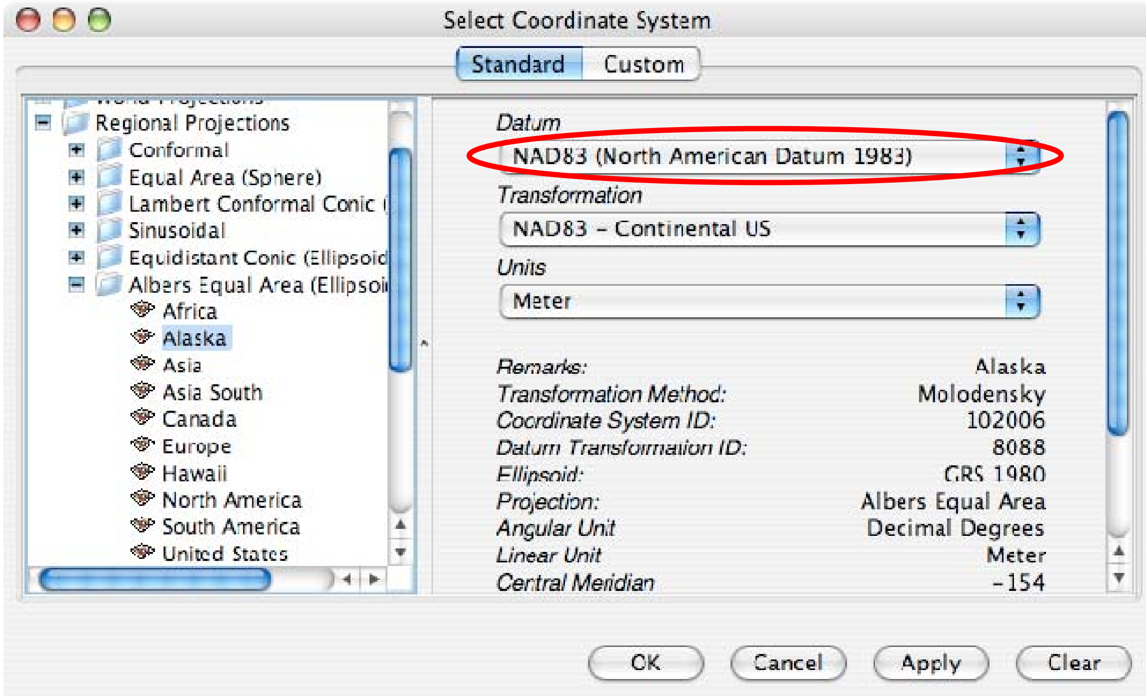
3. Use the Content Chooser or Tools/Catalog to **navigate to** ***/ESRI/AEJEE/Data/Data_MapTEACH_WGS84*** and choose the ***Base_Data*** **folder.**



4. **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**

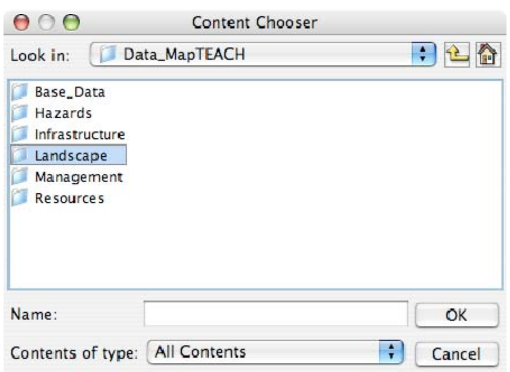
5. **Use Tools/Projection** to open the **Select Coordinate Systems** window to set your projection to **Regional Projections/Albers Equal Area (Ellipsoid)/Alaska**, and **leave the "Datum" as "NAD83 (North American Datum 1983)."**

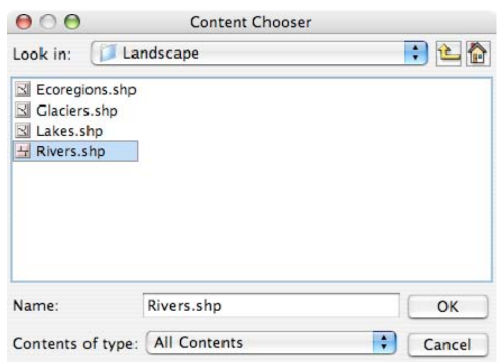


6. **Click "OK"** and wait patiently until the map redraws.

7. **Now, add more layers to your map** by clicking on the "Add Data" button for the Content Chooser window or use Tools/Catalog.

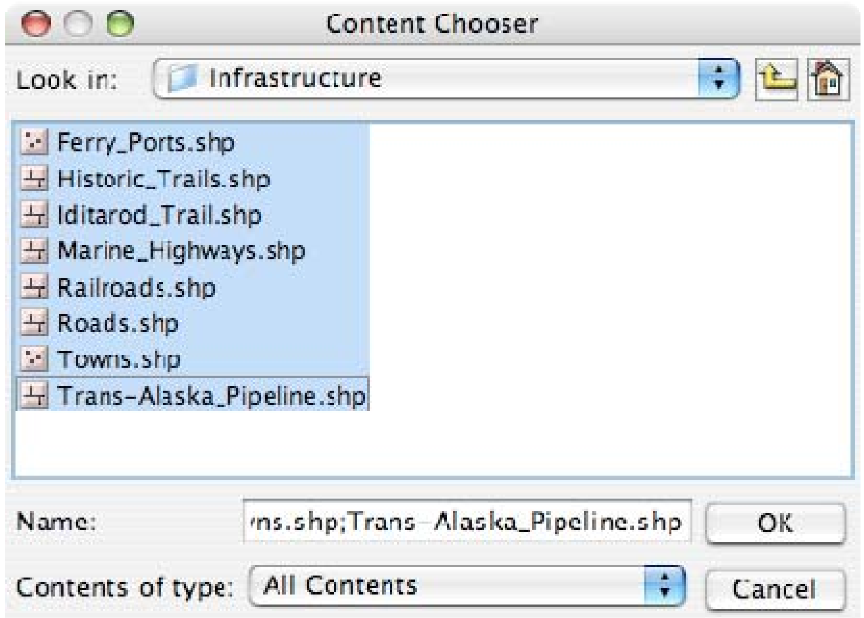
8. Navigate to the ***Data_MapTEACH_WGS84*** folder, find the ***Landscape*** folder, and load the ***Rivers*** shapefile.





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

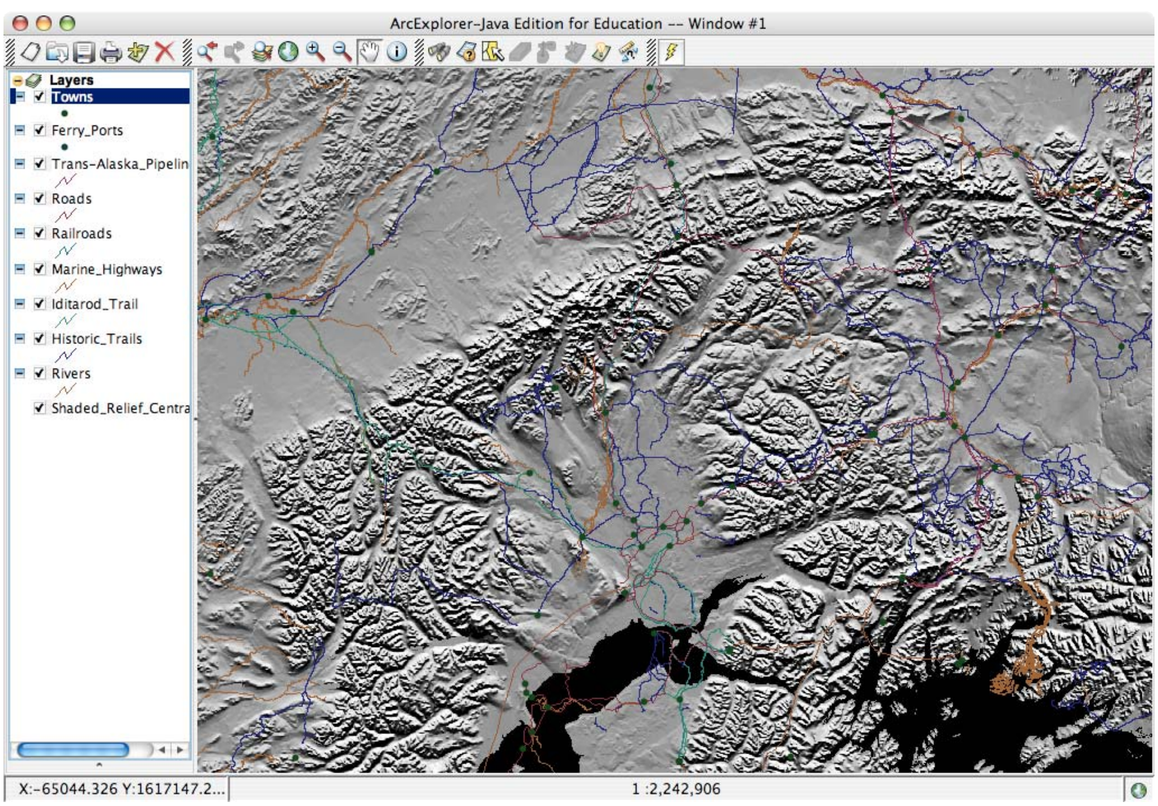
   A quick way to do this is to **click on the first shapefile** in the list, then **shift-click on the last name in the list**. This will highlight all the shapefiles in the list.



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

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

Your map might look something like this:



11. Look at your map closely. Pay especially close attention to where your rivers are located with respect to the hills, mountains and valleys on the shaded relief layer. If your map includes a coastal area, look hard at where the vector layers are lining up on top of the shaded relief layer along the coast.

    Does your map look weird? ____________

    What do you see that's wrong with it? ______________________________

    ____

    ____

    This is because we are using two different kinds of data together – shapefiles and raster imagery. We can fix this "problem" by saving the map, closing it, and then re-opening it again.

12. **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"**

13. Open your saved map project:
    - Select **"Open" from the File Menu**
    - **Navigate** to the **student/MapTEACH_Work** folder
    - **Select the project** you just saved": **firstname_lastname_projectbase**
    - **Click "Open"**

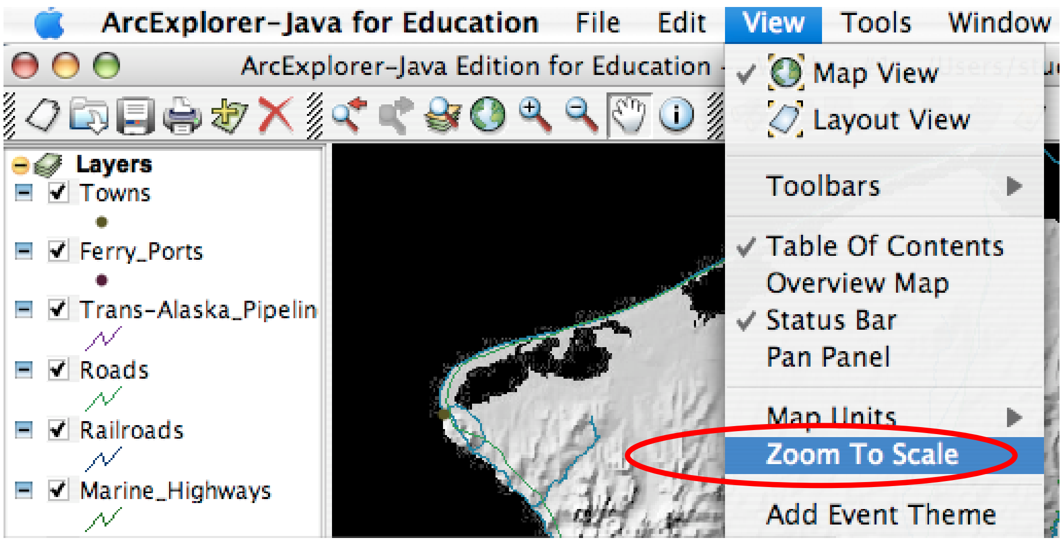
14. Zoom around and look at your map. Your layers should line up now. If not, ask your teacher for help.

Show your map to a teacher.

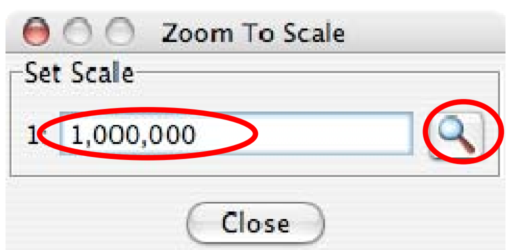
Teacher sign-off: ___________________________
(Check to see that the raster and vector data layers line up)

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.

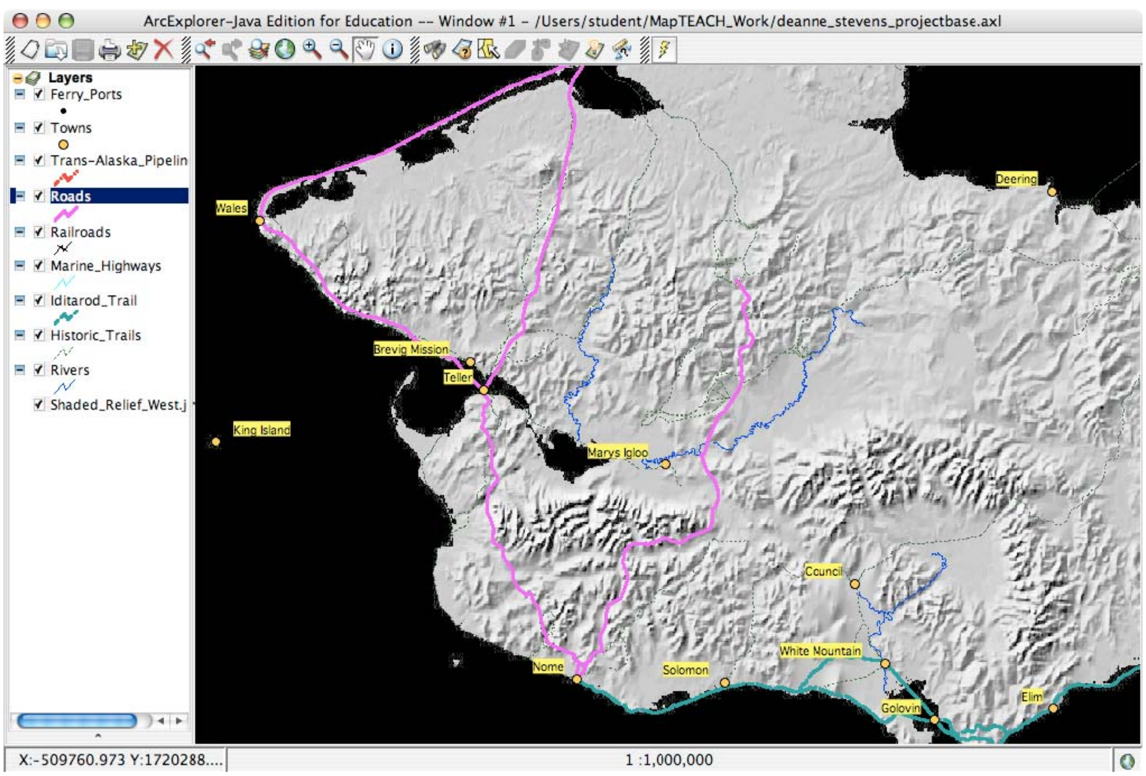
- **Towns Layer**
  - o make the **symbols** a **style, color**, and **size** you like
  - o **label** the towns with a **font style, color** and **size** you like

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

- **Remaining Layers**
  - o **Rivers**
  - o **Trans-Alaska Pipeline**
  - o **Roads**
  - o **Railroads**
  - o **Marine_Highways**
  - o **Iditarod_Trail**
  - o **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: ____________________________

GIS Lesson 6
MAPS WITH RASTER IMAGES III: SATELLITE IMAGERY
TEACHER INFORMATION

Lesson Summary: During this lesson students use GIS to load and view true-color and enhanced satellite images of Alaska. Based on their knowledge of Alaskan geography and recent image interpretation experiences in RSG Lesson 1, they interpret features found in the satellite images.

Objectives: Students will learn how to load and display satellite imagery in AEJEE and will answer questions about what they see in the images.

Estimated Time: 30 minutes

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

Images taken from satellites have been used by GIS and remote sensing researchers to make environmental observations from space for many years. There are many different satellites collecting many different kinds of data from all across the energy spectrum into wavelengths far beyond what the human eye can see.

Students tend to like the 'true color' images for their more familiar views of the earth, and of local community areas from space. Other kinds of enhanced images can be derived from satellite data and often provide important information, even though the color combinations take some getting used to. A common enhancement of satellite imagery is designed to approximate the appearance of CIR (Color Infrared) aerial photographs. (For a more thorough discussion of CIR, refer back to RSG Lesson 1.)

The Landsat image used in this lesson has been enhanced to highlight some of the diverse landscape features. In this statewide summertime image, areas covered by snow and ice are light blue, clear water is dark blue, vegetation is green, and bare rock, exposed soils and sand dunes are various shades of pink. Many areas that have been burned show up in tones of black and red.

Students will find that the larger the area covered by the image, the lower the resolution, and the larger the size of each pixel. These statewide images are actually made from many individual satellite images 'mosaiced' together so that the edge of each smaller image fits the next like pieces of a puzzle. Since individual satellite images are typically hundreds of megabytes in size, the whole image must be reprocessed to a lower resolution to create a manageable file size of a few megabytes.

It is tempting to want to use very high resolution satellite image data or digital air photos for a close-up view of an area of interest. These kinds of high resolution images can be very difficult or expensive to procure and cover only very small areas. The file sizes of these images are also extremely large. For our purposes, coarser-resolution data like the MODIS and Landsat imagery used in this lesson are still visually attractive choices for base maps and have the benefit of much smaller file sizes that function well with AEJEE.

MATERIALS

- Computers - one for each student is best or two students can share. The computers must meet the following specifications to run AEJEE:
  - Macintosh: Mac OS 10.3 or above, 100 MB hard drive space, Internet connection; recommend G4 or faster processor and more than 64 MB RAM
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions for the lesson

INSTRUCTIONAL PROCEDURES

Getting Ready

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

Gear-up

Ask students if they have ever seen satellite images before. Have they ever used Google Earth? Google Earth uses satellite images as base map data for their maps. Do they think Google Earth uses GIS?

Explain to students that this lesson gives them an opportunity to use pictures taken from space to look at the Alaska landscape in GIS. You can whet their appetites by showing them some interesting images of Alaska from the USGS Landsat Image Gallery (see the link in the resources section below).

MORE EXPLORATIONS

Have students explore Landsat images of Alaska by searching through the USGS Landsat Image Gallery. They can also use Google Earth to view places all over the world, as well as their own home communities or other areas of interest in Alaska.

TEACHER RESOURCES

The Landsat Education Program (NASA)
http://landsat.gsfc.nasa.gov/education/resources.html

MORE RESOURCES FOR STUDENTS OR TEACHERS

USGS Landsat Image Gallery: An easy-to-browse array of images including such Earth features as volcanoes, floods, cities and more.
http://landsat.usgs.gov/gallery.php

Visible Earth: A catalog of NASA images and animations of our home planet
http://visibleearth.nasa.gov/

Google Earth: An online interactive map site that uses satellite imagery to bring geography alive: http://earth.google.com/

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 experiences to illustrate basic remote sensing concepts.

Name: ____________________

GIS Lesson 6
MAPS WITH RASTER IMAGES III:
SATELLITE IMAGERY
STUDENT EXERCISE

Objectives: Students will learn how to load and display satellite imagery in AEJEE and will answer questions about what they see in the images.

Estimated Time: 30 minutes

In the last lesson you used shaded relief raster images as base layers to start building a map of your Project Community. We're going to take a break from the Project Community map right now to look at a different kind of raster layer, a satellite image. As you saw in class, satellite images can show many different kinds of features.

The satellite images we are going to use in this lesson are pretty low resolution in order to make data files that will work in AEJEE. We won't be able to see much detail, but we can still see plenty of features when we are zoomed out to large areas of Alaska.

During this lesson you will use a *MODIS satellite image* and a *Landsat satellite image* to look for features that stand out in the Alaskan landscape.

Explore 1: MODIS Satellite Image

1. **Open AEJEE** and make your window bigger **by clicking on the green button in the top left of the window.**

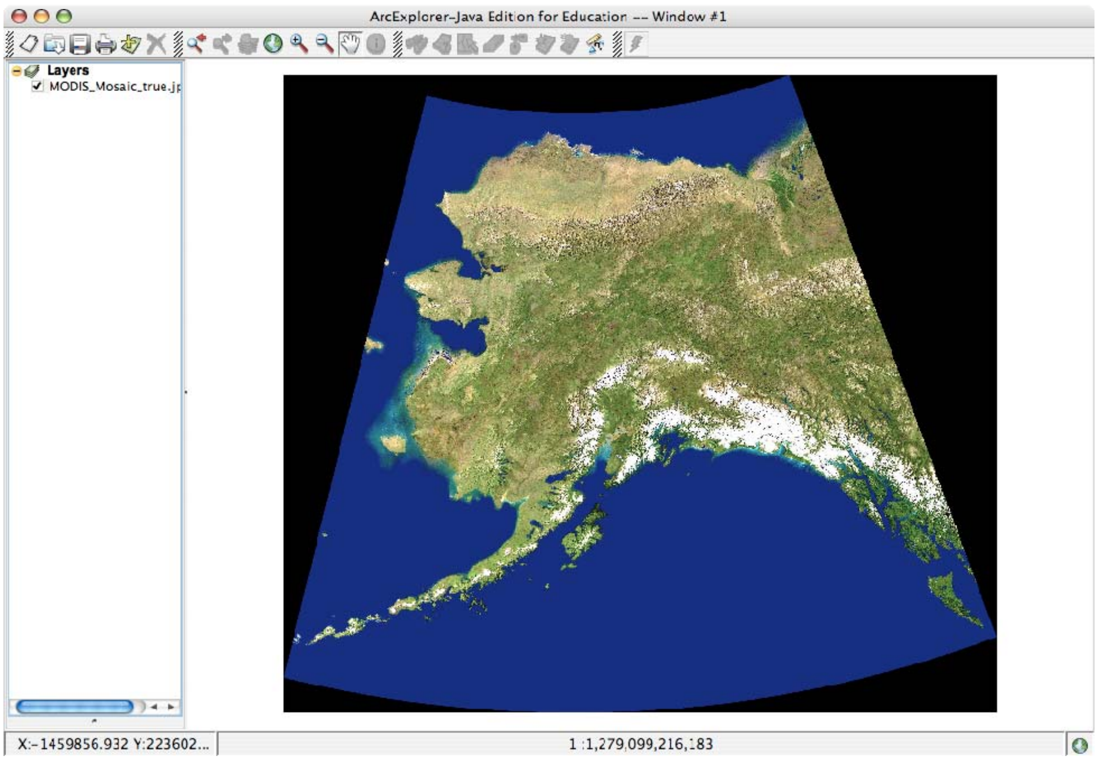
2. Navigate to the **Base_Data** folder and load the raster file **MODIS_Mosaic_true.jpg.** The "true" in the name is to indicate that the colors in the image are real-life colors.

IF the map does NOT show all of Alaska, Clear the Projection
Remember when we were working with the statewide shaded relief image and we did not set a projection? This satellite data set is also very big and complicated, so we will not be setting a projection for it. It may be necessary to clear the projection. Remember: Normally, you would always set a projection!
(Note: Because you have not set a projection, you will not be able to use the measure tool or the "Zoom To Scale" function)

- **If** you need to clear the projection, start by **clicking on "Projection"** in the **Tools** menu.

- The **"Select Coordinate System" window** will appear: Click on the **"Clear"** button. Click **"OK."**

Your map should look something like this:



3. **Save** your map as **firstname_lastname_satellite** in the **student/MapTEACH_Work folder.**

4. **Zoom around** and look at what the MODIS image shows.

MODIS Image Interpretation

How is this satellite raster image different from the shaded relief rasters?

____

____

____

In general, what do you think the green areas are? ______________________

In general, what do you think the dark blue areas are? ___________________

In general, what do you think the light blue areas are? ___________________

In general, what do you think the white areas are?_______________________

What time of year do you think this satellite image was taken, and why?

____

____

____

Do you think that this particular satellite image would be a good base map for a community planning project?

____

Why or why not? ____

____

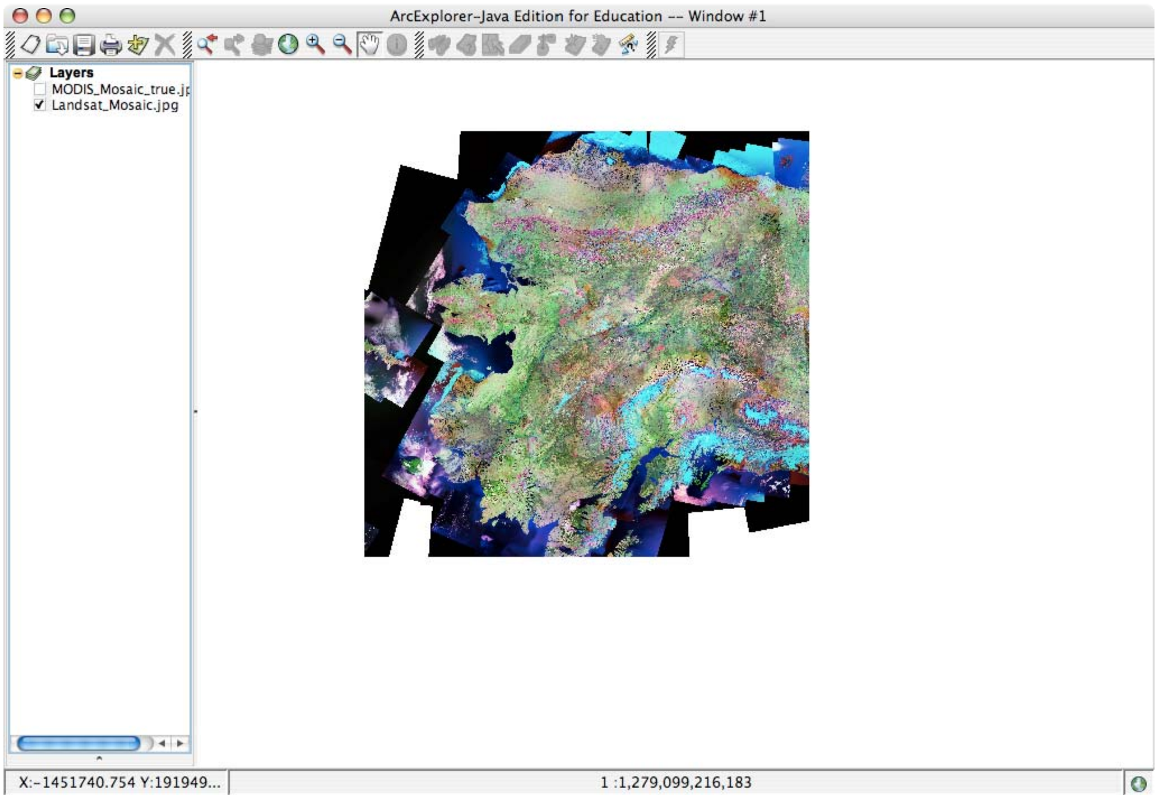
____

Explore 2: Landsat Satellite Image

1. Load the raster file **Landsat_Mosaic.jpg** from the **Base_Data** folder. This image is from a different satellite. We do not have an image like this that covers the entire state, but we can still see a lot of interesting things.

2. Turn off the MODIS_Mosaic_true raster layer so you can see the Landsat_Mosaic image.

Your map should look something like this:



3. **Save** your map.

4. **Zoom around** and look at what the Landsat image shows.

Landsat Image Interpretation

How is this raster image different from the MODIS image?

____

____

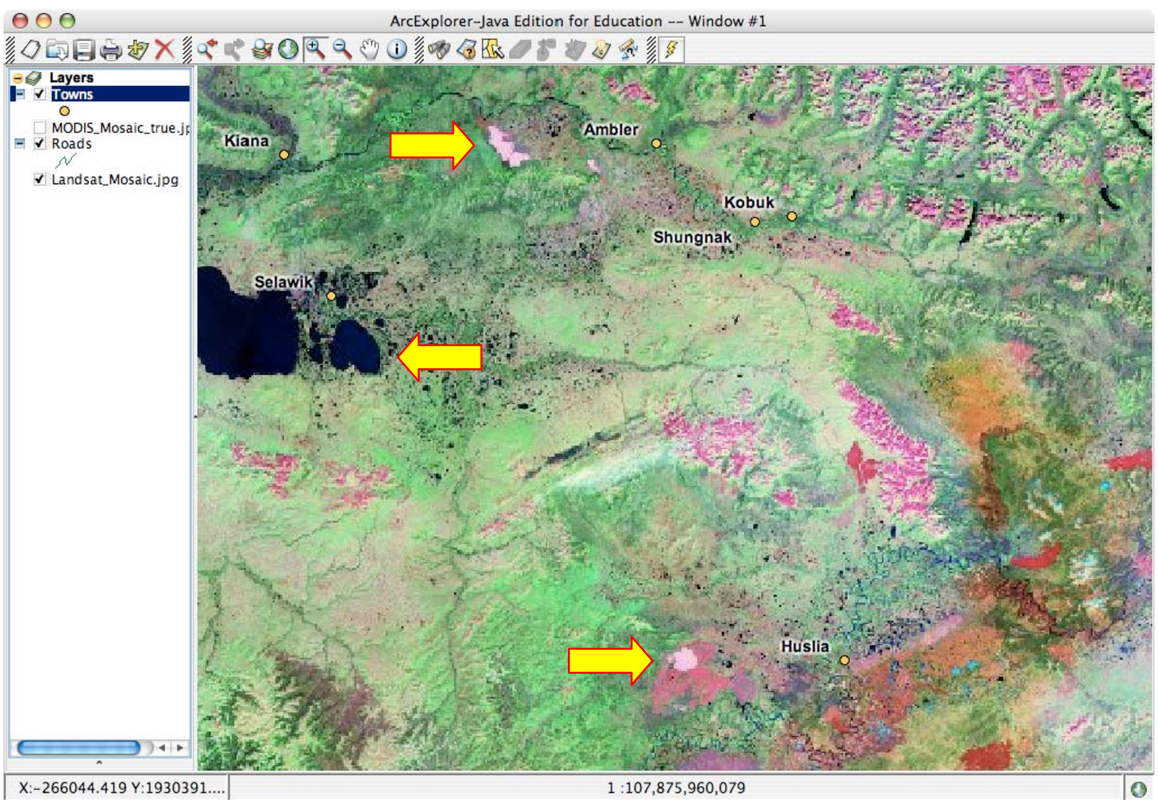
In general, what do you think the pink areas are?_________________________

In general, what do you think the light blue areas are? ___________________

In general, what do you think the dark blue areas are? ___________________

Add the **Towns** shapefile from the **Infrastructure** folder and label the towns with their names. Find the communities of Selawik, Huslia and Ambler and zoom in until you barely have all three in your map.

You should be zoomed in to the approximate extent shown here:



(The arrows on this map are pointing to places referred to in the next few questions)

Turn the MODIS_Mosaic_true layer on and off by checking and unchecking the box next to the layer name in the Table of Contents. This allows you to flicker between the two types of satellite image. Now, try to answer the following questions.

In the Landsat image, there is a light pink blob just west of Ambler and a light pink blob just west of Huslia. What do you think these could be?
(Hint: you may have seen one of these on an air photo in a PowerPoint presentation during a MapTEACH lesson; also, you might find these sorts of things in the Sahara Desert of Africa!)

____

____

What do these blobs look like in the MODIS image?

____

Turn off the MODIS image and use the Landsat image to look at the large lake that is just **southeast of Selawik**.

What color is the lake in the Landsat image?___________________________

Based on your previous interpretations of the colors in the Landsat image, what does this color indicate about the water?

____

____

What color is the lake in the MODIS image? ___________________________

Based on your previous interpretations of the colors in the MODIS image, what does this color indicate about the water?

____

____

The Landsat image is from 1990, and the MODIS image is from 2001.

Based on your observations of the satellite imagery, what do you think might have happened to the lake between 1990 and 2001?

____

____

Do you think that a Landsat satellite image would be a good base map for a community planning project?

____

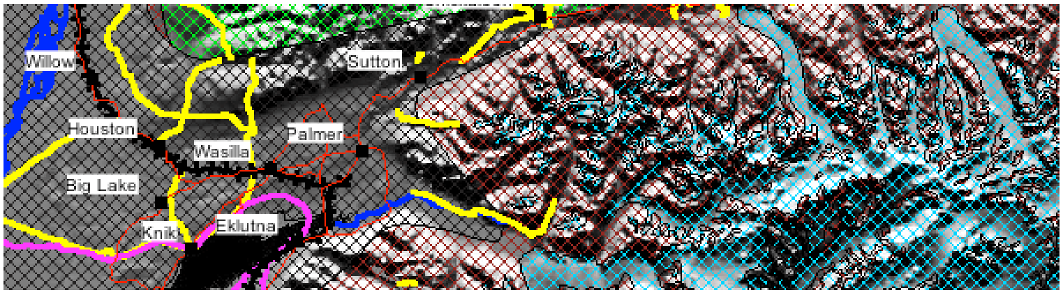
Why or why not? ____

____

Show your map to a teacher.

Teacher sign-off: __________________________

GIS Lesson 7
COMMUNITY GIS: GEOLOGIC HAZARDS
TEACHER INFORMATION



Lesson Summary: By choosing an Alaskan community as a starting point, students are able to investigate and map geologic hazards that may affect them directly. In turn they begin to see how the geology and climate of a place sets the stage for specific hazardous events.

Objectives: Students will explore a variety of GIS data sets relating to geologic hazards.

Estimated Time: 1 hour

Correlation to Alaska Standards:
Geography E-6 Evaluate the impact of physical hazards on human systems.

BACKGROUND FOR THE TEACHER

Though Alaskan students are inundated with warnings about local hazards, and regaled with stories of epic natural disasters, hazards are given little explicit emphasis in current state standards. Clearly, students are interested in hazards and enjoy describing experiences with them from personal, community and historic perspectives. This lesson presents them with opportunities to explore local and regional geologic hazards using scientific data and mapping tools.

Mitigating the effects of hazards in communities first requires an understanding of how and where events occur. Maps are often integral to plans for avoiding hazards or taking actions to make possible outcomes less severe. During this lesson, each student will be able to focus in on hazards that threaten a particular community. However, many kinds of hazards are covered during the lesson and together they serve as a foundation for understanding the distribution and effects of hazards throughout Alaska.

Some Important Concepts and Tips for Success:

- The project community chosen as a focus by the student should be one that he or she knows very well. Questions in the lesson ask the students to compare their personal observations and the information presented on their maps. The community does not need to be same as their school's community.
- Geologic hazards are natural geologic events that can endanger human lives and threaten human property. Earthquakes, tsunamis, floods, volcanic eruptions and permafrost all can cause significant and sometimes catastrophic damage in Alaska.
- Permafrost is ground whose temperature remains below freezing for two or more years in a row.
- Geographic extent is displayed on a map as an area that is characterized by a particular quality. For example, an area subject to permafrost is shown as permafrost extent.
- To supplement or extend this activity, bring in local people who have experience with hazards. They will inform and inspire students as they work on their maps. The homeowner who must cope with building on permafrost, a local government planner who maps flood zones, and a roads (transportation) engineer are all people who can share hazards expertise.

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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions 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

- This lesson presents students with tools and information for finding out more about hazards that affect their own community. One way to prime the pump for students to share their personal knowledge is to start with a list of temperate zone geologic hazards, e.g. hurricanes, tornadoes, karst sinkholes and tropical desert sand storms. Follow up by asking, "What geologic hazards affect Alaskans?"

  Check in on students' progress throughout the lesson to keep them on track to finish on time. For example, to complete 10 pages in an hour, the students need to be finished with page 5 after 30 minutes. Stand at the back of the room to watch computer monitors, and periodically ask questions like, "How many people have finished the "Explore" section on earthquakes? Raise your hand."

- Restrict or prevent student access to distracting activities like chat, email or social networking sites.
- Point out that this is an activity where they can begin to bring their GIS skills 'home'. As they work, they can also be thinking ahead to how they can make maps that would help people in their project community better understand hazards, and plan how to mitigate their effects.

TEACHER RESOURCES

The presentation **Geologic_Hazards_PowerPoint** file included in the MapTEACH geology unit curriculum materials provides an engaging introduction and spectacular images to **Natural Hazards in Alaska**. See included materials or search the web site at www.mapteach.org.

The article **Lessons Learned While Teaching Earth Science with GIS** includes relevant observations and insights made while using hazards as a content area focus. As a chapter of the AAAS publication *Invention and Impact: Building Excellence in Undergraduate Science, Technology, Engineering and Mathematics (STEM) Education* it can be downloaded as a .pdf from http://www.aaas.org/publications/books_reports/CCLI/PDFs/05_Vis_Ed_Hall.pdf

RESOURCES FOR STUDENTS OR TEACHERS

Guide to Geologic Hazards in Alaska – Introduction from the Division of Geological & Geophysical Surveys provides an online overview. Alaska hosts a long list of hazards including earthquakes, tsunamis, volcanic eruptions, permafrost, avalanches, floods and more. Each hazard is organized in a taxonomy and linked to many helpful resources via http://www.dggs.dnr.state.ak.us/index.php?menu_link=engineering&link=geohazards&sub_link=hazards

USGS Educational Resources For Secondary Grades Middle School and High School is organized by topic, e.g. volcanoes, and by resource type at http://education.usgs.gov/common/secondary.htm

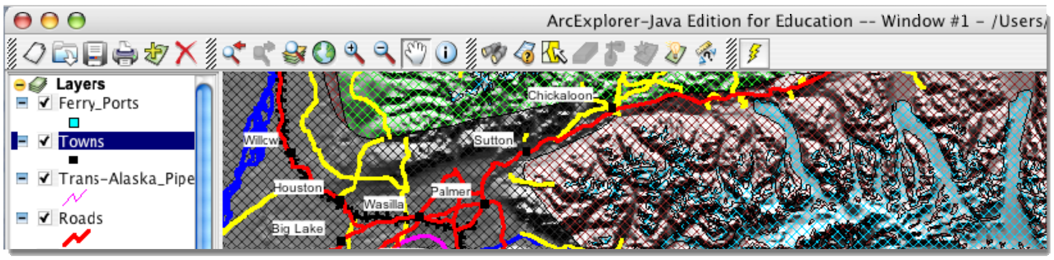
Natural Hazards Gateway is a comprehensive introduction to hazards found nationwide as presented by the US Geological Survey at http://www.usgs.gov/hazards/

The Geologic Hazards article at National*atlas*.gov offers descriptions, pictures and links to maps and map layers. See http://nationalatlas.gov/articles/geology/a_geohazards.html

Name: ____________________

Project Community: ____________________

GIS Lesson 7
COMMUNITY GIS: GEOLOGIC HAZARDS
STUDENT EXERCISE



Objectives: Students will explore a variety of GIS data sets relating to geologic hazards.

Estimated Time: 1 hour

By the end of this lesson, you will be able work with different kinds of data layers to answer questions about geologic hazards that are important for community planning projects.

Explore 1: How Does Permafrost Affect Towns?

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:

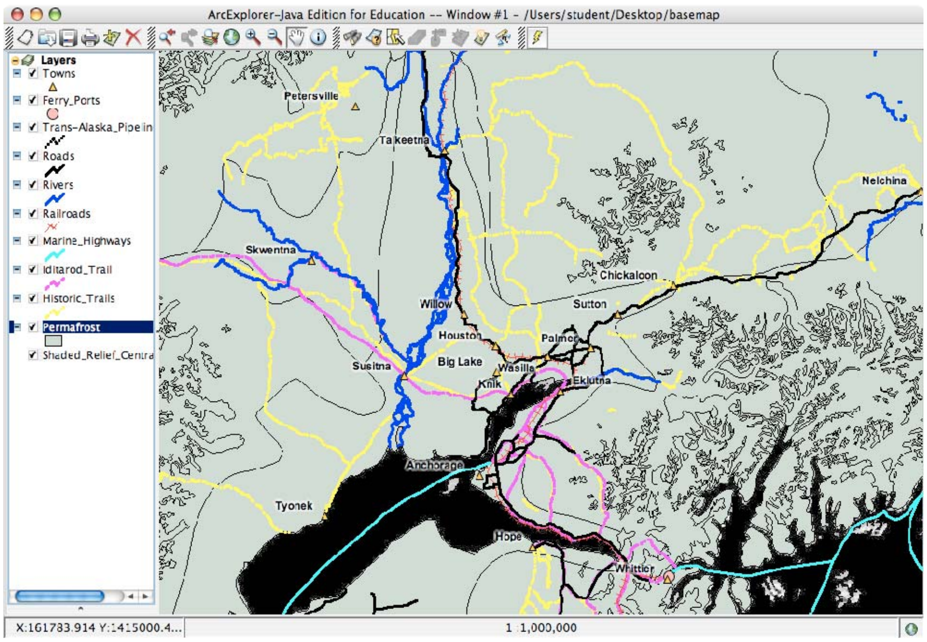
- **Click** on **“File”** in the Menu Bar
- Select **“Open”**
- **Navigate** to the **student/MapTEACH_Work** folder
- **Click** on the file name **firstname_lastname_projectbase.axl** and **click “Open”**
- Wait up to a few minutes while your map re-loads

1. **Choose an Alaskan community that you know well** as the focus for this lesson. **Zoom and pan** to the area around your community.

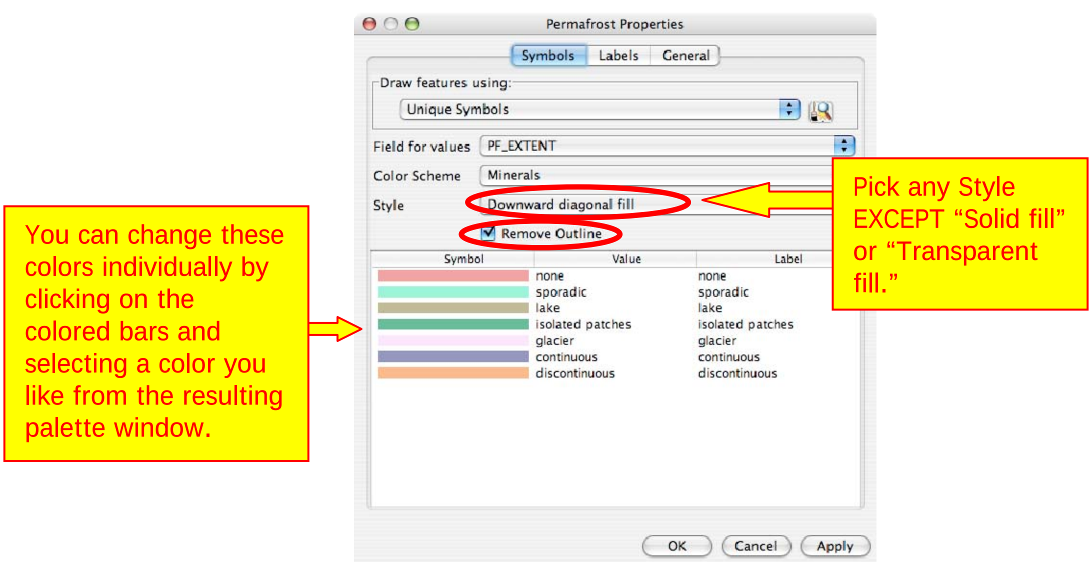
2. **Add the layer *Permafrost*** from the ***Hazards* folder** in ***Data_MapTEACH***.

3. **Move** the **Permafrost layer up one level** by **Ctrl-Clicking** and selecting **"Move Layer"** and **"Move Up."** We want to be able to see it on top of the shaded relief layer.

Your map might look something like this:



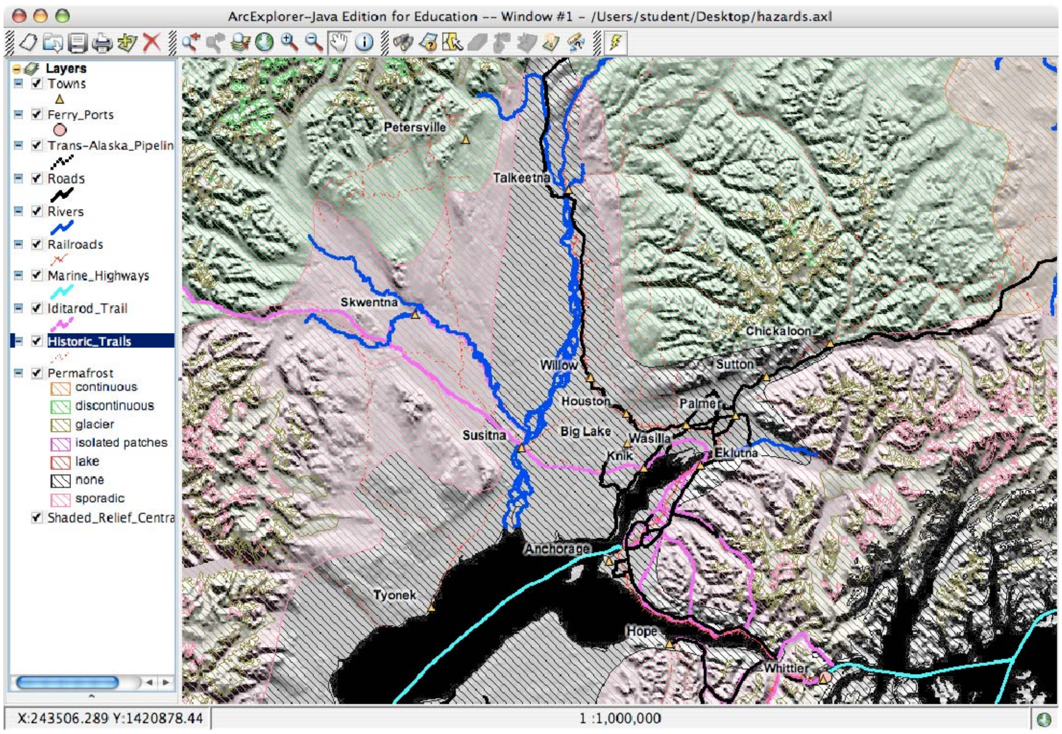
4. Symbolize the ***Permafrost*** layer using the **Properties** menu. Assign colors with **"Unique Symbols"** using the value of **"PF_EXTENT,"** and pick any color scheme that you like. For **"Style,"** you need to **pick anything EXCEPT "Solid fill" or "Transparent fill."** By selecting one of the patterns, you will be able to see the shaded relief layer through the permafrost layer.



5. **Check** the **"Remove Outline"** box.

6. When it looks the way you like it, **save** your map in the MapTEACH_Work directory as **firstname_lastname_hazards**.

Your map might look something like this:



Permafrost is ground whose temperature remains below freezing for two or more years in a row. In this data set, **permafrost extent** (how much of the area is subject to permafrost) is represented as continuous, discontinuous, sporadic, isolated patches, and none. **Ice content** (amount of actual ice likely to be present in the ground in the permafrost areas) is represented as high, medium, low, or none.

For your selected community, what is the permafrost type shown on the map?

____

Do you think that this is true? ___________

Why or why not? ____

____

Do you think melting permafrost could be hazardous to your community?

____

Why or why not? ____

____

7. **Turn off your shaded relief layer and zoom out to the whole state.**

   Based on what you see on your map, name two communities that would have a VERY difficult time digging outhouse holes because the ground is frozen. Use the **Identify** tool. (Hint: Sometimes it seems to take more than one click of the cursor with the "Identify Results" window open to make the tool work. Also, make sure the right layer is active - in this case the Permafrost layer.)

   1. ________________________________

   2. ________________________________

   Are there parts of the state that don't have permafrost? ________________

   Based on what you know and have learned so far, do you think that permafrost affects the location of roads?

   ____

   Why or in what way? ____

   ____

Have your teacher review your work.

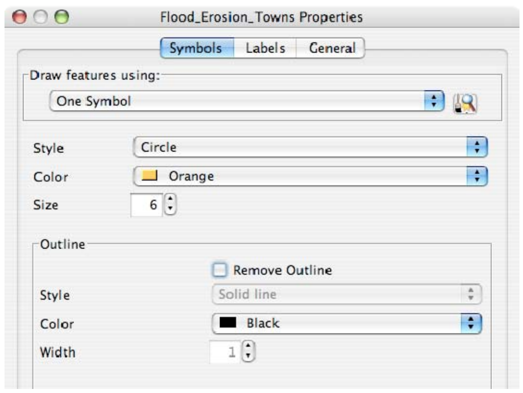
Teacher sign-off: ___________________________

Explore 2: Flooding and Erosion Hazards

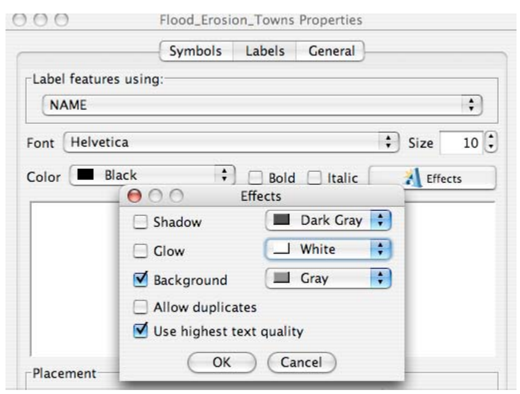
1. For this exercise, **turn off** the ***Towns*** layer.

2. **Add** the layer ***Flood_Erosion_Towns*** from the ***Hazards*** folder in ***Data_MapTEACH***.

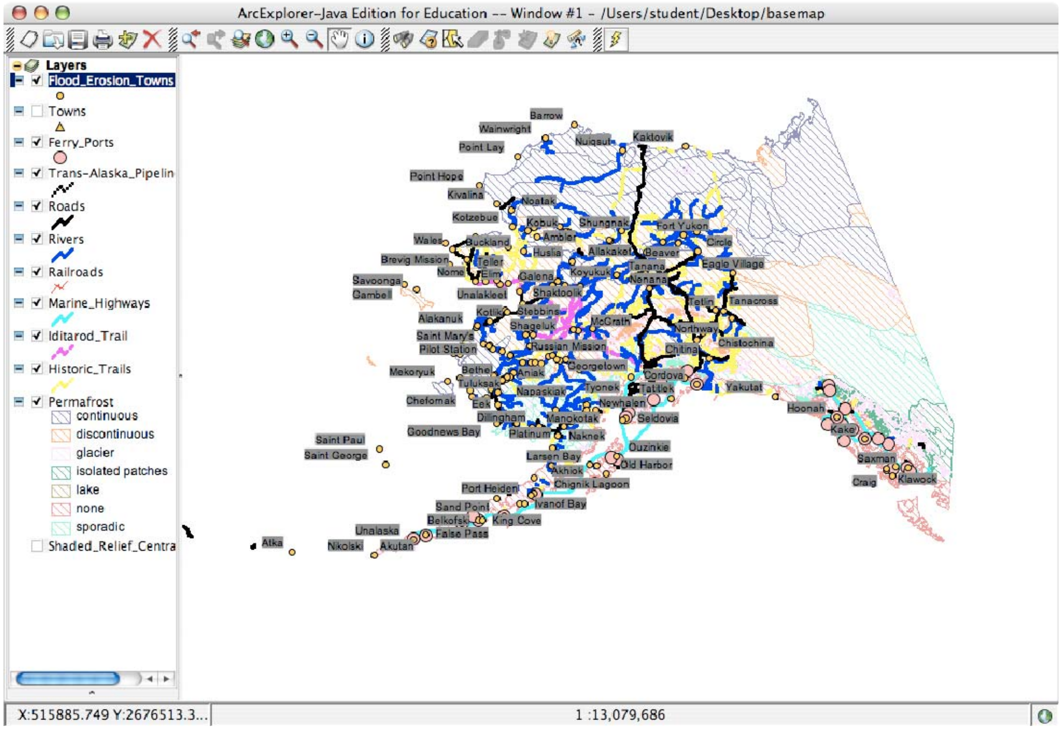
3. **Symbolize the layer using the Properties menu.**
   In the **Symbols** tab, assign **Circle** for **"Style," Orange** for **"Color," 6** for **"Size,"** and **uncheck "Remove Outline."**



4. In the **Labels** tab, **"Label features using:" NAME**, and assign **Helvetica** for **"Font," 10** for **"Size,"** and put in a **"Background" effect** using **Gray**.



If you zoom to full extent, your map might look something like this:



5. **Zoom around the State and look at the distribution of the towns in this data layer**.

   See if you can figure out a relationship between the locations of the towns and any other features or data layers displayed on your map.
   (Hint: Think about the name of this data set, and what kinds of places you might expect to find towns like these)

   What is the relationship, and with what other layer or layers?

   ____

   ____

   ____

   ____

   Is your project community included in this data layer? __________________
   If it is included, there is potential for flooding and/or erosion in your community.

If present, do you think your project community's flooding and erosion hazard is due to *coastal processes* or is it due to *river processes*?

____

What is the GIS evidence to support this conclusion? ___________________

____

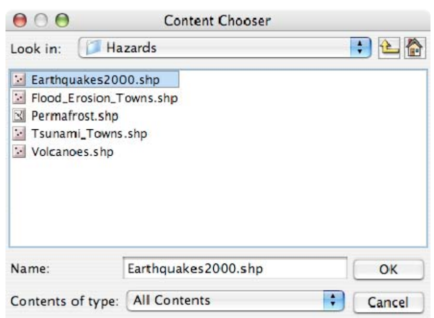
Have your teacher review your work.

Teacher sign-off: __________________________

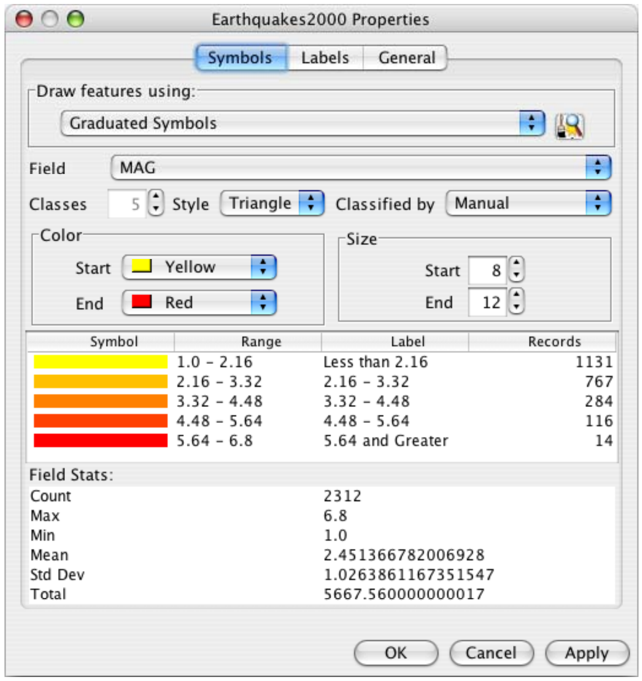
Explore 3: Earthquake Hazards

1. **Turn off** the ***Flood_Erosion_Towns*** layer and **turn on** the ***Towns*** layer.

2. **Add** ***Earthquakes2000*** from the ***Hazards*** folder. This layer shows Alaskan earthquakes that occurred in 2000.



3. **Symbolize Earthquakes** any way you like. Here's one example that shows how to use graduated symbols as food for thought, but it's up to you!



Are there many earthquakes recorded near your Project Community?

____

How far away is the nearest earthquake? _____________________
(Use the **Measure** tool, in miles or kilometers)

Use the **Identify** tool to answer the following questions:

What is the date of the nearest earthquake (DATE)?_____________________

What is the depth (DEPTH)? ____
(Units are kilometers)

What is the magnitude (MAG)? ______________________________________

Based on your experience, is this a big earthquake? _____________________

Based on the number of earthquakes near your Project Community, do you think earthquake hazards are a problem?

____

Explore 4: Tsunami Hazards

1. **Turn off** the ***Towns*** layer.

2. **Add** ***Tsunami_Towns*** from the ***Hazards*** folder. This layer shows Alaskan communities that are believed to have tsunami hazards.

3. **Symbolize** and **label** the ***Tsunami_Towns*** the way you like them.

   Is there potential for tsunamis in your Project Community? ______________

Explore 5: Volcanoes

1. **Turn off** the ***Tsunami_Towns*** layer and **turn on** the ***Towns*** layer.

2. **Add** ***Volcanoes*** from the ***Hazards*** folder. This layer shows Alaskan active volcanoes.

3. **Symbolize** ***Volcanoes*** the way you like them.

   Are there any active volcanoes near your Project Community? ____________

   How far away is the nearest volcano?________________________________
   (Use the **Measure** tool, in miles or kilometers)

   What is the name of the nearest volcano? ____________________________
   (Use the **Identify** tool)

   Do you think that the closest volcano might be a hazard for your Project Community?

   ____

   Why or why not? ____

   ____

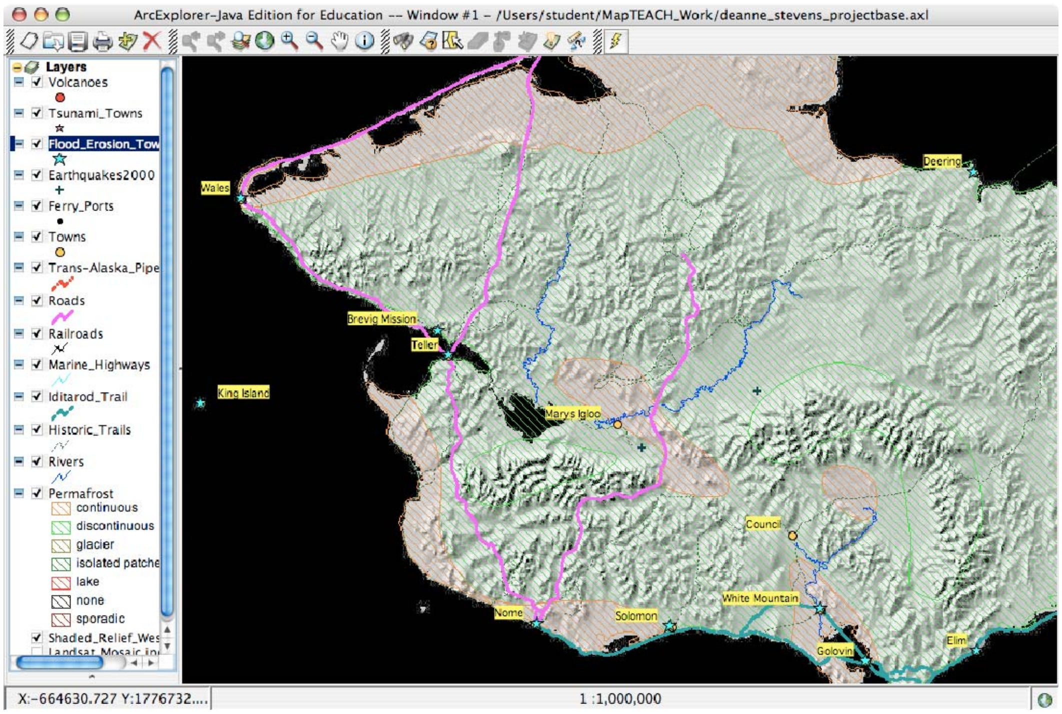
   Do you think it is important for planners to know what natural hazards affect communities?

   ____

   Why or why not? ____

   ____

At this point, your map may look something like this:



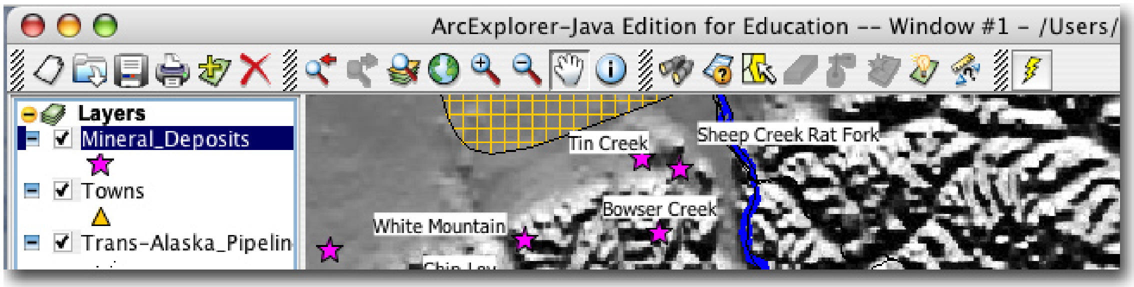
Save your map project.

You now have a project that contains all the hazards layers. If you decide you want to make a hazards 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: ___________________________

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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions 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 to 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/common/secondary.htm

The GEODE educational project hosts an online map of worldwide geological resources and hazards at http://geode.usgs.gov

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://wwwdggs.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/alaska/

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.html

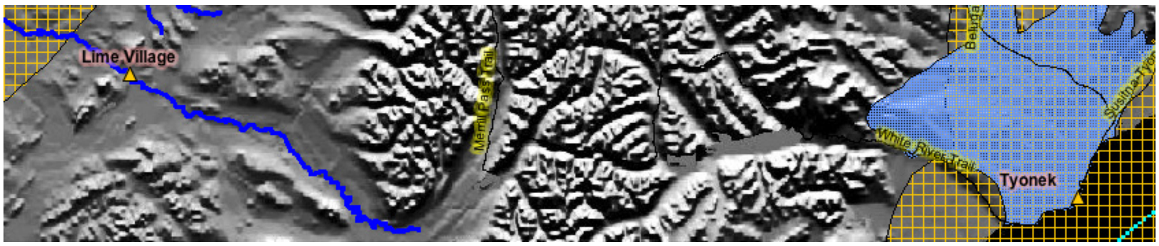
USGS Mineral Resources Data System (MRDS) describes metallic and nonmetallic mineral resources throughout the world and a smaller data set for North America, including Alaska. Included are deposit name, location, commodity, deposit description, geologic characteristics, production, reserves, resources, and references. Requires selectively downloading data sets as shapefiles.
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 (require installation of Mr. SID format viewer) See http://www.commerce.state.ak.us/dca

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)

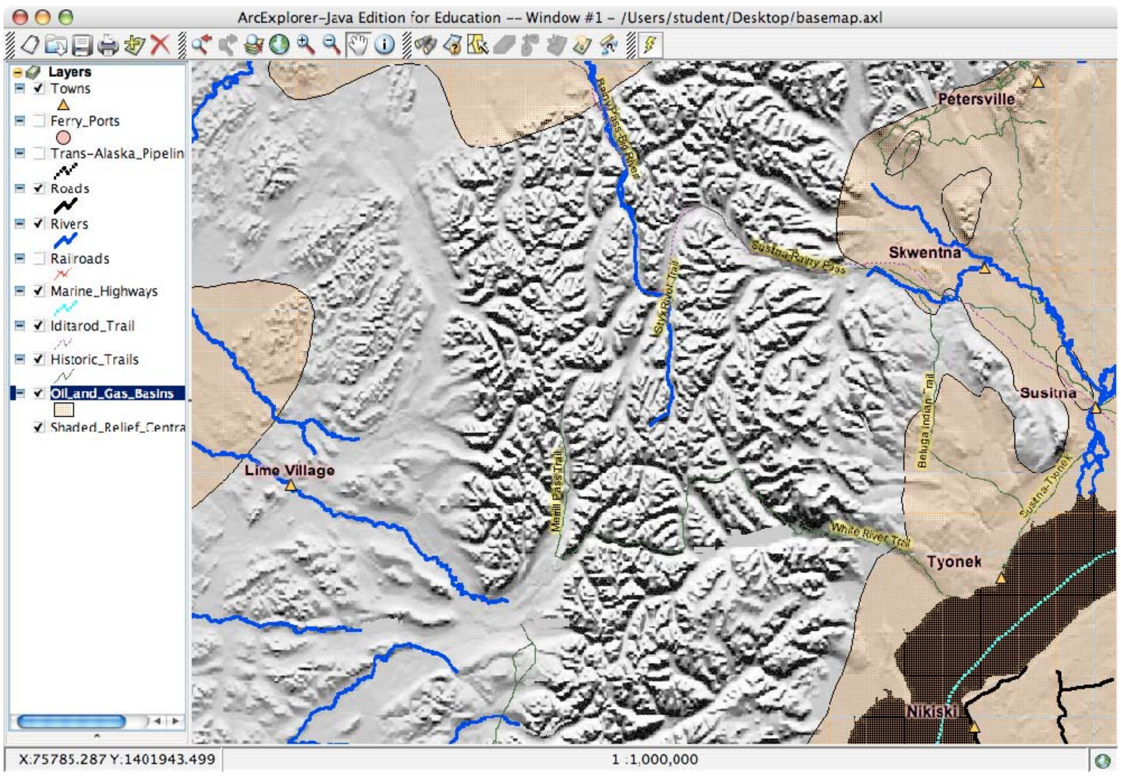
Make your window bigger by clicking on the green button in the top left of the window.

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?

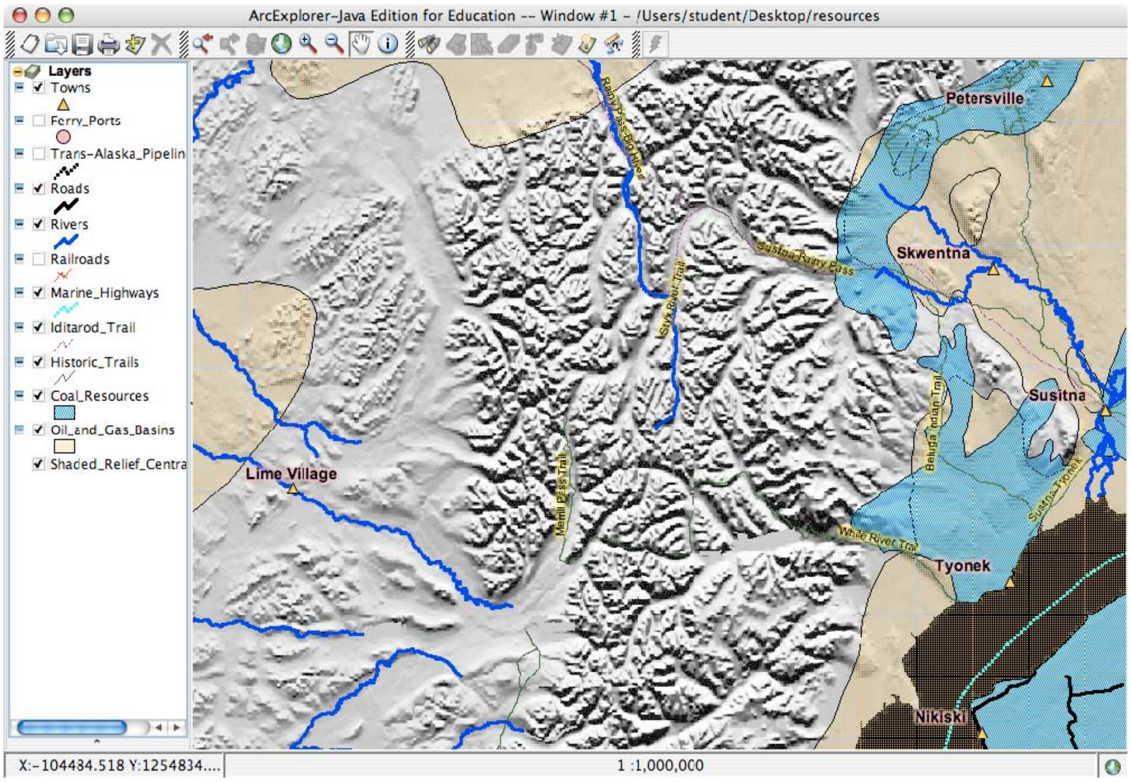
____

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?

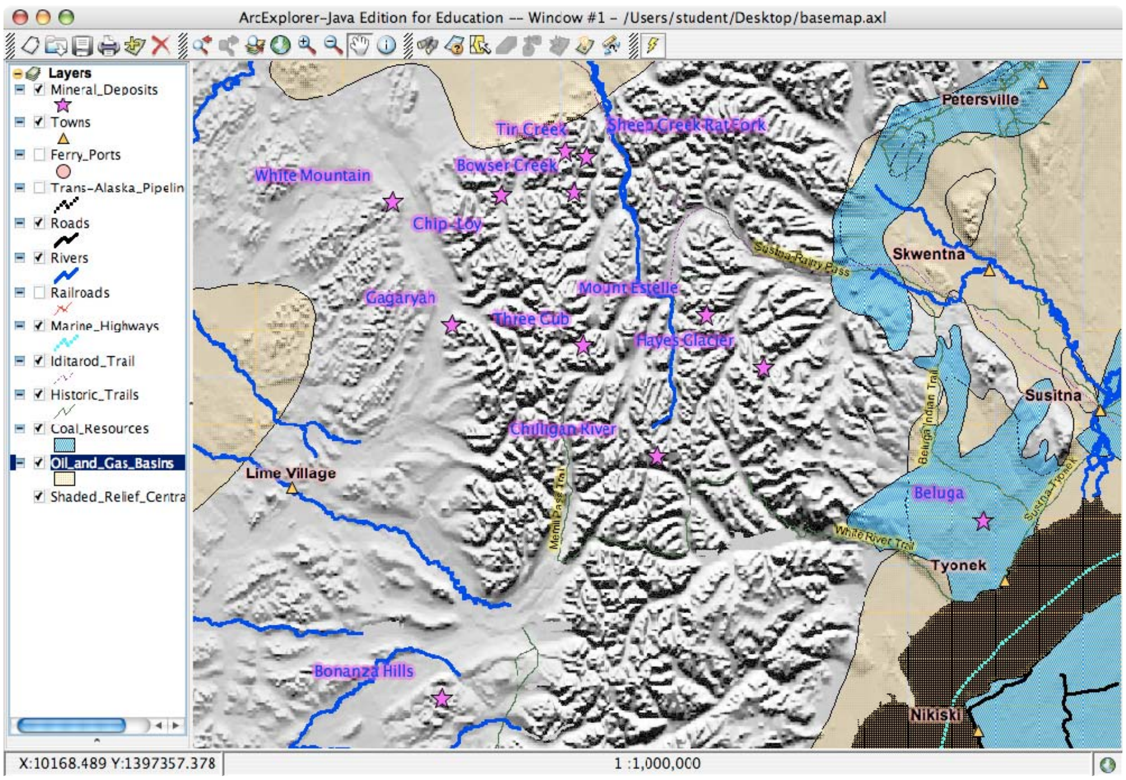
____

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**

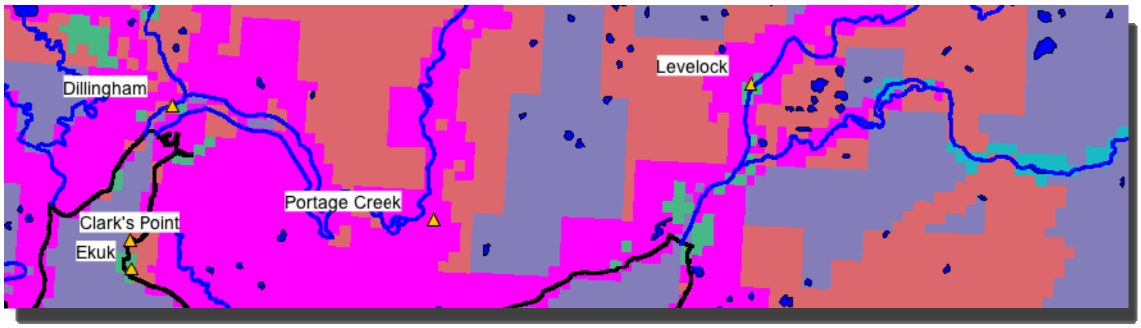
You now have a project that contains all the resources layers. If you decide you want to make a geologic natural resources map of your Project Community for your final project, this is the GIS project file that you can use to start with.

Have your teacher review your work.

Teacher sign-off: __________________________

(REMEMBER TO SAVE YOUR PROJECT!!)

GIS Lesson 9
COMMUNITY GIS: LAND MANAGEMENT
TEACHER INFORMATION



Lesson Summary: Who decides what is done with land in Alaska? This lesson provides students with a way to see some of the perspectives different stakeholders use to manage the land. Using GIS tools and information, the students are able to investigate the distribution of resources both regionally and locally by starting from their project community or game management units and moving outward. The maps students make can help them explore current and potential resource use by their project communities.

Objectives: Students will explore a variety of GIS data sets that can be helpful for community planning, and answer questions relevant to their Project Communities. They will also learn to use more GIS tools to analyze data.

Estimated Time: 1 hour

Correlation to Alaska Standards:

Geography A-4 Use graphic tools and technologies to depict and interpret the world's human and physical systems.

Geography F-6 Utilize geographic knowledge and skills to support interdisciplinary learning and build competencies required of citizens.

BACKGROUND FOR THE TEACHER

The relative abundance of land in Alaska relative to the number of residents only makes individual understanding and participation in land management more essential and influential. At the same time, huge tracts of land are already spoken for; often controlled by governmental, non-governmental and private entities that are geographically and culturally distant from local communities. The better students understand the status of land and the many stakeholders who have roles in making decisions about the land, the better they can participate as citizens.

This lesson is just one way for students to begin to understand what is going on from a mapping perspective. For broader and deeper perspectives that can inform other curricular activities, resources available through the Planning and Land Management Section of the state Division of Community and Regional Affairs provide information for Alaska communities at: http://www.commerce.state.ak.us/dca/planning/planning.htm

Some Important Concepts and Tips for Success:

- Community planners promote the best use of a community's land and resources for local residents, businesses, government organizations and native corporations. They address environmental, economic, and social health issues of a community as it grows and changes.
- If time and the curriculum allow, bringing in a local expert or other active stakeholder to talk with students about the maps they are making is an excellent supplementary activity.

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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions for the lesson

INSTRUCTIONAL PROCEDURES

Getting Ready

This is an interesting lesson to try out ahead of time, since you as a teacher can learn some new things about how land is managed for and around the community where you teach, or any other place of interest to you in Alaska.

Gear-up

- Everyone spends time out on the land for many different reasons, so this is another lesson where students can describe personal observations and experiences that bring meaning to the lesson. The lesson can be introduced by asking students questions about how local land status has affected them, their families and friends - all stakeholders with valuable insights to share.

- The “buffer” concept may be worth introducing, to help ready the student for using a GIS buffer in this lesson. A buffer is an area of specified distance (radius) around a map feature or features.
- Check in on students’ progress throughout the lesson to keep them on track to finish on time. 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 the best use of land and of stakeholder participation in community decisions.

TEACHER RESOURCES

The Alaska Economic Development Resource Guide is designed to bring together in one place an inventory of programs and services which can provide economic development assistance to Alaska communities and businesses. http://www.commerce.state.ak.us/dca/edrg/EDRG.htm

Get the word out about your students’ Alaskan community projects by contacting staff at MapTEACH or by submitting projects to the ESRI Community Atlas program. http://www.esri.com/industries/k-12/atlas/index.html

RESOURCES FOR STUDENTS OR TEACHERS

The Planning and Land Management Section for the state Division of Community and Regional Affairs provides assistance to Alaska communities on regional and local land issues. http://www.commerce.state.ak.us/dca/planning/planning.htm

High water lines from historic floods are one of the features included in Alaskan Community Profile Maps. These maps can be viewed over the internet after the installation of a Mr. SID format viewer. These maps cannot be viewed using AEJEE. http://www.commerce.state.ak.us/dca/profiles/profile-maps.htm

The Alaska Dept. of Commerce provides information and overviews for communities via the Community Database Online at http://www.commerce.state.ak.us/dca/commdb/CF_COMDB.htm

An extensive collection of community photos throughout Alaska recognize the uniqueness of life in Alaska, and offer a glimpse of communities, their environment, events and everyday life. Find photos of your community at http://www.commerce.state.ak.us/dca/photos/comm_list.cfm

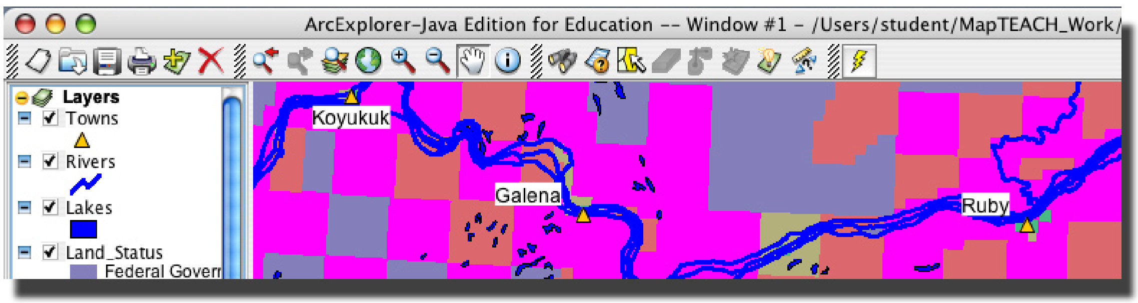
To see economic information by borough or census area, click on the Alaska map at http://www.commerce.state.ak.us/dca/AEIS/AEIS_Home.htm

Community plan documents can be found in the Plans Library and can provide students with background information, history and current plans for their project communities. http://www.commerce.state.ak.us/dca/commdb/CF_Plans.cfm

Name: ____________________

Project Community: ____________________

GIS Lesson 9
COMMUNITY GIS: LAND MANAGEMENT
STUDENT EXERCISE



Objectives: Students will explore a variety of GIS data sets that can be helpful for community planning, and answer questions relevant to their Project Communities. They will also learn to use more GIS tools to analyze data.

Estimated Time: 45 minutes

By the end of this lesson, you will be able to work with data layers of land ownership and management and use some new GIS tools to answer questions that are important for community planning projects.

Young people like you are among the many different kinds of *stakeholders* who want to influence how land is managed. Stakeholders are people who will be impacted by decisions made about the land, and may include individuals, communities, and governments. These stakeholders may be local residents, landowners, leaseholders, managers, or other people who have other relationships with community land. Planners need to be aware of who the stakeholders are in their area so they can work with everyone and make sure that important concerns and issues are addressed.

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:

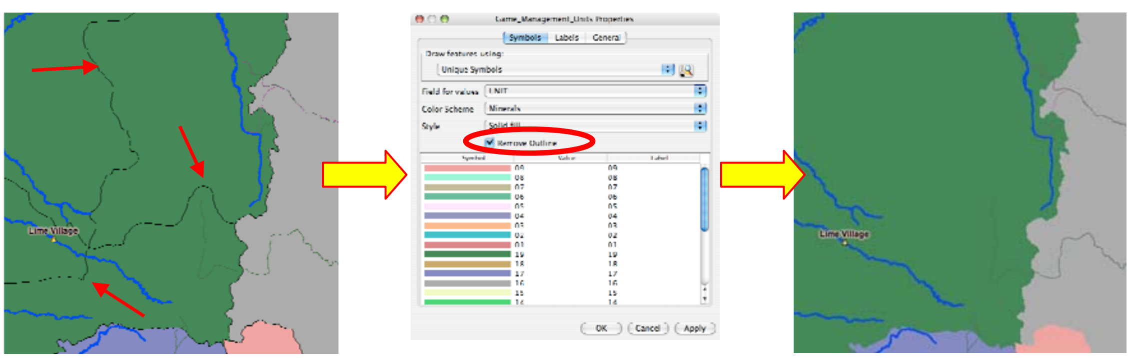
- **Click** on **"File"** in the Menu Bar
- Select **"Open"**
- **Navigate** to the **student / MapTEACH_Work** folder
- **Click** on the file name **firstname_lastname_projectbase.axl** and **click "Open"**
- Wait a few minutes while your map re-loads

The data layers we are going to be working with will be easier and faster to work with if we **turn off** the **shaded relief raster image**, so do so now.

Explore 1: Game Management Units

1. **Add *Game_Management_Units*** from the ***Management*** folder. This layer shows the Game Management Units from the Alaska hunting and fishing regulations. It tells a community what the seasons and bag limits are on fish and game in their area.

2. **Symbolize** the ***Game_Management_Units*** the way you like them, using **"UNIT"** as your **Field for values**.
   - Notice that there are some "extra" lines within the Game Management Units. This is because each unit in this data set is also broken into subunits.
   - You can make the map draw more neatly if you **check** the **"Remove Outline"** box in the Properties window.



Use the **"Identify"** tool to answer these questions:

What Game Management Unit is your Project Community in (UNIT)?

____

What Game Management Subunit is your Project Community in (SUB)?

____

When you have more time, you might be interested in looking up your Project Community's hunting and fishing regulations online at the Alaska Department of Fish and Game website: http://www.adfg.state.ak.us/

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 "management": **firstname_lastname_management**

Explore 2: Native Corporations

1. **Turn off** ***Game_Management_Units***.

2. **Add** ***Native_Corporations*** from the ***Management*** folder. This layer shows the Native Corporation boundaries.

3. **Symbolize** the ***Native_Corporations*** the way you like them, using **"NAT_CORP"** as your **Field for values**.

   What Native Corporation is your Project Community in (NAT_CORP)?
   (Use the **"Identify"** tool)

   ____

Explore 3: Wildlife Refuges

1. **Turn off** ***Native_Corporations.***

2. **Add** ***Wildlife_Refuges*** from the ***Management*** folder. This layer shows the boundaries of Alaska's *special use areas* including Parks, Preserves, Monuments, Wildlife Refuges, and Conservation Areas.

3. **Symbolize** the ***Wildlife_Refuges*** the way you like them, using **"NAME"** as your **Field for values**. If you want, you can also label the areas in this layer using **"NAME."**

What special use area is your Project Community closest to (NAME)?
(Use the **"Identify"** tool)

____

How far away is the nearest special use area? ____________________ miles
(Use the **"Measure"** tool)

Explore 4: Using the Buffer Tool to Query Land Status

Up until now, we have used the **Info** tool to find out information about features in our AEJEE projects. Now we're going to do something a little more advanced to ask questions about, or *query*, our data.

We will do a special kind of query using the AEJEE **Buffer** tool to answer the question *"Who are the owner-stakeholders for the area within 25 miles of my Project Community?"*

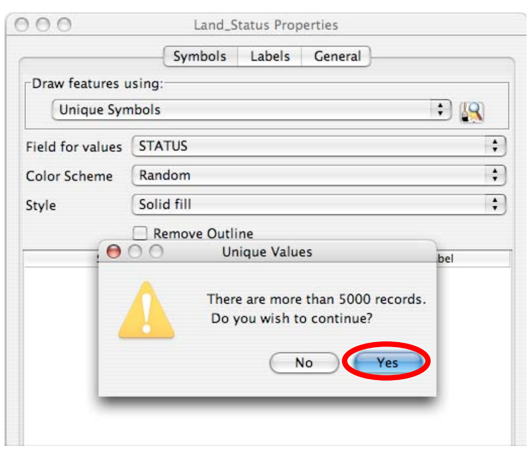
First, let's set up our map data:

1. **Turn off *Wildlife_Refuges***.

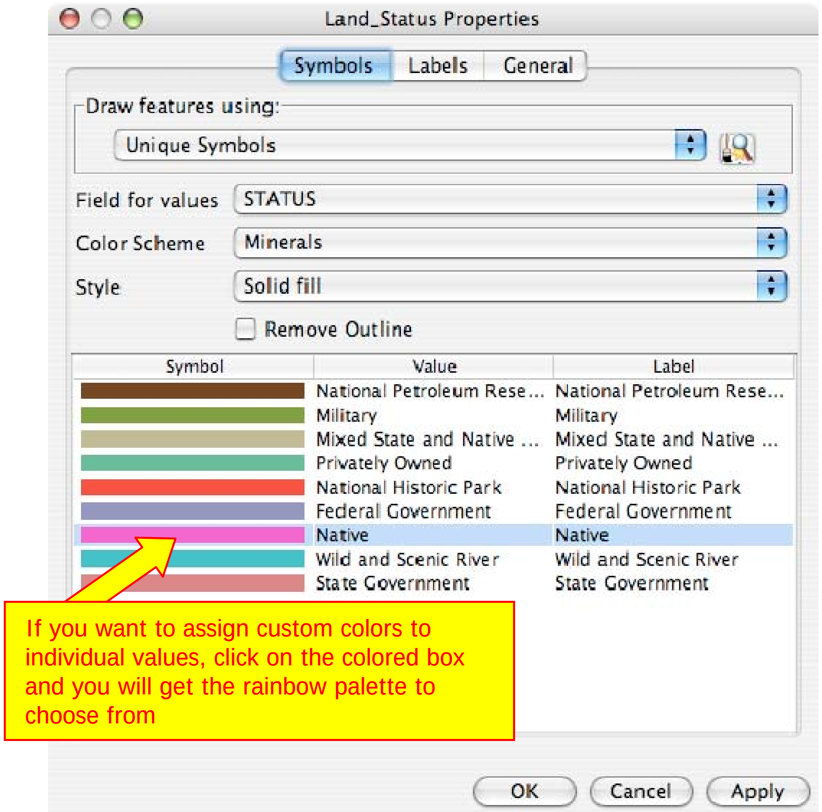
2. **Add *Land_Status*** from the ***Management*** folder. This layer shows general land ownership for Alaska. This is a really large data set, so it will be somewhat slow to draw.

3. **Symbolize *Land_Status*** the way you like it, using **"STATUS"** as your **Field for values**.

   A warning message will appear on the screen because this is a very big data set. **Click "Yes."**



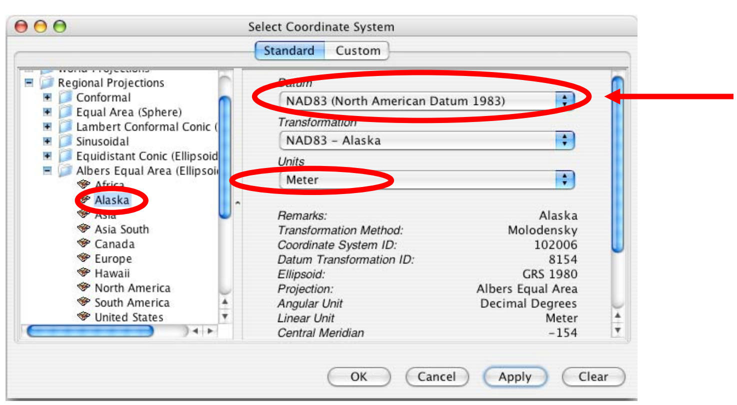
Change the colors until you like the way they look. Here is an example – **you don't have to do it exactly like this**:



Let's get the map area set up a little better before we begin our query:

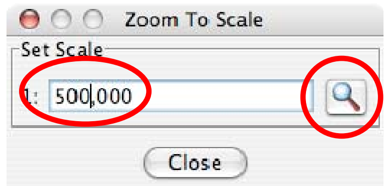
1. First, refresh the projection for your map. **Use Tools/Projection** to open the **Select Coordinate Systems** window to set your projection to **Regional Projections/Albers Equal Area (Ellipsoid)/Alaska**, and leave the "Datum" as **"NAD83 (North American Datum 1983)."**

Set the "Transformation" to **NAD83 – Alaska**



2. Click “OK” and wait patiently until the map redraws.

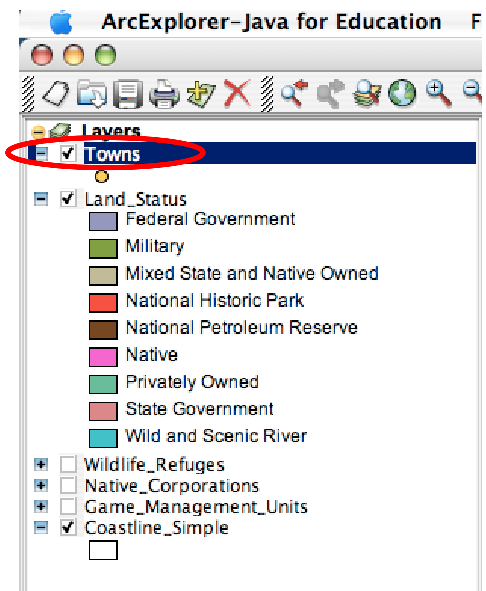
3. Zoom in to your Project Community at a scale of **1:500,000** using the **“Zoom To Scale”** tool in the **View** menu. Remember to click the magnifying glass button to apply the scale setting.



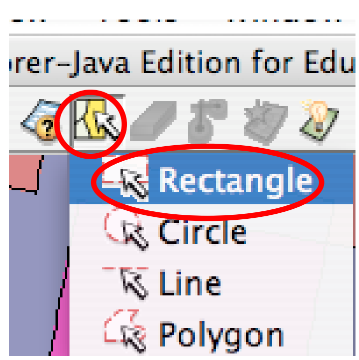
4. **Pan** so your **Project Community** is in the **center** of your screen.

It’s time to begin the query process:

1. **Click on *Towns*** in the **Table of Contents** to highlight it blue (this means it has been selected as the layer we are going to be querying).



2. **Click** on the **“Select Features”** button on the menu bar and **select “Rectangle”** from the menu.



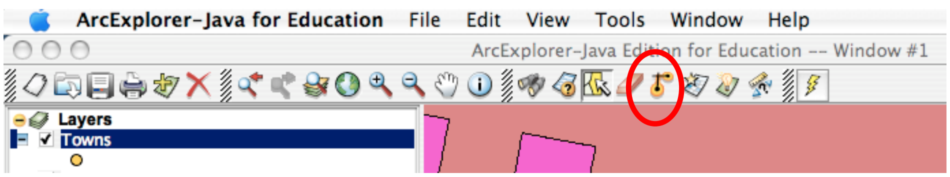
3. **Click and drag a small box on your map just around the symbol for your Project Community.** The symbol representing your Project Community should become highlighted on your map.

Have your teacher check your selection.

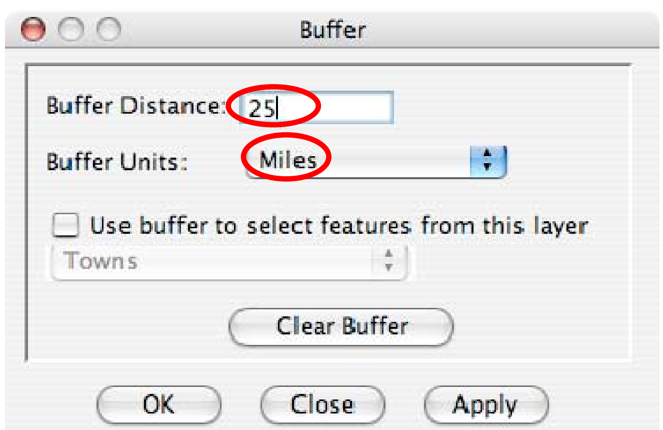
Teacher sign-off: ______________________________
(Confirm that only the student's Project Community is highlighted)

Use the Buffer tool:

1. Now, **click** on the **"Buffer"** button on the menu bar.

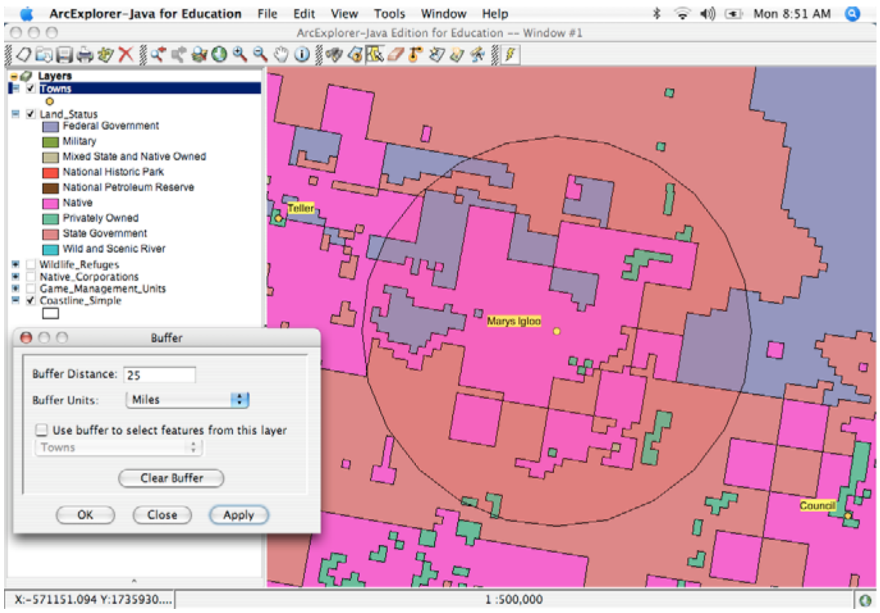


2. In the Buffer window, type in **"25"** for **Buffer Distance** and keep **"Miles"** for **Buffer Units**.



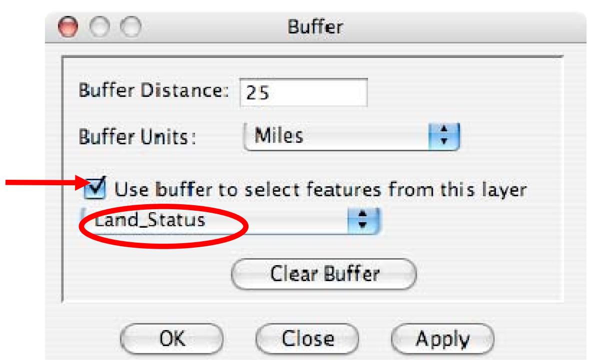
3. **Click "Apply."**

4. Your screen should look something like this (but with **your** project community in the center):



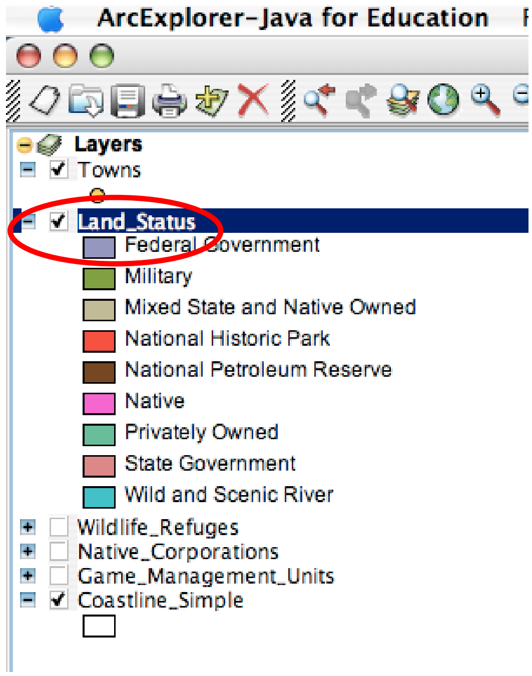
You could use this 25-mile radius circle to *visually* determine who the stakeholders are within 25 miles of your Project Community, but GIS has a better way:

5. In the Buffer window, **click the box** for **"Use buffer to select features from this layer"** and **select "Land_Status"** from the drop-down menu.

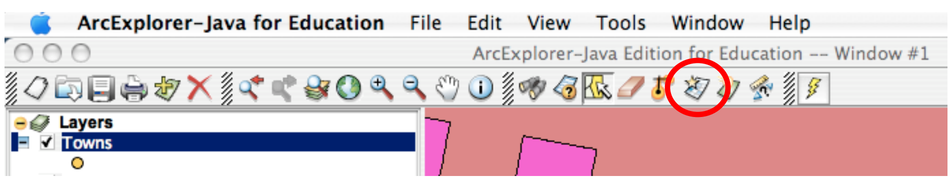


6. **Click "OK."** All the ***Land_Status*** blocks within 25 miles of your Target Community should now be highlighted. You might need to wait a minute or two for it to find all the areas and highlight them.

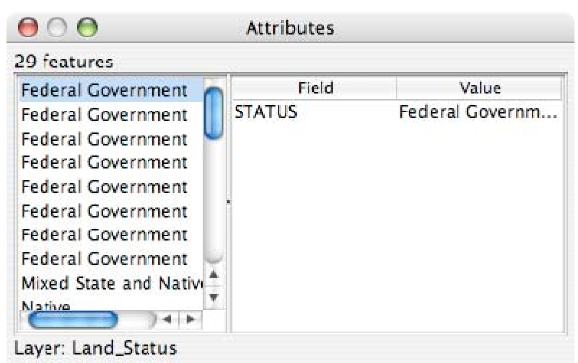
7. **Click on *Land_Status*** in the **Table of Contents** to highlight it.



8. Now, **click** on the **"Attributes"** button on the menu bar.



The Attributes window will appear, listing all the *Land_Status* information for the blocks within 25 miles of your Project Community.



Have your teacher check your project.

Teacher sign-off: ___________________________
(Confirm that the student has an appropriate Attributes window)

Scroll down the list of features in the Attributes window to see the land status of the area you selected with the buffer.

Based on the results in your Attributes window, list the stakeholders for the area within 25 miles of your Project Community (you probably won't need all the spaces below):

1. ____

2. ____

3. ____

4. ____

5. ____

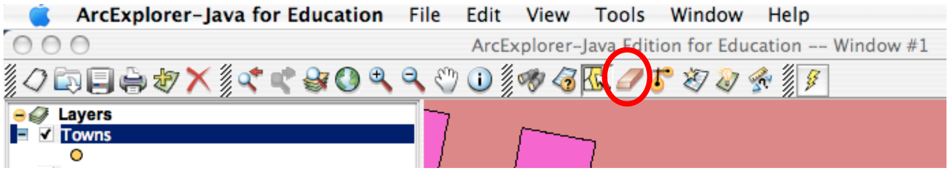
6. ____

7. ____

8. ____

Close the Attributes window by clicking the red button on the top left of the window.

Now, **click** on the **"Clear All Selections"** button on the menu bar. This will clear the highlights from your screen. This 'eraser' resets the map.



Explore 5: Finishing the Land Status Map

The shaded relief base layer may not display well with all this polygon data. You can try it out, but will need to use patterns for your land status for the shaded relief to show through your data.

An alternative way to have a map with enough geographic features to make it informative is to **add *Lakes* *and* *Glaciers*** from the ***Landscape*** folder.

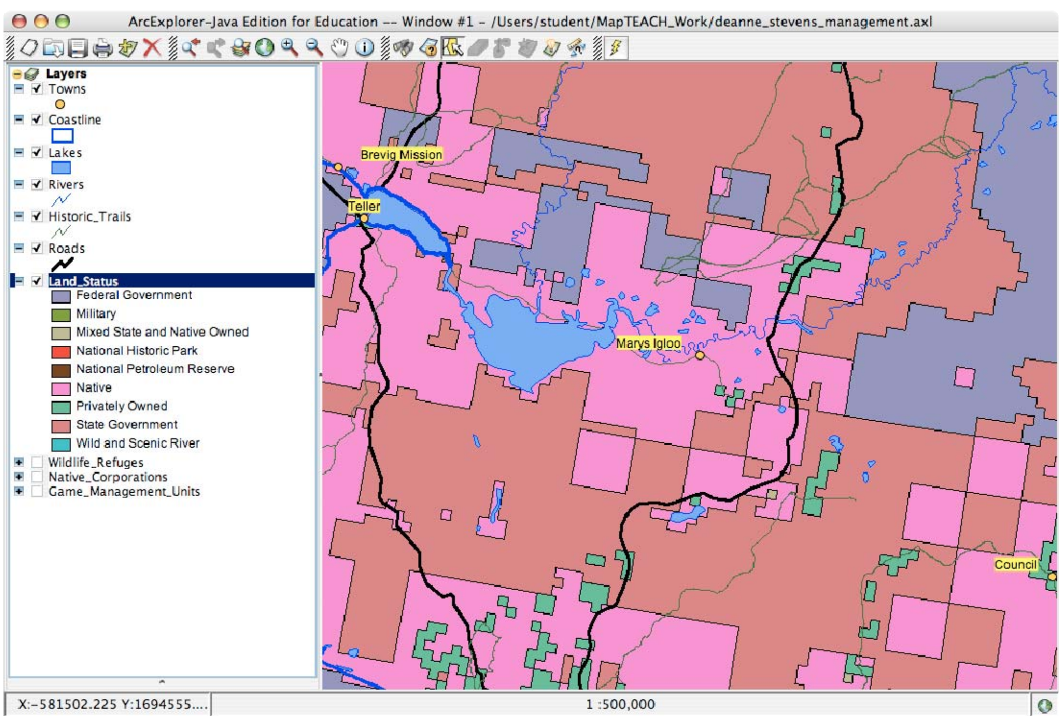
If your area does not have any lakes or glaciers, you can turn those layers off or remove them. You can also turn off any other layers that do not appear in your map view, since you won't see them in your map anyway.

Only if you are on the coast:

- **Add *Coastline*** from the ***Base_Data*** folder.
- **Move *Coastline*** to **just below *Towns*** in the **Table of Contents**.
- **Ctrl-Click** on the ***Coastline*** layer to open the Properties window, use the **Style** box and its pull-down menu to choose **"Transparent Fill"** and **click** on the **"OK"** button.

Symbolize the remaining visible layers to make them look the way you like them.

Your map might look something like this:



You now have a project that contains all the management layers.

If you decide you want to make a land management, land status, or stakeholders map of your Project Community for your final project, this is the GIS project file that you can use to start with.

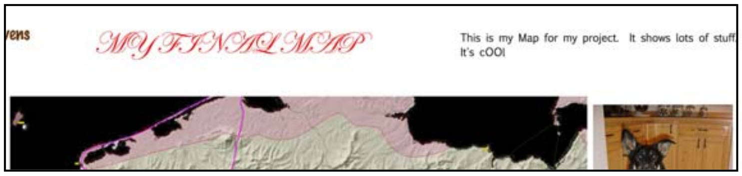
Save your personalized "Community GIS: Land Management" map project.

Show your map to a teacher.

Teacher sign-off: ___________________________

(REMEMBER TO SAVE YOUR PROJECT!!)

GIS Lesson 10
GOOD MAP – BAD MAP
TEACHER INFORMATION



Lesson Summary: The teacher reviews the basic cartographic guidelines, and then shows an example AEJEE map that is cartographically incorrect, incomplete, and poorly designed. Students critique the map. A correct, complete, and attractively designed map is then reviewed for comparison.

Objectives: Students will apply the principles of good cartography to critically evaluate maps for completeness, correctness, and aesthetic appeal.

Estimated Time: 30 minutes

Correlation to Alaska Standards:

Arts C-1	Know the criteria used to evaluate the arts; these may include craftsmanship, function, organization, originality, technique, and theme.
Arts C-3	Accept and offer constructive criticism.
Arts C-4	Recognize and consider an individual's artistic expression.
Arts C-5	Exhibit appropriate audience skills.
Geography A	Make and use maps, globes, and graphs to gather, analyze, and report spatial (geographic) information.

BACKGROUND FOR THE TEACHER

Cartography is defined as the science of making maps, but it is also an art. There are many different kinds of maps, and *how* map information is depicted is highly dependent on the *type* of information and the *intent* of the map. The cartography "Student Checklist for Success" sheet provides a good overview of elements that are desirable in cartographically-correct AEJEE maps, as well as some guidelines to help make good decisions about cartographic design elements.

This exercise can be used before students have done a layout in AEJEE to help them think about what constitutes a “good” map as they begin working on their own map. It can also be used very effectively after students have already had the experience of making a layout of their own and are ready to take their cartography skills up to the next level.

MATERIALS

- At least one example each of a good AEJEE map and a bad AEJEE map, preferably prepared by the teacher, for use as an overhead or as part of a PowerPoint that can be projected on the screen; or, use the examples provided in the “Map Layouts and Cartography” PowerPoint.
- "Map Layouts and Cartography" PowerPoint, available from MapTEACH
- Copies of cartography handout *Student Checklist for Success*
- Blackboard/whiteboard or flip-chart, with appropriate chalk or markers

INSTRUCTIONAL PROCEDURES

Getting Ready

If you wish, prepare your own good and bad map layouts in AEJEE, export them to JPG format, and print as overheads or place in the “Map Layouts and Cartography” PowerPoint to use instead of (or in addition to) the examples that are provided.

Gear-up

- Ask students what sorts of things they would expect or want to see on a professional map. Prompt them with questions that will guide them to recognize that it would be important to have things like a scale, title, north arrow, author, date, etc.
- Explain that cartography is the science of making maps, and that people who professionally make maps are called “cartographers.” Cartography has a lot of rules and guidelines, but the biggest mission for mapmakers is to make their maps attractive and easy to understand by their audience. A well-made map is a work of art as much as it is a product of science.
- Use the “Map Layouts and Cartography” PowerPoint cartographic basics slides to review all the things that should be included on a map, and design guidelines that will help students succeed in making professional-looking map products. (Note: you may choose to wait to show this until after the students have first critiqued the maps using their own ideas and opinions of what makes a map “good” or “bad.”)
- Explain that you have been making maps in AEJEE just like they have (or will be), and that you are anxious to show them what you can do. In this exercise they will get a chance to evaluate some maps that you, the teacher, made in AEJEE!

Explore

- Project the “bad” map on the screen and ask students what they think of your fine map example. Use the flip-chart or the board to write down each item the students find that is bad. As they make their criticisms, ask them what could be done to correct each problem. Write each “fix” next to the problem.
  - o Students love it when you ham it up – if they say something is wrong on the map, prompt them to elaborate by saying things like “What’s wrong with my map title? *My cool MaPe* is a perfectly good title – it’s my map, and it’s cool!” or “What do you mean there’s no north arrow? It’s right there in the middle of the map – it just happens to be the same color as the feature it’s sitting on top of…”
- Project the “good” map on the screen and ask students what they think of this one. Use the flip-chart or the board to record their observations.

Generalize

Pass out the cartography “Student Checklist for Success” handout and ask them if there is anything that they would change if the “good map” were their map. Explain that good cartography is an art as well as a science, and that many design decisions are based on personal preference. You do not expect or want everybody’s maps to look the same!

Apply/Assess

GIS lesson “Map Layouts.”

TEACHER RESOURCES

Guidance for very basic map design principles can be found at ESRI at:
http://www.esri.com/industries/k-12/download/docs/intrcart.pdf

A very interesting book that investigates how maps have been used to control perceptions and interpretations of geospatial information:
Monmonier, Mark. 1996. *How to Lie with Maps*. University of Chicago Press.

The classic handbook of cartography:
Robinson, Arthur H., Morrison, Joel L., Muehrcke, Phillip C., and Kimerling, A. Jon. 1995. *Elements of Cartography*. Wiley, John & Sons, Incorporated.

Date: ____________________ Name: ______________________

Student Checklist for Success:
Cartography and Map Layout for Final Project

Check off every item in this list to make sure you have a complete final map that follows good cartographic principles.

Before You Start

☐ Map has a clearly defined theme – what is the message you are trying to get across to the viewer? This theme will be reflected in your title, your descriptive text, and the data you choose to represent on the map.

In Map View

☐ If appropriate, map includes a suitable raster base layer (topographic map, SPOT5 satellite image, or Landsat satellite image)

You can only choose one for your layout, so think about:

- Your map theme: which base layer will help you get your message across best?
- How large an area your data points spread out over: if your points cover a small area, use a base layer with lots of detail; if your points cover a large area, use a base layer with less detail.
- Legibility and ease of reading: which base layer allows you to see your data better when you plot your points on top of it?

☐ Map includes your selected data points, symbolized and labeled so they are legible and informative.

- Symbol sizes and colors show up well on the base layer and don't interfere with each other.
- Label text is a legible font style, color, and size, and shows up well on the base layer.

☐ Map area is zoomed in on your selected data points and whatever other features you want to show on your map.

****

You need to get this all figured out and finalized BEFORE you go on to the next step – you may have problems with AEJEE if you try to go back and change any of these after you have begun your layout

****

In Layout View

☐ Map balance: elements are placed on the page so you there is an even distribution of elements covering the page and there isn't a lot of white space.

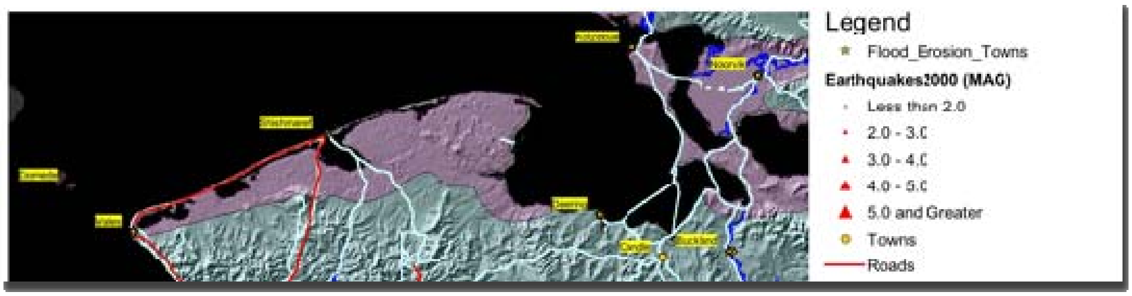
☐ Fonts for text and titles are carefully selected:

- Choose fonts that are easy-to-read, attractive, and fit your theme.
- Try to limit yourself to no more than two fonts; this helps your map look more uniform and professional.
- The title is usually the largest font size on the map.

☐ Map includes the basic elements essential to a good map layout:

- Data Frame: should be large enough to adequately show the data/features of your map.
- Title and Text: title and text should reflect your map theme - text should provide additional information about your map and data and how it relates to your map theme; it is also helpful to the viewer if you provide information about your map projection and datum.
- Legend: make sure it is legible.
- Scale: choose units that make sense for your map, usually miles or kilometers; typically placed right below the data frame.
- North Arrow: make sure it is easy to see, but not too large; typically placed next to the scale, right below the data frame.
- Author: full name, spelled out the way you would want someone to cite you if they were referencing your work.
- Date: date the map was completed; using a smaller text size, you could also include the date of the base map (if known) and date(s) that data were collected.
- Citation/Credit: give thanks and/or credit to anyone who has contributed to the data on the map, including gathering the data and sharing information or resources with you.
- Photograph: use one or more photographs that relate to your map theme and the data you are representing; be sure to include text explaining what the photo shows and who the photographer was.
- *Optional overview map (also called a location map): this map shows a larger area with an outline of where your map fits into it and gives the viewer an overview of where your map area is located.*

GIS Lesson 11
COMMUNITY GIS: MAP LAYOUTS
TEACHER INFORMATION



Lesson Summary: Students make map layouts that can be used to print paper maps and to make graphics for reports or presentations. The lesson begins by opening the hazards project from GIS Lesson 7 “Community GIS: Geologic Hazards.” Once the hazards project is set up carefully, AEJEE is used in layout mode to add required elements and build up a cartographically complete map. The resulting layout is exported as a JPG graphics file to create a permanent map document that can be printed or used in a variety of other computer applications. The map JPG is imported into MS Word and printed.

Objectives: Students will learn to use GIS tools to produce cartographically complete map layouts using Alaskan GIS data sets helpful for community planning.

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.
Technology A-1	Use a computer to enter and retrieve information.

BACKGROUND FOR THE TEACHER

Students really like working on map layouts, in spite of technical challenges, exacting instructions and nearly inevitable ‘AEJEE layout crashes’ that require them to go back and start over from their original (saved!) project. Student time and task management must be closely monitored as they enthusiastically devote so much time to tweaking the appearance of their layouts, work carefully through many small steps, and try to complete and export their layout in one sitting.

During the lesson students learn how to prepare a layout for their map following standard mapping conventions. These conventions include use of a scale bar, a legend, a title, and a north arrow, among other things. Up until now, we have worked with the “Map View” interface for AEJEE where all we worked with was the representation of the map data in layers. Now we will use the “Layout View” to provide a context for the map layers. In essence, the final “Map View” will be imbedded in a designed map document or layout.

The Layout View mode allows students to design and print real maps that can include photographs and text to accompany the map portion of the document.

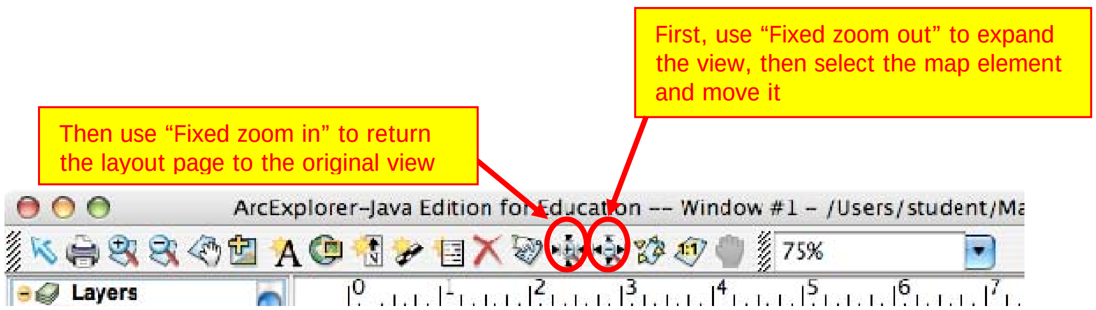
However, the Layout View mode comes with a number of limitations and quirky software obstacles that this lesson will try to help you and your students navigate around.

Some important concepts and tips for success:

- Layouts in AEJEE cannot be reliably saved and MUST be done in a single session! **Do not let students begin working on a layout if they do not have enough time to finish it to your satisfaction, or their work will be lost.**
- Make a backup copy (or do a Save As…) of your final map view starting point **before** switching to Layout View. This will allow you to start over should your map layout become corrupted.
- **Symbology and labels should appear exactly the way the student wants them to look before switching to Layout View in AEJEE**. Changing the symbology and labels after entering layout view can cause problems.
- Students should simplify their maps in Map View by removing unnecessary layers BEFORE moving into Layout View.
- Do not switch back and forth between Layout View and Map View. Once you are in Layout View, stay there.
- Photos placed in an AEJEE layout will default to a square shape. Resizing the photo using the corners of the square will stretch or squash the image, so students should be observant of what their photos look like in their final layouts.
- Students should not change the scale of their map document after they enter Layout View in AEJEE. Redraw times are very long if the scale is changed, and it is much better to leave the document at the default scale.
- If the student is having trouble selecting a map element (scale bar, north arrow, text, etc.) that is on top of the map data frame, have them click on the white space around the map (called the “collar”), then click on the map

data frame, and then move the data frame out of the way. The map element can then be selected and moved well off to the side. The map data frame can then be selected and moved back into place, and the map element can be selected and placed where the student wants it to be.

- If the student moves a map element too far off to the side of the layout page, AEJEE may not be able to select the element. If the map element is far off to the side and the student is unable to select it, use the "Fixed zoom out" tool to expand the view of the layout page. You can then select the out-of-bounds map element and move it back into the work area. Then use the "Fixed zoom in" tool to return to the original view of the page



- Keep in mind the general guidelines for cartography and working with map layouts in AEJEE:
- Map should have a clearly defined subject, or *theme* – a purpose for the map, or the story that the map is meant to tell
- Map should include data points that are symbolized and labeled so they are legible and informative
    - o Symbol sizes and colors should show up well on the base layer and shouldn't interfere with each other
    - o Label text should be a legible font style, color, and size, and show up well on the base layer
    - o ***Important Tip: When working in AEJEE layouts, make text and symbols for points much bigger than you think they should be; they end up looking smaller in the final printed map***
- Map area should be zoomed in on the selected data points and whatever other features that should be included on the map
- Map balance
    - o Elements should be placed on the page so there is an even distribution of elements covering the page and there isn't a lot of white space
- Fonts for text and titles should be carefully selected
    - o Fonts should be chosen that are easy-to-read, attractive, and fit the theme of the map
    - o Try to limit fonts to no more than two; this helps the map look more uniform and professional
    - o The title is usually the largest font size on the map

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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions for the lesson
- One or more saved AEJEE map projects that students have saved from previous GIS lessons.

INSTRUCTIONAL PROCEDURES

Getting Ready

- Have a strategy for saving and/or printing the students' Layout View outputs. Since saving AEJEE layout files is problematic and unreliable, you will use AEJEE to export and save layouts as JPG files in this lesson.
- Check, update and/or maintain all student equipment including computers so everything works as smoothly as possible.
- Prepare materials for the lesson and try out all the activities well in advance before the students work through them.

Gear-up

- Inform students that this lesson is typically a big favorite. However, while it is fun and satisfying to make a good layout and print out your very own custom map, the only way to be successful is to follow all the instructions very carefully.

- Ask students what sorts of things they would expect or want to see on a generic map. Prompt them with questions that will guide them to recognize that it would be important to have things like a scale, title, north arrow, author, date, etc.

- Explain that cartography is the science of making maps, and that people who make maps professionally are called "cartographers." Cartography has a lot of rules and guidelines, but the biggest mission for mapmakers is to make their maps attractive and easy to understand. A well-made map is a work of art as much as it is a product of science.

- Go over the general guidelines for cartography and working with map layouts in AEJEE. These guidelines appear on page 1 of the student lesson. You can do the "Good Map – Bad Map" activity at this time, or you may wish to wait until after students have had the experience of making their first layout.

Have fun with the "Good Map – Bad Map" activity. Students enjoy playing the role of critic and are sure to see important ways to improve the map layouts.

- Explain that in this lesson they will make cartographically complete maps using the "layout" function of AEJEE. They will need to follow the instructions very carefully so they don't leave something out or do something that will make AEJEE malfunction.

- Emphasize to students that layouts need to be completed in a single computer session because they cannot be reliably saved and reopened later. The only permanent record of their final map will be the JPG file they generate from their layout.

TEACHER RESOURCES

Guidance for map design principles can be found in this PDF from ESRI that covers the basics of map design:
http://www.esri.com/industries/k-12/download/docs/intrcart.pdf

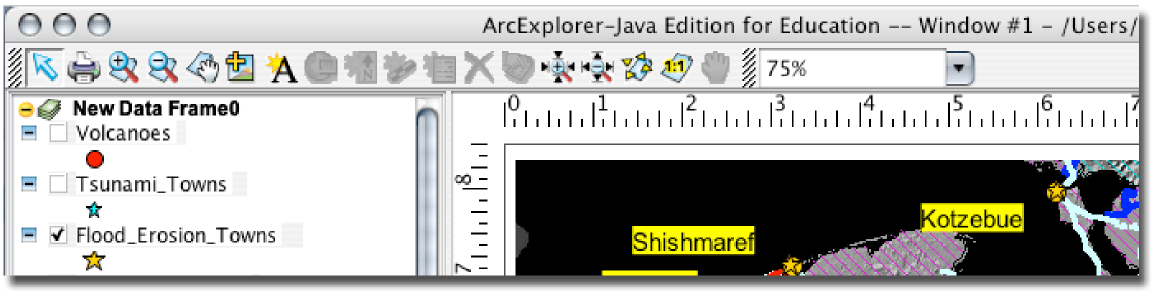
TEACHER REFERENCES

ESRI's "Introduction to ArcExplorer—Java Edition for Education" available as an Adobe Acrobat PDF: http://www.esri.com/software/arcexplorer/download.html

Name: ____________________

Project Community: ____________________

GIS Lesson 11
COMMUNITY GIS: MAP LAYOUTS
STUDENT EXERCISE



Objectives: Using GIS data sets, students will produce maps that can be helpful for community planning. They will learn to use GIS tools to produce final map layouts.

Estimated Time: 1 hour

By the end of this lesson, you will be able to make map layouts in GIS to represent information that is important for community planning projects.

Explore 1: Making a Layout

Cartography: Cartography is the science of making maps. Planners need to be aware of good cartographic principles so they can make maps that communicate effectively with members of the community and government.

Some general guidelines for good cartography include:

- The map has a clearly defined subject, or theme – a purpose for the map or the story that the map is meant to tell
- The map includes data points that are symbolized and labeled so they are legible and informative
    - Symbol sizes and colors show up well on the base layer and don't interfere with each other
    - Label text is a legible font style, color, and size, and shows up well on the base layer

Tip: When working in AEJEE, make text and symbols for points bigger than you think they should be; they end up looking smaller on the final printed map

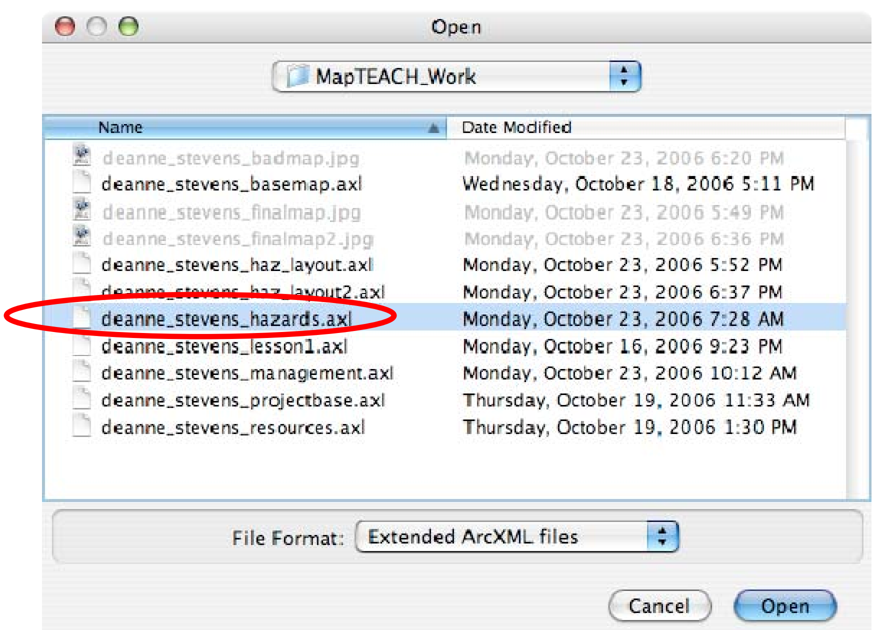
- The map area is zoomed in on your selected data points and whatever other features you want to show on your map
- Map balance
  - o Elements are placed on the page so there is an even distribution of elements covering the page and there isn't a lot of white space
- Fonts for text and titles are carefully selected
  - o Choose fonts that are easy-to-read, attractive, and fit your theme
  - o Try to limit yourself to no more than two fonts; this helps your map look more uniform and professional
  - o The title is usually the largest font size on the map

With these principles in mind, let's make a map layout with a theme of ***"Geologic hazards near your Project Community."*** You will use your hazards project from GIS Lesson 7 to make this layout.

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.

Navigate to your ***MapTEACH_Work*** folder and **Open** your **hazards project**.

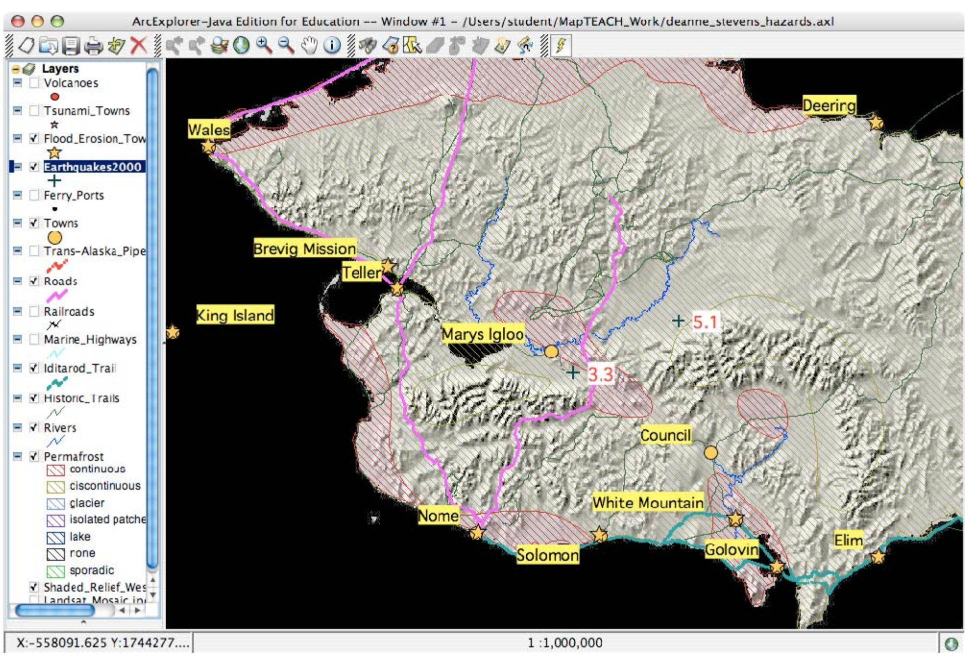


Prepare your project to move into Layout mode:

1. **Remove all extra layers** that you are not using in your map. Be sure to get rid of all layers that you have turned off because you didn't want them to show on your map, and get rid of layers that you may have in your Table of Contents where none of the features in that layer are present in your map view (for example, remove the Volcanoes layer if there are no volcanoes in your area).

2. **Make sure that everything looks just the way you want it to look on your final map. THIS IS REALLY IMPORTANT!!!**
   a) Make sure you are zoomed in to the area of the map that you want to show on your map layout. If you are zoomed too far out, there won't be enough detail to see your data very well. If you are zoomed too far in, some of your area of interest may be outside the map, and your base map image (if it is a raster data set) will look really fuzzy.
   b) This is your last chance to fiddle with your fonts and symbols. It is not a good idea to change symbology in AEJEE once you've started the layout process.
   c) ***Remember to make your labels and symbols for points bigger than you think they should be*** *– they'll show up better in the final map. The symbols for lines will show up pretty much the way they look in the regular map view.*

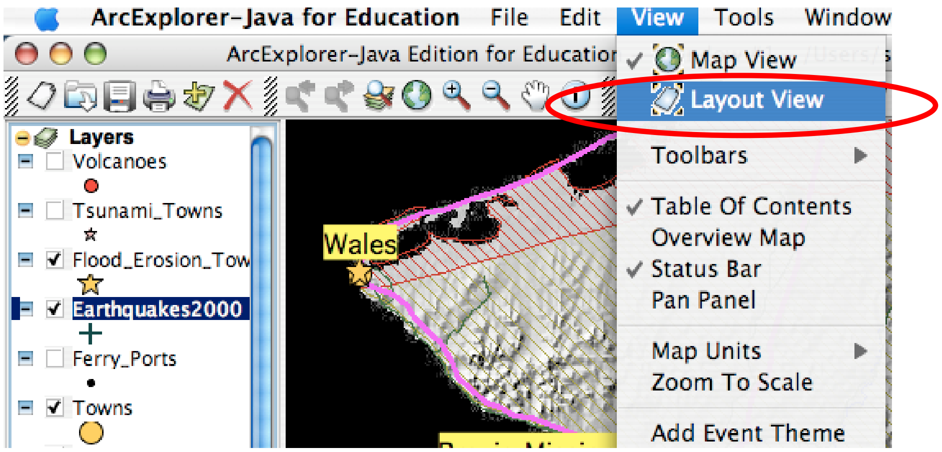
Your map might look something like this:



3. **Save your project**. This saved file will be your backup in case something goes wrong during the layout process. You will be able to start the layout over again with everything still looking just the way you want it.

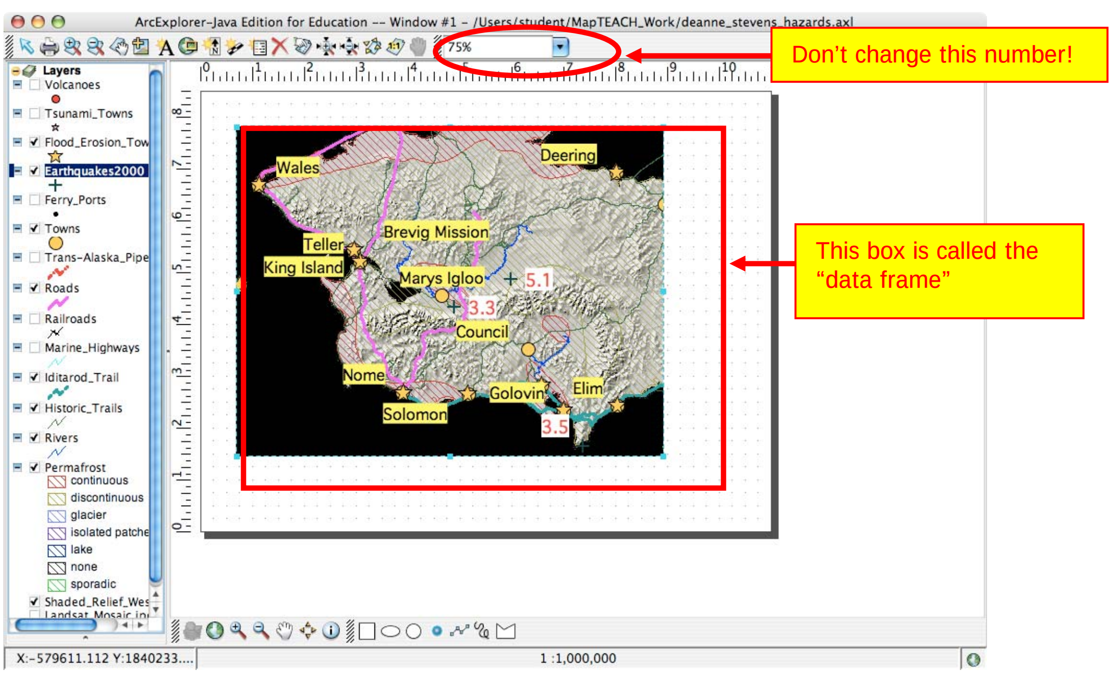
Now, let's do the layout:

4. Start the layout process by selecting **View** from the main menu, and selecting **"Layout View."**



5. **Wait patiently for AEJEE to redraw the map**. Your map data frame will appear to be drawn on a standard sheet of paper, measuring 8½ by 11 inches.

IMPORTANT TIP: Do not change the scale while you are working in layout view. Doing this will make your map take a REALLY long time to redraw.



You can check your map symbols and fonts at this point by clicking on **"File"** and **"Export to Image."**

- Use **150 dpi** for **Input**.
- Examine your map carefully in the Export window.
- If you like what you see, click **"Close"** and continue with the map layout instructions below.
- If you don't like the symbols and fonts, click **"Close," exit AEJEE (don't save)**, and **re-open your project** to make the changes you want.

The basic elements required in your final map layout include:

- Data Frame
- Title and text
- Legend
- North Arrow
- Scale Bar
- Author
- Date
- Citation/Credit
- Photograph (optional)

Follow along with these steps to add the required elements to your layout:

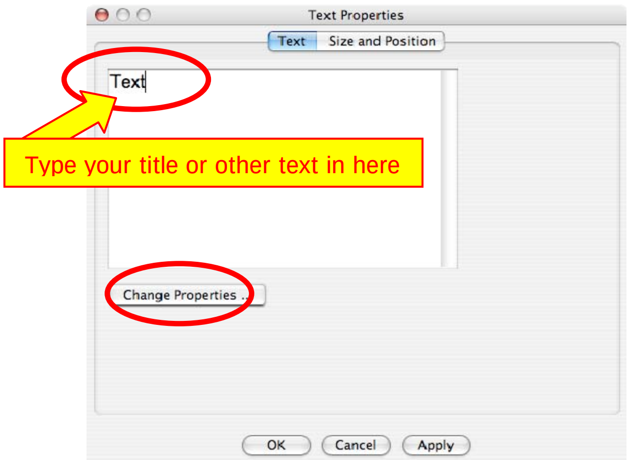
Data Frame (this is the AEJEE "map" that you've been seeing all along up to this point)

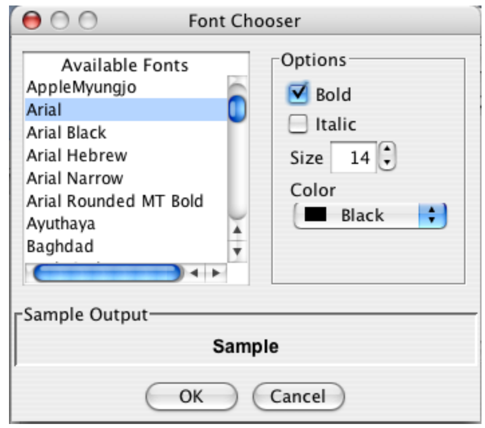
- **You can leave the data frame where it is, or move and change the size** by selecting and dragging, or by grabbing the corner handles to change the size. **Before you resize the data frame**, **control-click** on it to choose **"Properties,"** go to the **"Size and Position"** tab, and click the box next to **"Preserve Aspect Ratio."** This will maintain your map area so it doesn't get stretched or squashed.

Title and Text

- Every finished map needs a title. The title provides a very brief introduction and overview to what the map describes. The title will most often describe the subject and location of the map.
- **First click on an empty space on the layout** to deselect any other elements.
- **Select** , **the Add Text button,** to insert a text box
  - A small box will appear on the page that says "Text."
  - **Drag** this box to a position you like on the page.

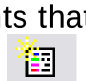
- o **Control-Click the box** and choose **"Properties."** The Text Properties window will appear.
- o **Type** in your text. You can also change the font, size and color of text by selecting the **"Change Properties ..."** button.





More text boxes can be added using a smaller font to describe more information about your map. You should also add text to make captions for any photos you include on your map (see "Photograph" section below).

Legend

- The map legend is a small table that explains the symbols used on the map. Legends are often called "keys."
- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the legend.
- **Select** **, the Add Map Legend button**. The map legend graphic will appear on the page and can be dragged and resized.
- **Control-Click the legend element** and choose **"Properties"** to access the options available for customizing the legend.

North Arrow

- The North Arrow orients the viewer to determine the direction of North on the map.
- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the north arrow.
- **Select** **, the Add north arrow button.** The North arrow selector window opens and presents many different styles to choose from. Choose one, drag, drop and alter the size and color so that it looks good on the layout.

Scale Bar

- First **click on the data frame to 'turn on' the buttons** that can add elements that relate to the map, including the scale bar.
- **Select** **, the Add map scale bar button.** Choose the bar you like and place it on the map. **Control-Click on the scale bar element**, and use **"Properties"** to select ***miles or kilometers*** for the units shown.

Author

- **Make a text box and add the author's name.** This entry may also include where the author works or goes to school.

Date

- **Make a text box and add the date when the map was completed.** This may be appended to the author.

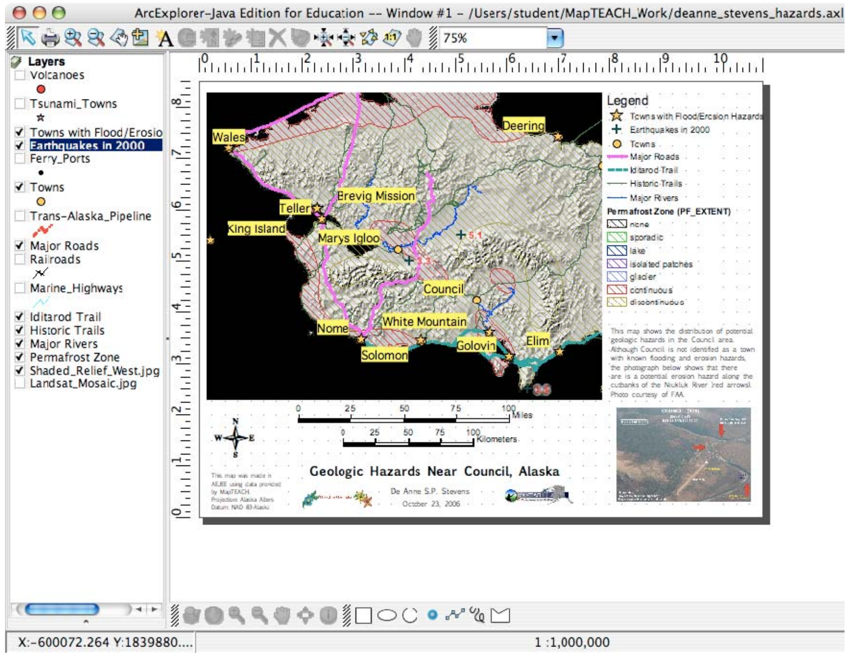
Citation/Credit

- The citation tells the viewer where data for the map came from. The citation includes any necessary or important information about sources of data for the map, when data was gathered, projection information and any thing else that seems important for a person reading the map.
- **Make a text box to add a citation.** Some citations are brief.

Photograph

- A photograph or other picture can be added when you **select** **, the Add image button.**
    - o If you have a digital picture of your community, you can include it on your map.
    - o You can resize your photo image by grabbing and using the corner handles. Pay attention to what you're doing, since you can stretch or squash your picture this way.
    - o Make sure to use the Text tool to add a caption describing the photograph and giving credit to the photographer or source of the photo.

When your map layout is complete, it might look something like this:



Show your map layout to a teacher.

Teacher sign-off: ___________________________

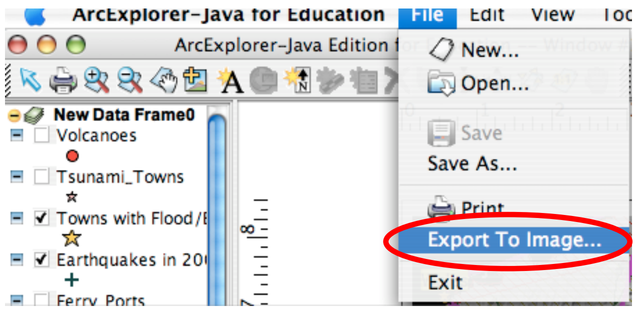
Save your map layout project:

- **Click** on **"File"** in the Menu Bar
- Select **"Save As"**
- **Navigate** to the **student/MapTEACH_Work** folder
- **Name the project** using an appropriate name that includes your own name (for instance, *yourname_HazardsLayout*)

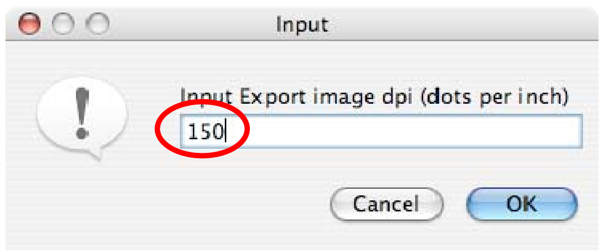
Explore 2: Export Your Map Layout

Because AEJEE does not reliably save map layouts, the only way to preserve your final map is to convert it into a graphics file. We will use a JPG format. Your JPG map can then be printed, added as a picture into a word processing document, or used as a graphic image in presentation software like MS PowerPoint.

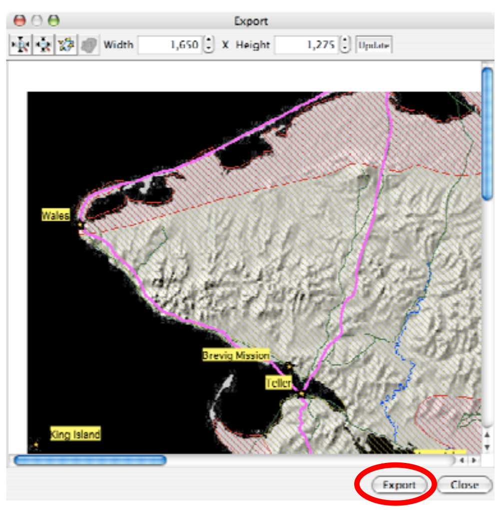
1. **Choose File/Export to image from the AEJEE menu.**



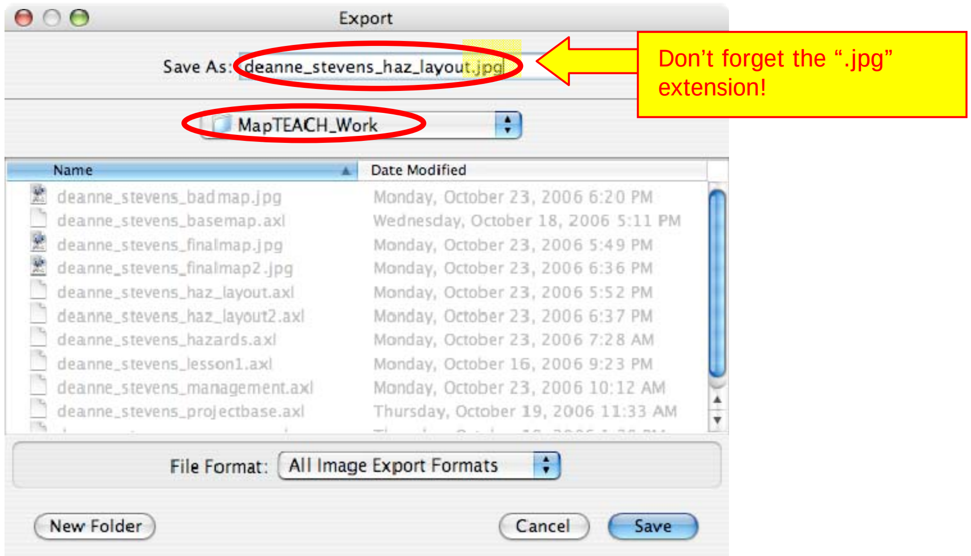
2. A dialogue box will appear and require a number for dots per inch (dpi) to specify the resolution of the output file. **Use 150 dpi**.



3. ***Wait*** patiently **until a new window appears**. It can take a couple of minutes. **In the Export window, click "Export."**



4. **Save the image** into your **MapTEACH_Work** folder as a JPG. **Name the file to include the extension ".jpg"**. Otherwise it will not save. Wait a minute or two while the computer exports your map.



5. **Wait a moment to allow AEJEE to complete the export process, then close** the **Export window** and **exit AEJEE.**

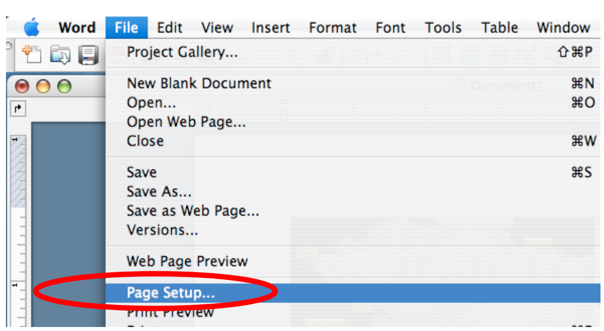
Explore 3: Print Your Map Layout

Once the map image is saved, it can be imported into word processing documents (MS Word), graphics presentations (MS PowerPoint) or any image processing application. The exported map can also be emailed anywhere as an attachment.

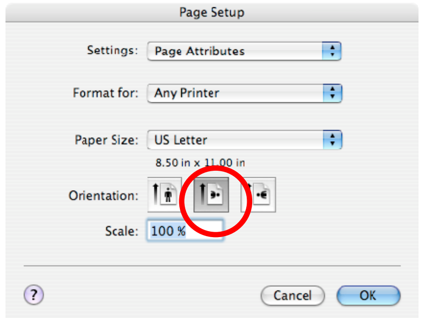
You may be able to open your JPG map directly by double-clicking on the file, and then print it from your computer's picture viewer. If you import it into a Word document, however, you can have some added flexibility for resizing and orienting the map on the printed page.

1. **Start up MS Word.**

2. **Select Page Setup** from the **File** pull-down menu.

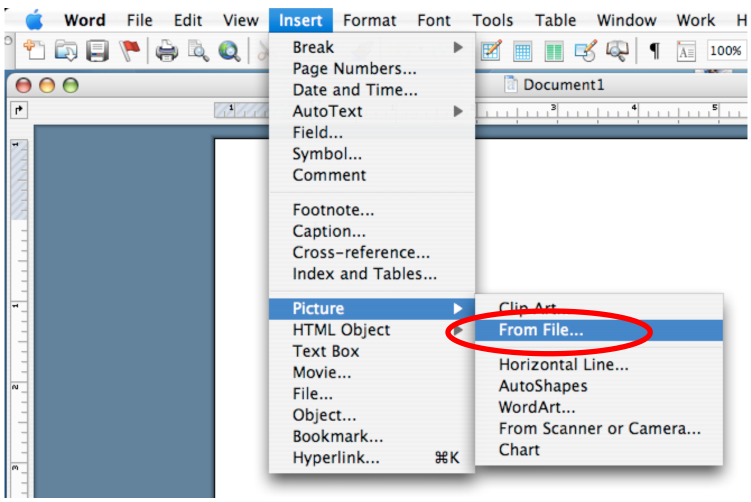


3. **Change** the **Orientation** of the page by **selecting the middle icon.**

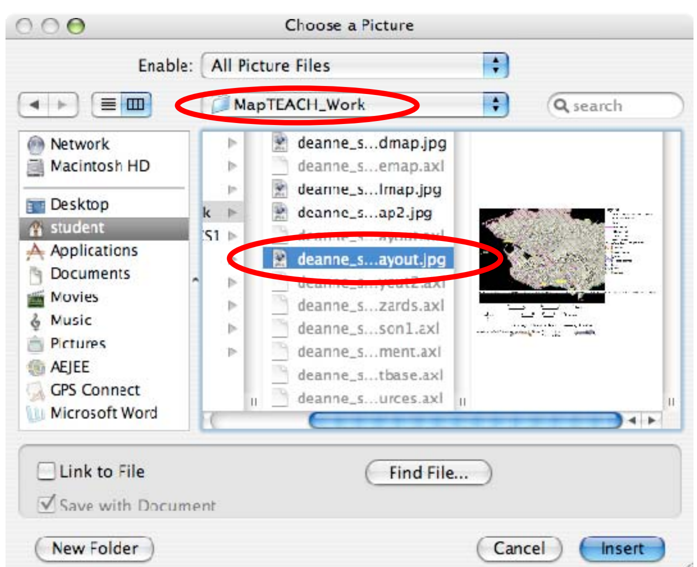


4. **Click "OK."**

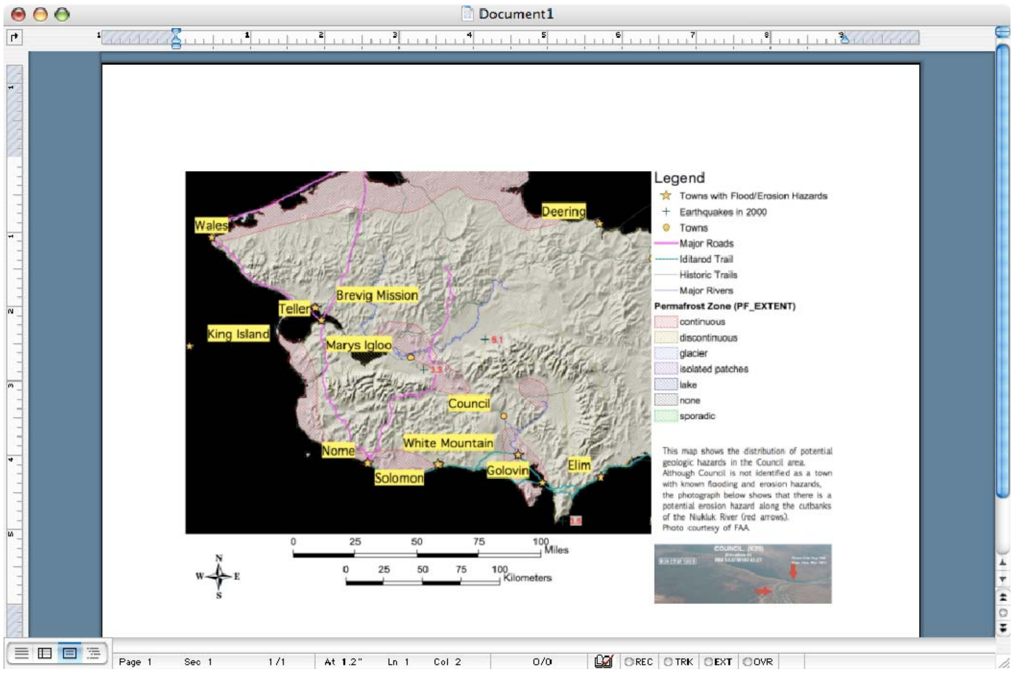
5. **Select Insert / Picture / From File** from the pull down menu.



6. **Navigate** to your **JPG file** in **MapTEACH_Work** and **click** the **Insert** button.



7. The image appears in the document. You can re-size the picture if you wish.



8. **Save** your Word document map to your **MapTEACH_Work** directory, using any name you would like.

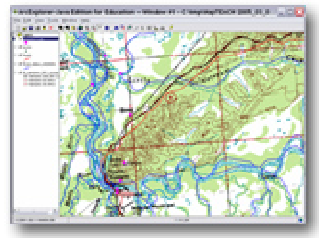
9. **Print your map,** or have the Word document transferred to your teacher's thumb drive for printing.

GREAT JOB! You have done it! Save everything one more time and..

Show your printed map to a teacher.

Teacher sign-off: __________________________

GIS Lesson 12
ADDING COORDINATE LOCATIONS INTO A GIS
TEACHER INFORMATION



Lesson Summary: During this lesson students use Serpentine Hot Springs on the Seward Peninsula as an example site to learn how to manually add coordinate data into a GIS project. Geographic coordinates for the hot springs are provided, and the students set up a Mac TextEdit document and type in these coordinates according to a strictly-defined format. The file is saved as a *comma separated values* file (.csv), and the data is then imported into an AEJEE project using the “Add Event Theme” tool.

Objectives: Students will learn to manually add coordinate locations into a GIS project.

Estimated Time: Thirty minutes

Correlation to Alaska Standards:

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

Technology A-1 Use a computer to enter and retrieve information.

BACKGROUND FOR THE TEACHER

Remember where you went to kindergarten? Remember the first place someone let you drive the boat to? Your GIS map doesn’t, but it can. You have to tell it *where* and you have tell it *what*. “Adding a point” is how you and your students can make a GIS tell about a place. A GIS can understand where places are if you provide the locations in latitude and longitude coordinates.

The “adding a point” process is fundamental for students to understand how to take their field observations and map them with GIS.

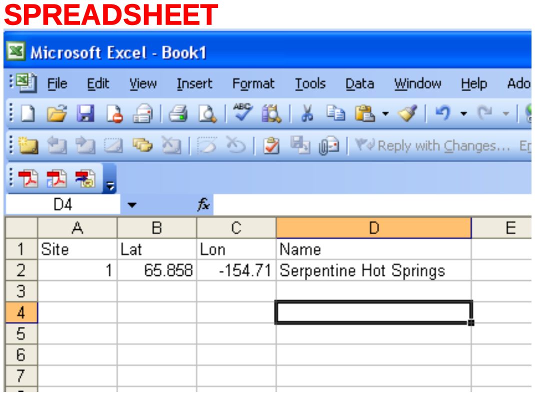
The lesson is written so that students can accomplish this initial process *without* first being forced to learn technical vocabulary that defines data tables, a database format and shapefiles. In this way they will eventually be able to bring field observations located by GPS into a GIS map. This will give them the power to make unique observations about their local area, and map this information like a GIS professional.

For this to work, students must be very exacting in carrying out each step. Indirectly, the students are learning that they can be creative and have a good time with doing real work with computers, but that attention to detail is required to make software work reliably.

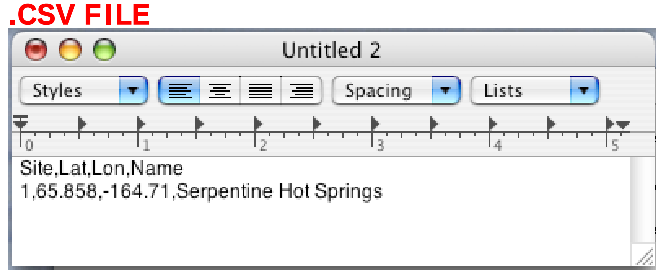
Some important concepts and tips for success:

- AEJEE requires comma separated values files (.csv, or CSV), which can be generated using the TextEdit application that is standard on Mac computers.
- Comma separated values files are very simple data files in which commas are used to separate individual data values that would equate to column entries in a spreadsheet, and individual lines of data equate to rows in a spreadsheet:

SPREADSHEET

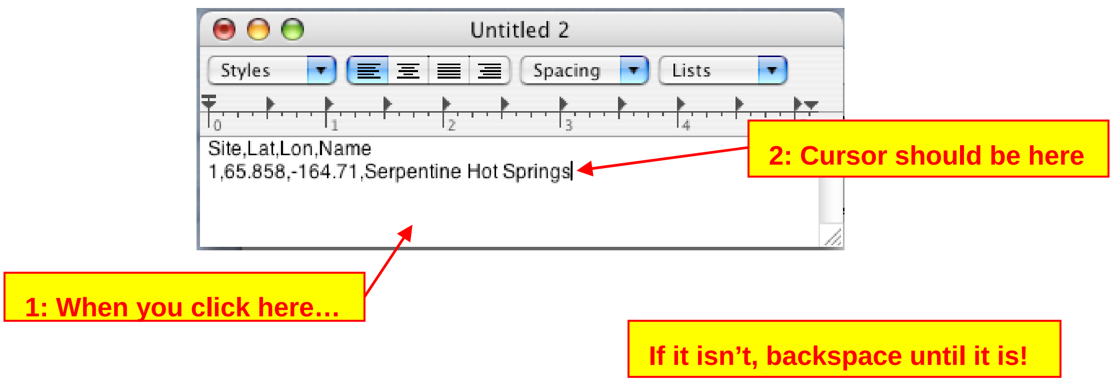


.CSV FILE



- Coordinates must be added as latitude and longitude in **decimal degrees**.
- The location accuracy will be affected by the number of decimal places included in the coordinates: the more decimal places, the closer the point generated from the coordinates will be to the actual site location. We recommend a minimum of three significant digits, but four is better.
- Longitudes for the western hemisphere, including Alaska, are preceded by a minus sign (-). Longitudes for the eastern hemisphere would not include a sign.
- The first line in the CSV file equates to column headings in a spreadsheet, and is required for AEJEE to read all the data points. If you do not include a line of column headings (for instance, “Site,Lat,Lon,Name”), it will read the first line of data as the column headings and cause much confusion!

- Each line of data should include entries for each of the column headings, in the same order as they are listed in the first line. In the example above, "Site" is "1", "Lat" is "68.858", "Lon" is "-164.71", and "Name" is "Serpentine Hot Springs."
- Older versions of AEJEE did not allow spaces on either side of the commas in the CSV files, although the newest version seems more tolerant. To avoid possible confusion, the lesson retains instructions for the older versions of AEJEE.
- There can be no "empty returns" at the end of the CSV document. If you click your pointer in the blank white area below your last line of data and a cursor appears below your last line of data, you must backspace or delete until the cursor is exactly after (to the right of) your last piece of data.



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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions for the lesson.

INSTRUCTIONAL PROCEDURES

Getting Ready

As always, try out the lesson on a classroom computer ahead of time. You will better anticipate tasks that your students might find challenging, and feel much more comfortable giving directions and answering questions. Make any modifications that will help your students be more successful.

Gear-up

- Ask a student to tell you where he went to kindergarten, or where she first drove a snowmachine, or any good question about a “where” and a “what.” Then ask him or her to point to the place on a map of Alaska, or anywhere in the world. Explain that a GIS knows nothing about this place unless the student chooses to tell it. This lesson will show how to tell a GIS about a where and a what.

- Explain to the students that computers are not actually ‘smart’. Computers need to be told about things in ways they can understand - very simple, very specific ways. Otherwise, the computer will just sit there like a bump on a log.

- For your GIS to know anything about a place, we have to tell it *where* by giving it a latitude and a longitude, and we have to tell it *what* by giving it some text.

  So if you went to kindergarten at the school in Hooper Bay, the GIS would need to know the latitude is 61.5311, the longitude is -166.09656 (the minus sign means it’s a west longitude), and the name of the school is Hooper Bay. You would need to tell the computer in a very particular way that looks like this (write on the board):

  Lat,Lon,Name
  61.5311,-166.09656,Hooper Bay

  But if you tell this to the computer in a way it doesn’t understand, if you so much as even include a space after a comma, the computer won’t get it. The computer will just sit there like a bump on a log.

  You can tell the computer more about the place, but this is the minimum you need to tell it so it can do anything with the information.

- Explain to the students that they will now get the chance to tell the GIS about a place, and doing it will make more sense than talking about it. Have them get started with the exercise.

  Depending on the students’ previous experiences with computers, you can mention that in computer terms we call the categories “fields” and the numbers and text “data.” When the two are put together as above, in a format the computer can understand, you have created a data table with one data record in it. This format is called CSV (comma-separated values). A data table is a simple kind of database.

Students have likely done this many times before and just didn't know it. For instance, when you enter a name and number in a cell phone, you have just created a new data record in a database. The fields are name and number.

- One of the things students may recognize is that they can be creative in making a GIS database and the records that could go in it. For example, they could make a list of where friends live, their names, nicknames, emails and favorite songs. This "list" is actually the beginning of a database.

- So what is being creative with databases good for? Some would say fun. We would also say jobs: http://www.mapteach.org/job_search.php
The guys who own Facebook would say money, lots of money: http://developers.facebook.com/

TEACHER RESOURCES

Specific instructions on creating CSV files with Macs and PCs to make point shapefiles can be found in ESRI's "Introduction to ArcExplorer—Java Edition for Education" for AEJEE 2.3 available as an Adobe Acrobat PDF: http://www.esri.com/software/arcexplorer/download.html

Wikipedia provides information about Comma-Separated Values (CSV) files at http://en.wikipedia.org/wiki/Comma-separated_values

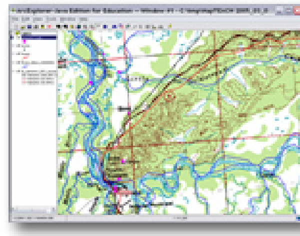
MORE RESOURCES FOR STUDENTS OR TEACHERS

An on-line spreadsheet with location information for 108 Alaskan hot springs and fumaroles has been compiled by the National Geophysical Data Center Listings, and is provided at http://www.hotspringsenthusiast.com/AK.asp

Latitude and longitudes for many Alaskan schools can be found at the GLOBE Schools web site. A current list of Globe Schools in Alaska can be obtained from the Globe website at http://www.globe.gov . Carry out a "School Search" on http://viz.globe.gov/viz-bin/zoom.cgi?C=US&rg=n&l=en to find out how many Alaskan schools are participating on the program. Some 195 schools or more may be listed.

Name: ____________________

GIS Lesson 12
ADDING COORDINATE LOCATIONS INTO A GIS
STUDENT EXERCISE



Objectives: Students will learn to manually add a coordinate location into a GIS project.

Estimated Time: 30 minutes

By the end of this lesson, you will be able to add sites (points) to a GIS map. AEJEE makes it possible to input information about places by attaching data to points. You do this in two steps by:

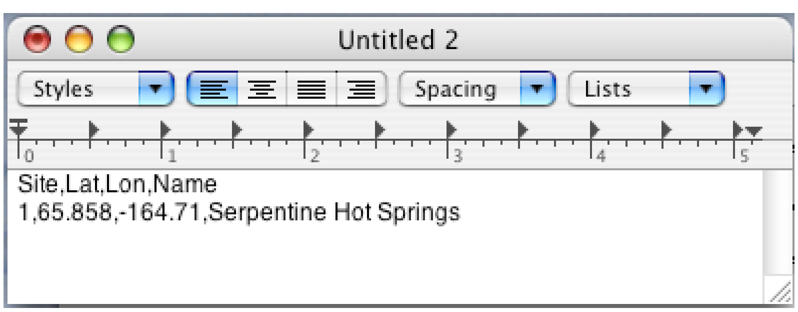
- Making a **data file** in a text editor program, and
- Making a new map layer from that data file in AEJEE itself.

The data file will be transformed to a "point" layer in your map later. We are going to make a single point on your map where Serpentine Hot Springs is.

Explore 1: Enter Point Data

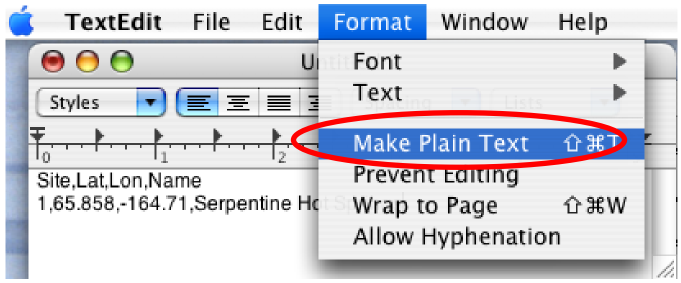
1. **Start up the Mac text editing application TextEdit.**
(If it is not on the dock of your computer desktop, you can access TextEdit by going to Macintosh HD/Applications and double-clicking on TextEdit)

2. **Type in the exact same text shown below, with NO spaces before or after commas.** "Lat" stands for latitude and "Lon" for longitude.

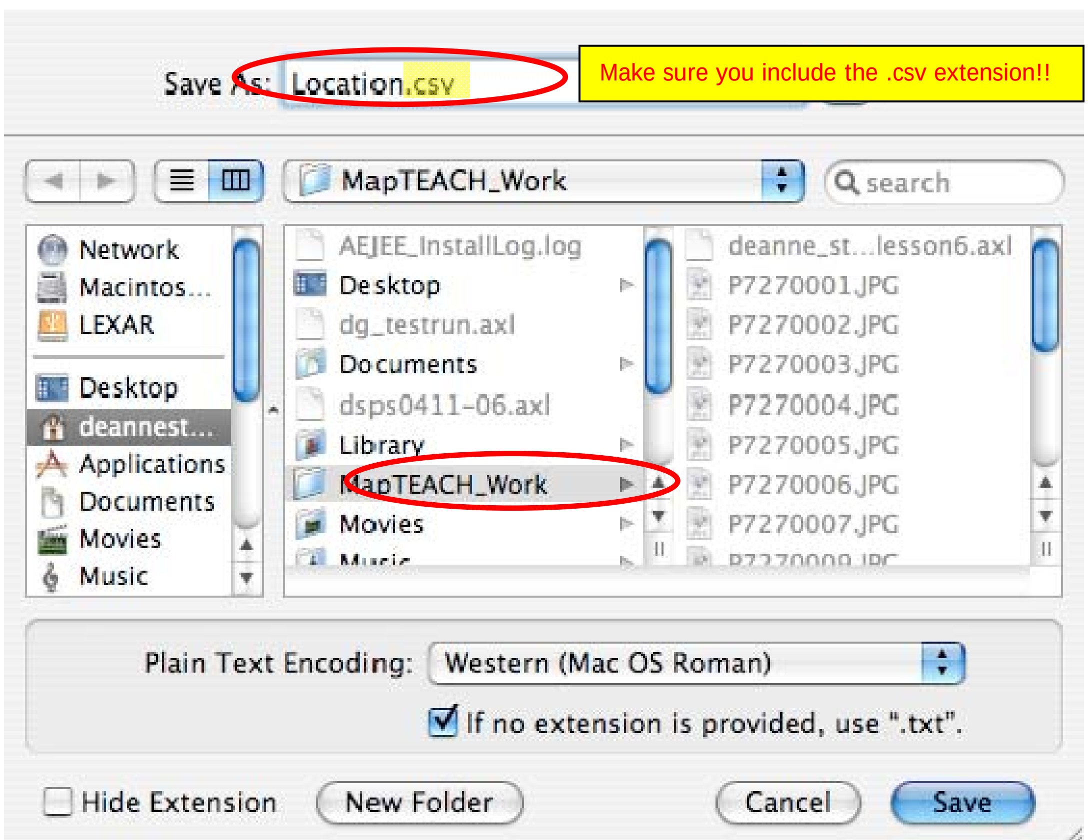


This data file contains a single point, the location of Serpentine Hot Springs.

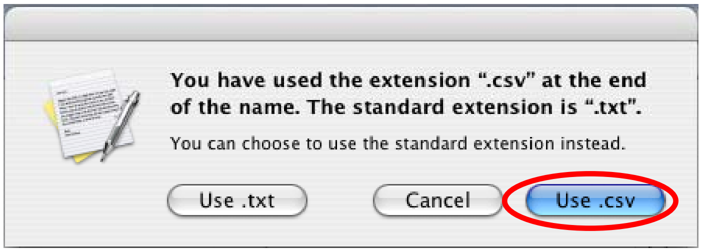
3. Check carefully that you do not have any mistakes in your typing, then save this data in a format that AEJEE can understand.
   a) **Change the file into plain text** using the Format menu in TextEdit. The default save format is not plain text but "rich text format" and AEJEE will not understand that format.



   b) **Save the data as a .csv file,** with the name typed in as "*Location.csv*". The .csv extension at the end of the file name tells AEJEE that this is a *comma separated values file*. This is a special kind of file that AEJEE can read and make point data with. When using the Mac and TextEdit, the screen will look something like this:



When TextEdit gives you a choice, click on "Use .csv".



Show your CSV file to a teacher.

Teacher sign-off: ____________________________

Explore 2: Set Up the Base Map and Projection

As always, the first two steps **to start any AEJEE map project are:**

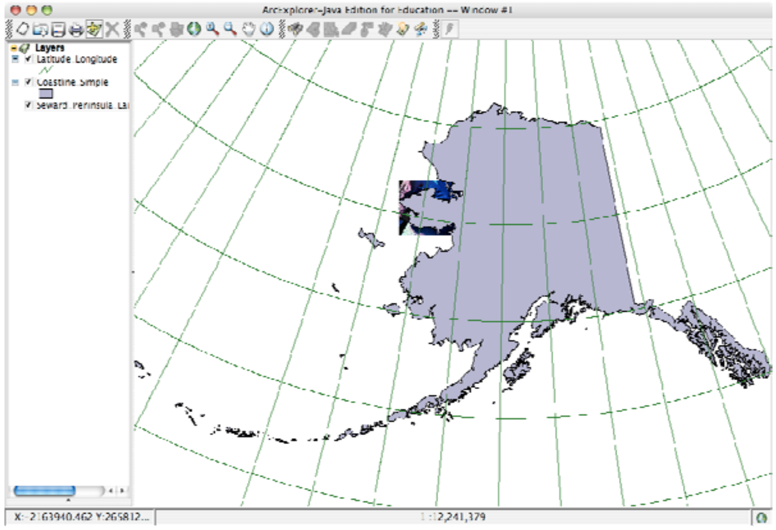
- **Add a map layer**
- **Define a projection**

1. **Add** the layer ***Coastline_Simple*** -- located at **/ESRI/AEJEE/Data_MapTEACH_WGS84/Base_Data/Coastline_Simple.shp**

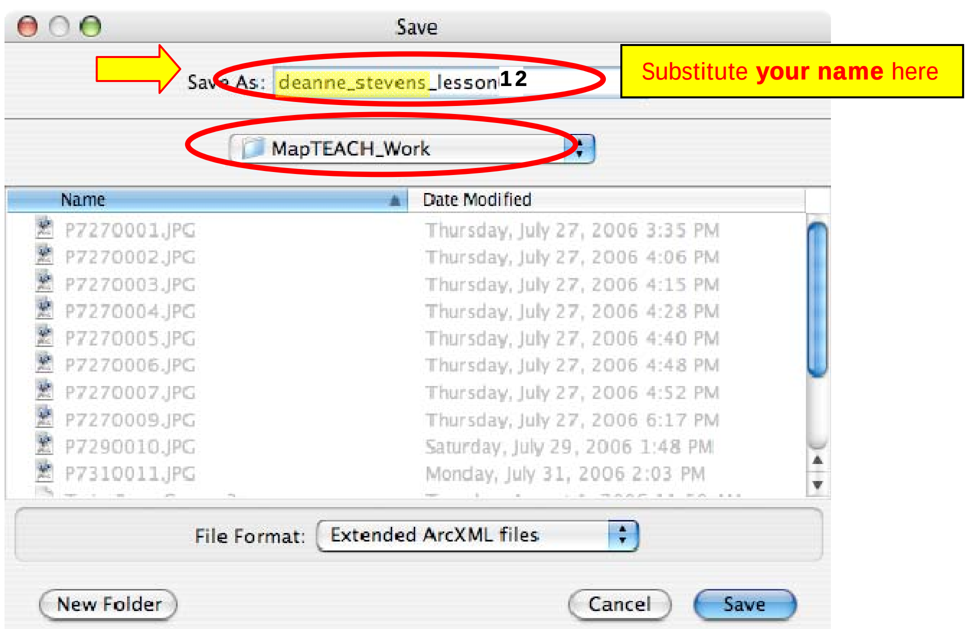
2. Set the map projection
   a) Go to the menu bar and choose **Tools**, then select **Projection**.
   b) In the Select Coordinate System window, choose **Regional Projections/Albers Equal Area (Ellipsoid)** and select **Alaska**.
   c) Select **NAD 83** from the "Datum" dropdown menu and click "OK." (If it helps, review the detailed steps provided in previous lessons)

3. To make this an informative base map, **add two more data layers** from the **Base_Data** folder in **Data_MapTEACH_WGS84**.
   a) *Latitude_Longitude*
   b) *Seward_Peninsula_Landsat (a satellite image of the Seward Peninsula)*

Your map should look something like this:



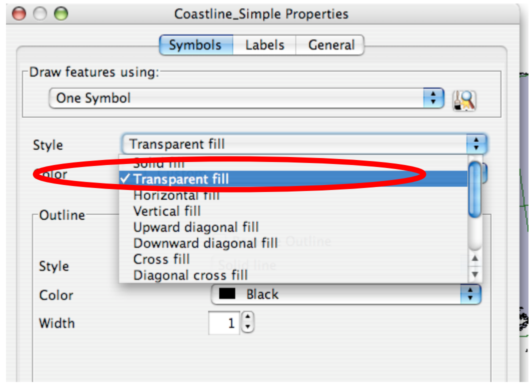
4. **Save** your map project:
   - **Click** on **"File"** in the Menu Bar
   - Select **"Save As"**
   - **Navigate** to the **student/MapTEACH_Work** folder
   - **Name the project** using your full name followed by "lesson12": **firstname_lastname_lesson12**



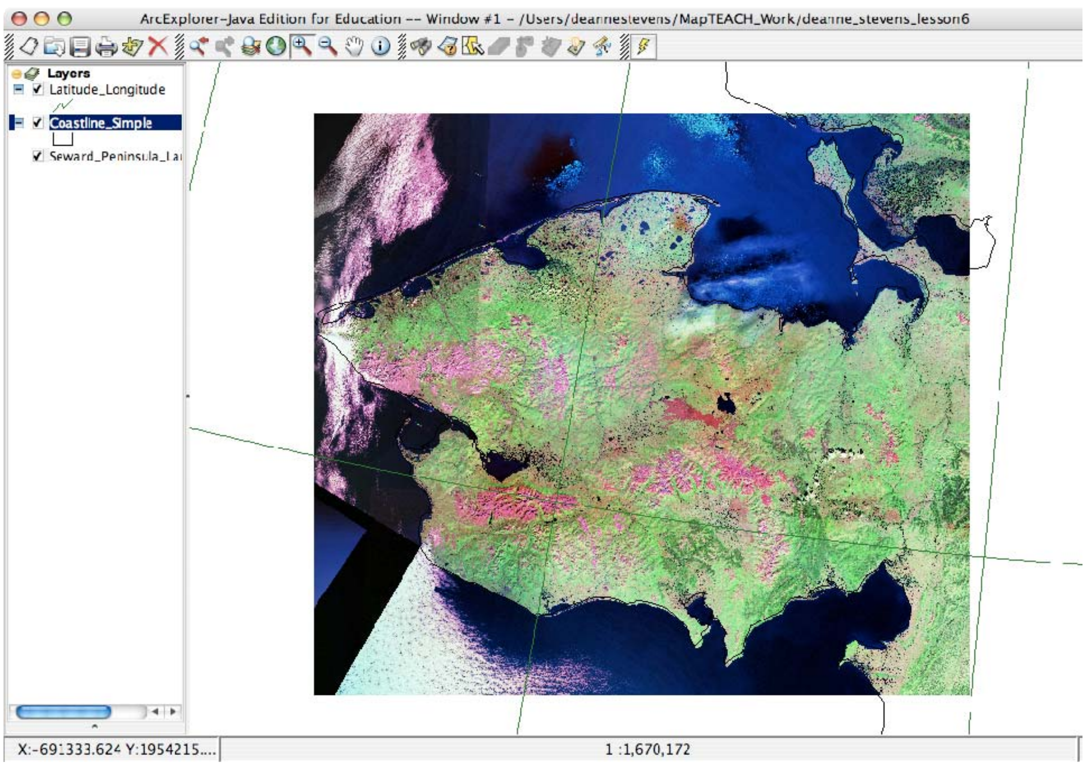
Save again throughout the lesson so you can start from the most recent save if the computer or AEJEE freezes up.

5. Make the fill for the Coastline_Simple layer transparent

- Do this by **control-clicking on the layer name**, and choosing the **style** to be **transparent fill** from the properties window.



6. **Zoom in to the Seward Peninsula**.



7. **Save** your project.

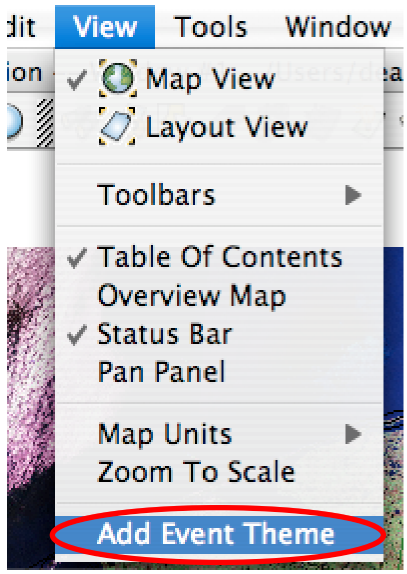
8. Now you're ready to begin adding point locations to your GIS project.

Show your map to a teacher.

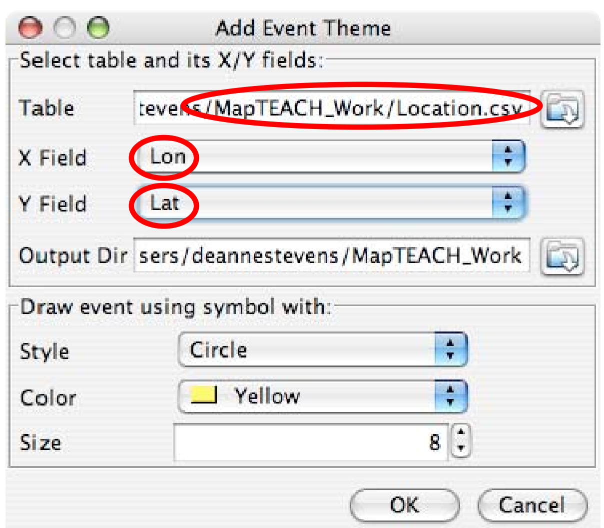
Teacher sign-off: ___________________________

Explore 3: Add Event Theme

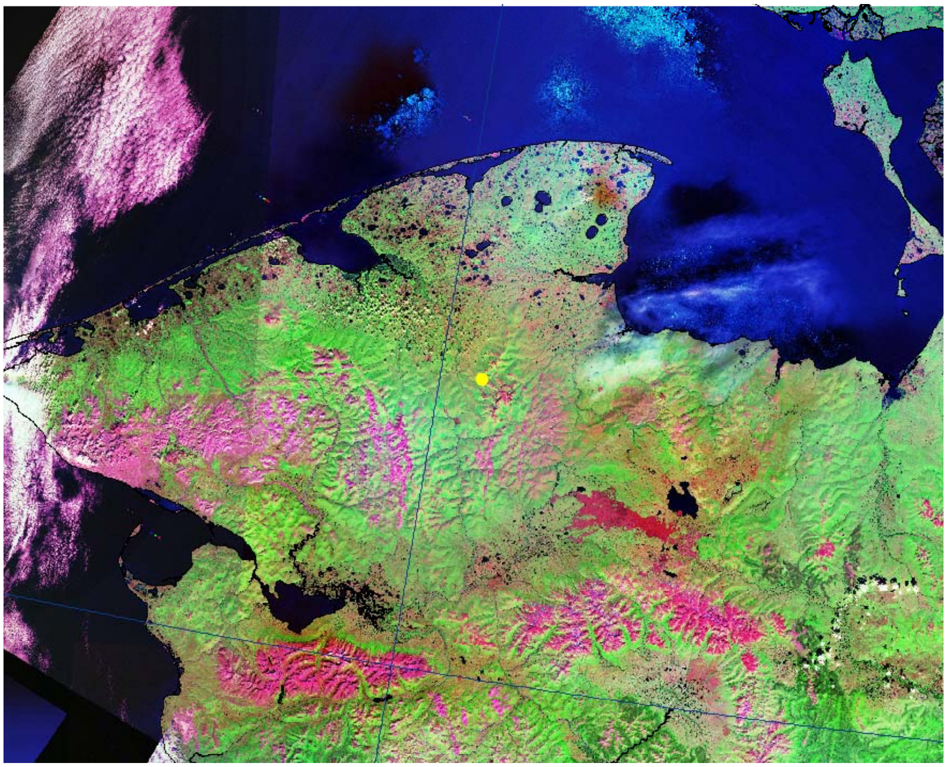
1. In the **View** menu, **select Add Event Theme**.



2. Browse to *Location.csv* in the **Table** field. Next set the **X Field** to be **"Lon"** (longitude) and the **Y Field** to be **"Lat"** (longitude). Choose a symbol style, color and size that will stand out on your map.



3. Click "OK" and AEJEE will add in "Location" as a layer and redraw your map. Find the point location for Serpentine Hot Springs (yellow circle in our example) in the northern part of the Seward Peninsula.



4. If the new point does not appear on your map or is in the wrong place, carefully check your CSV file for errors and make sure you are using the correct entries in the Add Event Theme box.

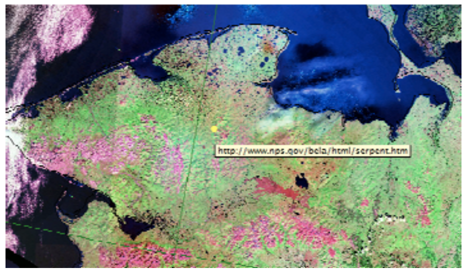
5. If you want, label the point with its name by control-clicking on the layer name and going to Properties/Labels and selecting "Name" under the "Label features using" drop-down menu.

6. **Save** your project.

Show your map to a teacher.

Teacher sign-off: ___________________________

GIS Lesson 13
HOTLINKING
TEACHER INFORMATION



Lesson Summary: During this lesson students use Serpentine Hot Springs on the Seward Peninsula as an example site to learn how to hotlink data in a GIS project. The CSV file created in GIS Lesson 12 is modified to include the web url of a National Park Service website describing the hot springs. The revised CSV file is loaded into the existing AEJEE project and the hotlink is activated, allowing the user to click on the point representing Serpentine Hot Springs in the GIS and connect to the informative web site.

Objectives: Students will learn to hotlink a website to a point in their AEJEE map.

Estimated Time: 30 minutes

Correlation to Alaska Standards:

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

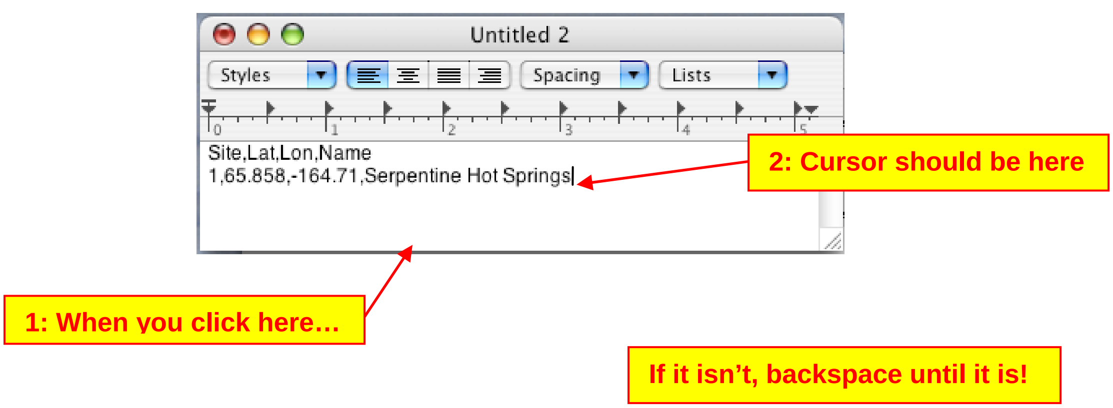
Technology A-1 Use a computer to enter and retrieve information.

BACKGROUND FOR THE TEACHER

Some important concepts and tips for success:

- AEJEE uses comma separated values files (.csv, or CSV) to generate shapefiles of points that can be hotlinked.
- The attribute name in the first line of the CSV file that equates to the hotlink must be HOTLINK, all in capital letters. See example:

- This lesson constructs a hotlink to connect to a web site (using the site url). Hotlinks can also connect to any kind of file your computer can open. This includes pictures, text documents, video clips, sound files, etc.
  - o The syntax to connect a point to a web site is **http://** followed by the web site name.
    Example:
    http://www.nps.gov/bela/html/serpent.htm
  - o The syntax to connect to a file on your computer is **file:///** followed by the pathname and document name.
    Example:
    File:///Users/student/MapTEACH_Work/FieldTripSite1.doc
    (This connects to a Word document named FieldTripSite1.doc that is located in the MapTEACH_Work folder in the Users/student directory of a Mac computer; if you want to hotlink to a file or document that is saved somewhere else, remember that the syntax must exactly match the pathname so AEJEE can find your file)
- Older versions of AEJEE did not allow spaces on either side of the commas in the CSV files, although the newest version seems more tolerant. To avoid possible confusion, the lesson retains instructions for the older versions of AEJEE.
- There can be no "empty returns" at the end of the CSV document. If you click your pointer in the blank white area below your last line of data and a cursor appears below your last line of data, you must backspace or delete until the cursor is exactly after (to the right of) your last piece of data.



- Working with CSV files and hotlinks can be very frustrating for students, who are often rushing and not paying close attention to what they are typing. Any typographical error, extra space or misplaced comma will cause the process to malfunction. If the hotlink is not working, work patiently with the student to very carefully check their file for errors.

- When activating hotlinks, there are some critical items that must be kept in mind:
  - MapTips must be set to reference HOTLINK in the point shapefile that the hotlink is generated from
  - The shapefile containing the hotlink(s) must be selected (highlighted) in the Table of Contents on the left side of the AEJEE window
  - The Hotlink lightning bolt tool must be used to select the point in the map project
  - Hover the Hotlink lightning bolt tool over the point until the MapTip info appears next to point (either the url if linking to a web site, or the pathname and file name if linking to a file or document); do not click until you can see this information
  - If you can see the MapTip info next to the point but are having trouble clicking on it, try zooming in a little so you can better target the point
  - If you can see the MapTip info and can successfully click the point, but nothing happens, it means that you have set up everything correctly but there is a typographical error in the url, pathname, or file name in your CSV file and AEJEE can not find your hotlinked web site or file; check for typos!

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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions for the lesson

INSTRUCTIONAL PROCEDURES

Getting Ready

As always, try out the lesson on a classroom computer ahead of time. You will better anticipate tasks that your students might find challenging, and feel much more comfortable giving directions and answering questions. Make any modifications that will help your students be more successful.

Gear-up

Bring out a map of your choice and let students describe places on it that they are familiar with. Ask them if the map by itself has enough information in it about all the things about a place that they would like to share with someone else – stories, sights, sounds? How much more informative would a map be if you could actually connect the places on it to photographs, documents, web sites and videos describing those places and why they are important or interesting? Hotlinking allows us to do just that, creating a richer, multidimensional map experience.

TEACHER RESOURCES

Specific instructions on creating CSV files with Macs and PCs to make point shapefiles and hotlinks can be found in ESRI's "Introduction to ArcExplorer—Java Edition for Education" for AEJEE 2.3 available as an Adobe Acrobat PDF:
http://www.esri.com/software/arcexplorer/download.html

Wikipedia provides information about Comma-Separated Values (CSV) files at:
http://en.wikipedia.org/wiki/Comma-separated_values

And on hyperlinks at:
http://en.wikipedia.org/wiki/Hyperlink

MORE RESOURCES FOR STUDENTS OR TEACHERS

The State of Alaska Division of Community Advocacy maintains an extensive online database of information and photographs for Alaskan communities at http://www.commerce.state.ak.us/dca/commdb/CF_COMDB.htm . The community summaries include latitudes and longitudes (typically embedded in the text of the first paragraph) for all communities listed.

An on-line spreadsheet with location information for 108 Alaskan hot springs and fumaroles has been compiled by the National Geophysical Data Center Listings, and is provided at http://www.hotspringsenthusiast.com/AK.asp

Latitudes and longitudes for many Alaskan schools can be found at the GLOBE Schools web site. A current list of Globe Schools in Alaska can be obtained from the Globe website at http://www.globe.gov . Carry out a "School Search" on http://viz.globe.gov/viz-bin/zoom.cgi?C=US&rg=n&l=en to find out how many Alaskan schools are participating on the program. Some 195 schools or more may be listed.

Name: ____________________

GIS Lesson 13
HOTLINKING
STUDENT EXERCISE

Objectives: Students will learn to add coordinate locations into a GIS project and to use GIS tools to make hotlinks to web sites.

Estimated Time: 30 minutes

By the end of this lesson, you will be able to add points with hotlinks to your GIS map. **Hotlinking** provides a way to add a hyperlink to a **point** on your map. By clicking on a hyperlinked point, a new document will open up. The new document can be a web page, photo, movie, text document or whatever you choose.

Explore 1: Enter Point Data

AEJEE makes it possible to hotlink to documents and web sites by attaching instructions to the points in your map project about where to find those documents or web sites. You do this in two steps by:

- Making a **data file** in a text editor program that includes the field HOTLINK, and
- Making a new map layer from that data file in AEJEE itself.

As before, the data file will be transformed into a “point” layer in your map. We are going to use your Serpentine Hot Springs map project and “hotlink” (also known as “hyperlink”) your point to a web site that has information about Serpentine Hot Springs.

1. **Use TextEdit to open the CSV file you created in GIS Lesson 12**. Start up the **TextEdit** application and open the Location.csv file you saved in your MapTEACH_Work directory.

2. **Modify your CSV file to include HOTLINK and the web url of a web site about Serpentine Hot Springs.** Just after “Name,” add a comma and the new field called “HOTLINK” all in capital letters. Remember - *do not include any extra spaces in this file*. Then, just after the name of the location, add a comma and http://www.nps.gov/archive/bela/html/serpent.htm

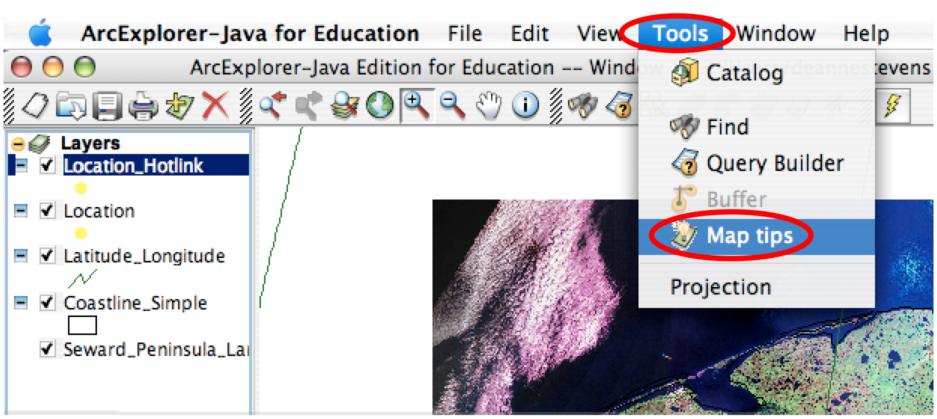
   Save this file as “Location_Hotlink.csv” in your MapTEACH_Work directory.

Explore 2: Add a Hotlinked Point

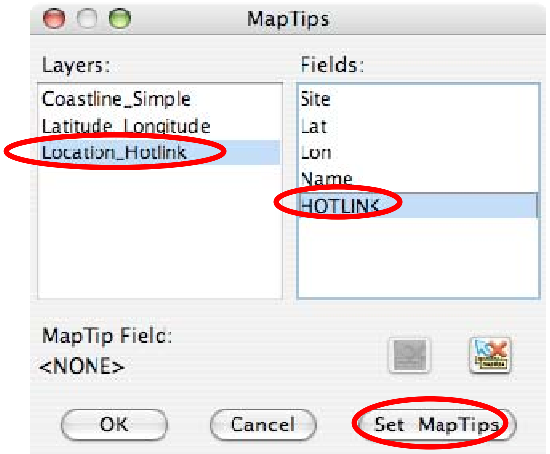
1. **Start up AEJEE and open your GIS Lesson 12 project.** This project should be named *firstname_lastname_lesson12,* and is found in the student/MapTEACH_Work folder.

2. Use the **Add Event Theme** process to make a new shapefile called *Location_Hotlink***.** (If it helps, review the detailed steps provided in GIS Lesson 12)

3. On the AEJEE menu, use **Tools/Map tips** to open the **MapTips** dialogue box. This will help AEJEE to find the hot spot for the link on the map.

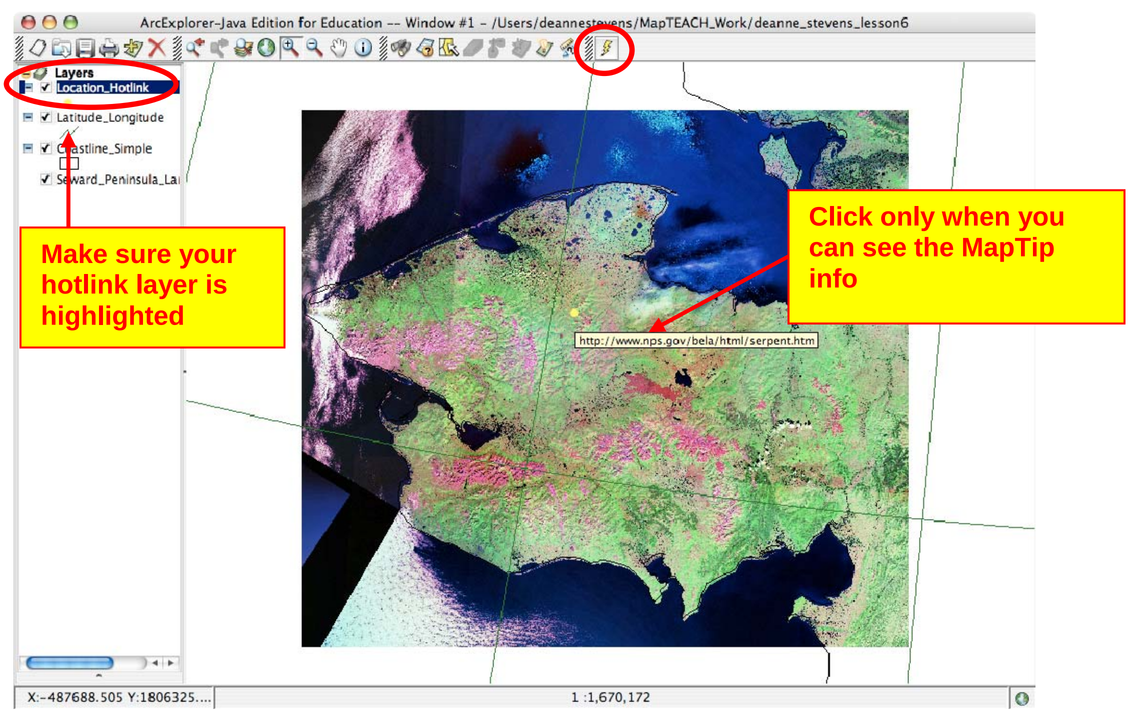


4. In the MapTips box, select ***Location_Hotlink*** for the **layer** and **HOTLINK** as the **field**. Click **Set MapTips** and then click **"OK."**



5. Make sure that **Location _Hotlink is highlighted in your Table of Contents** window.

6. **Select the "Hot Link" lightning bolt** from the tool bar. **Hover** the cursor right over the dot at Serpentine Hot Springs **until the MapTip info pops up and shows the web site address**. **Click** and your browser will open to a National Park Service web page with information about Serpentine Hot Springs.



7. If the new point does not appear on your map or is in the wrong place, carefully check your CSV file for errors and make sure you are using the correct entries in the Add Event Theme box.

Show your map and hotlink to a teacher.

Teacher sign-off: ___________________________

Extra Credit: Make another Web Site Hotlink

Find a web site related to an Alaska community of your choice.

Community name: ____________________________

Web site (url): ____

Go to the web site of the Alaska Division of Community Advocacy at

http://www.commerce.state.ak.us/dca/commdb/CF_COMDB.htm

Look up your community and find the latitude and longitude:

Latitude:_________________________

Longitude: _______________________

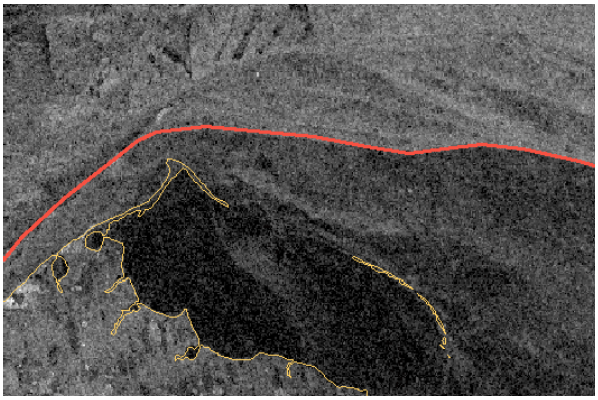
Make a new CSV file for hotlinking using your community coordinates and web site. Or, you can add this point to the CSV file you already have.

Make an AEJEE project with the hotlinked site.

Show your map and hotlink to a teacher.

Teacher sign-off: ___________________________

GIS Lesson 14
CHANGE OVER TIME: SHOREFAST SEA ICE
TEACHER INFORMATION



Lesson Summary: During this lesson students use GIS to analyze changes in the extent of shorefast sea ice. They extract information from multi-year and single year data and look for trends over time.

Objectives: Students will learn how to load and display multiple data layers in AEJEE and will use the measure tool to answer questions about what they see.

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.

Science E-1 Develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.

BACKGROUND FOR THE TEACHER

For a discussion of shorefast (landfast) sea ice and to learn more about the data used in this lesson, see the Alaska Satellite Facility newsletter article "Examining Landfast Sea Ice on Alaska's Northern Coast" at:
http://www.asf.alaska.edu/publications/newsletter/ASFNNV.2No.2.pdf

MATERIALS

- Computers - one for each student is best or two students can share. The computers must meet the following specifications to run AEJEE:

  - Macintosh: Mac OS 10.3 or above, 100 MB hard drive space, Internet connection; recommend G4 or faster processor and more than 64 MB RAM
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a CD delivered to you, or you can download the correct version from our website at http://www.mapteach.org
- MapTEACH GIS data also can be sent on a CD or downloaded from our website at http://www.mapteach.org
- Copies of student directions for the lesson.

INSTRUCTIONAL PROCEDURES

Getting Ready

- As always, try out the lesson on a classroom computer ahead of time.
- Make an overhead or PowerPoint slide of the example of radar imagery provided in the MapTEACH Ice_Data folder (Radar_Example).
- Consider whether you wish to preface this lesson with a more in-depth study of sea ice (see Teacher Resources).

Gear-up

- Work together with students to explore what shorefast sea ice is and why it is important to people living on the coast. A good teacher resource is the Sea Ice web page of the National Snow and Ice Data Center (http://nsidc.org/seaice/).
- Show students an example of the radar imagery that was used to make the shapefiles they will be working with. An AEJEE-ready example of this imagery and the line marking the location of the edge of shorefast ice in this image can be found in the MapTEACH Ice_Data folder (Radar_Example). You may choose to use it only as part of the gear-up for this lesson, or as an additional exploration so students have the opportunity to better understand the source of the GIS data they are working with. Explain how the extent of shorefast sea ice is indicated by the transition from dark speckled areas (where little or no movement has taken place) to light speckled areas (where significant movement is taking place).

More Explorations

- Have students work with the example radar image and the associated shapefile of shorefast ice (found in the MapTEACH Ice_Data folder – "Radar_Example").
- Students can code the ice limit data they worked with in this lesson so each shapefile has a fill color (in the exercise, they use transparent fill and only use the outlines to measure distances). When the layers are arranged in chronological order in the Table of Contents, students can

systematically turn the layers off and on to make a sort of time-lapse sequence of the extent of shorefast ice. Students can make observations about how the ice limit changes across the entire extent of the map area, as well as in specific locations.

- You may wish to have your students use graph paper to graph the measurements they make in this exercise, with time as one axis and distance from shore as the other axis.

MORE RESOURCES FOR STUDENTS OR TEACHERS

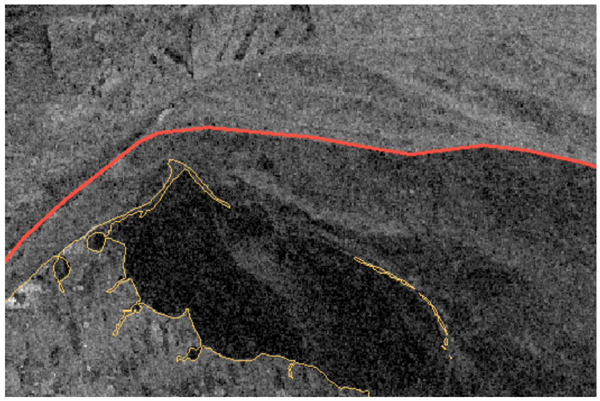
Background information on the University of Alaska Geophysical Institute's project that generated the data used in this lesson can be found at:
http://mms.gina.alaska.edu/

The National Snow and Ice Data Center's web page on Sea Ice offers a great deal of useful information for teachers or advanced students:
http://nsidc.org/seaice/
The "Environments" tab includes a section on indigenous peoples' knowledge of sea ice and how it impacts them.

The web site of the Barrow Ice Observatory, including a live webcam, can be found at:
http://www.gi.alaska.edu/snowice/sea-lake-ice/Barrow_observatory.html

Name: ____________________

GIS Lesson 14
CHANGE OVER TIME: SHOREFAST SEA ICE
STUDENT EXERCISE



Objectives: Students will learn how to load and display multiple data layers in AEJEE and will use the measure tool to answer questions about what they see.

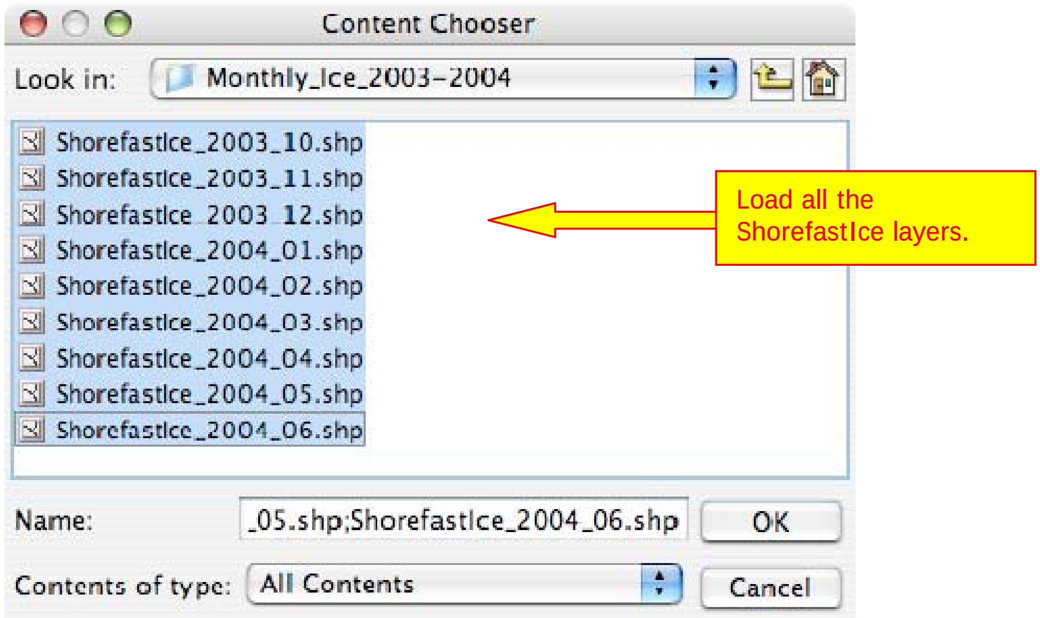
Estimated Time: 1 hour

As you have seen in class and in earlier lessons, satellite images can show many different kinds of features. Today you will be working with shapefiles that scientists have made by using computers to interpret radar imagery. The shapefiles you will be using show the extent of shorefast sea ice along the northern coast of Alaska during different years and during different times of the year.

Explore 1: One Year of Ice Data

1. **Open AEJEE** and make your window bigger by clicking on the green button in the top left of the window.

2. Navigate to the **Ice_Data** folder, open the folder **Monthly_Ice_2003-2004**, and load all of the shapefiles into your project. The easiest way to do this is to click on the top file name in the Content Chooser and then shift-click on the bottom file name to highlight all the file names.



Each of these shapefiles marks the extent of shorefast sea ice during one month between October 2003 and June 2004, which is almost a full 1-year cycle. You can tell the date of the ice limit by looking at the name of the shapefile, which includes the year and the month of that data. For instance, ShorefastIce_2004_03 is the shorefast ice limit in March (the 3rd month) of 2004.

3. **Set your map projection** to **Regional Projections / Albers Equal Area (Ellipsoid) / Alaska** in Systems, with a Datum of **NAD83 (North American Datum 1983)** and a Transformation of **NAD83 – Alaska**.

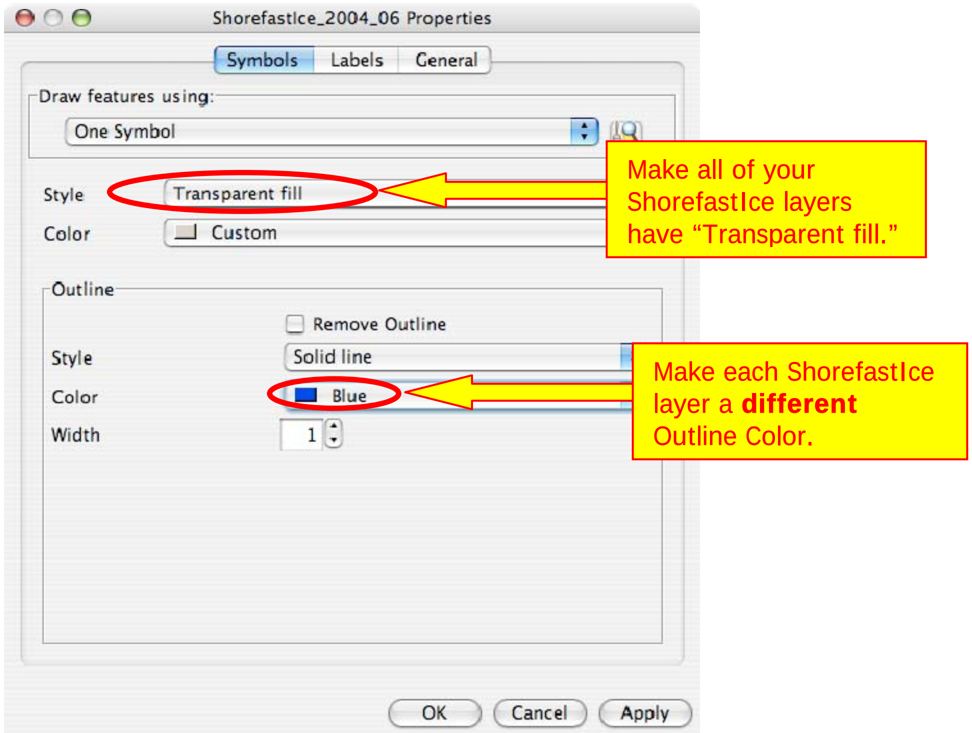
4. **Add NorthernCoastDetailed.shp** from the **North_Alaska_Coast** folder in **Ice_Data**.

5. **Add Towns** from the **Infrastructure** folder.

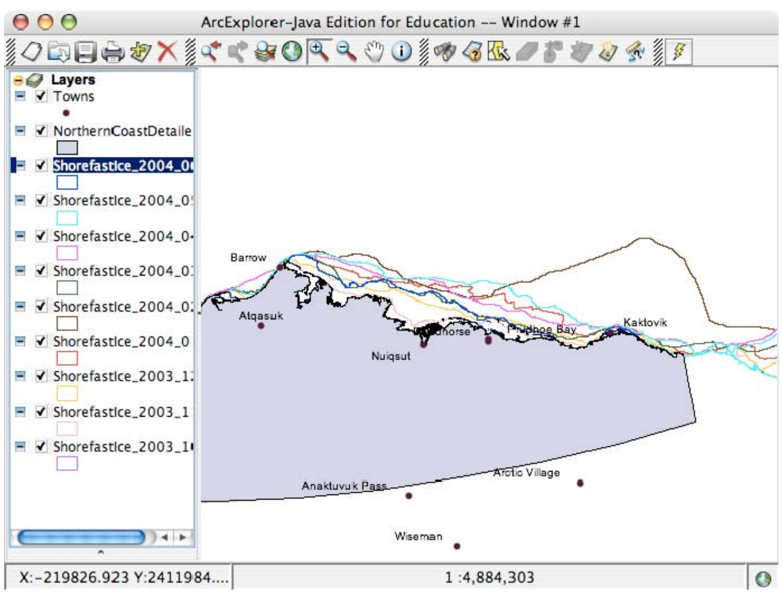
6. **Symbolize NorthernCoastDetailed** any way you like.

7. **Symbolize Towns** any way you like, and **label** it with the **town names**.

8. **Symbolize all the ShorefastIce layers** so that the **Style** is **Transparent fill** and the **line colors are all different** so you can easily tell the difference between the different layers.

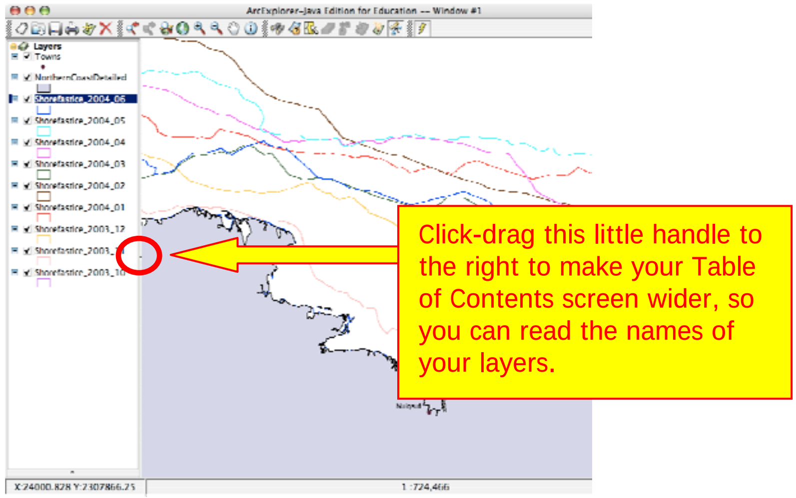


Your map might look something like this:



9. **Zoom in** on an area of the coast that interests you, making sure that your view includes all the shorefast ice extent lines that extend out to sea from that area.

10. Make your **Table of Contents** screen a little **wider** so you can see the full names of all your data layers. Do this by click-dragging the tiny button you can barely see in the middle of the bar separating the Table of Contents from the map screen.



11. Pick a point on the coast as your starting point and **use the Measure tool** to **measure the distance from that point on the coast to the edge of the shorefast sea ice for each of the months of data** you have in your project. Try to make all your measurements along a single, imaginary straight line extending out from the point you have chosen as your starting point. Use **Kilometers** as your units, and record your measurements in the space provided below:

October 2003 ____________________

November 2003 ____________________

December 2003 ____________________

January 2004 ____________________

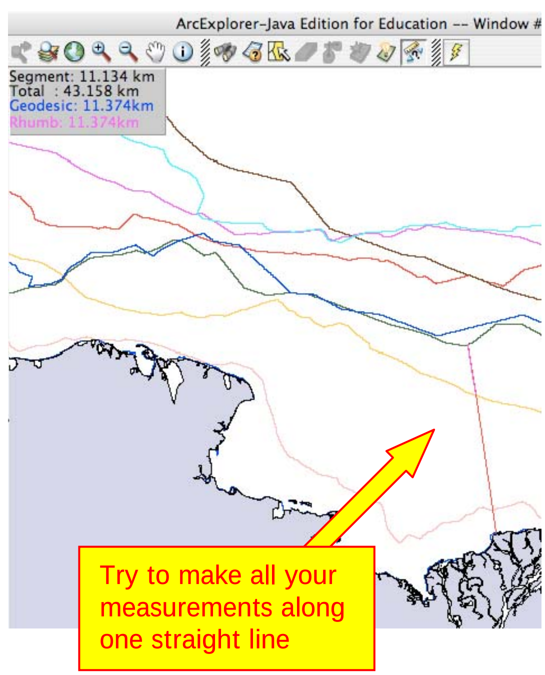
February 2004 ____________________

March 2004 ____________________

April 2004 ____________________

May 2004 ____________________

June 2004 ____________________



Interpreting Data

Which month had the most shorefast sea ice for your chosen location on the coast?

____

Which month had the least? _______________________

In general, was there any pattern or trend to the extent of shorefast sea ice over time for your chosen location on the coast?

____

If you observed a pattern or trend, please describe it:

____

____

Compare your results with someone else in your class who chose a different part of the coast. Did you get the same results?

____

What is your best guess about why or why not?

____

____

____

Save your project in your MapTEACH_work directory.

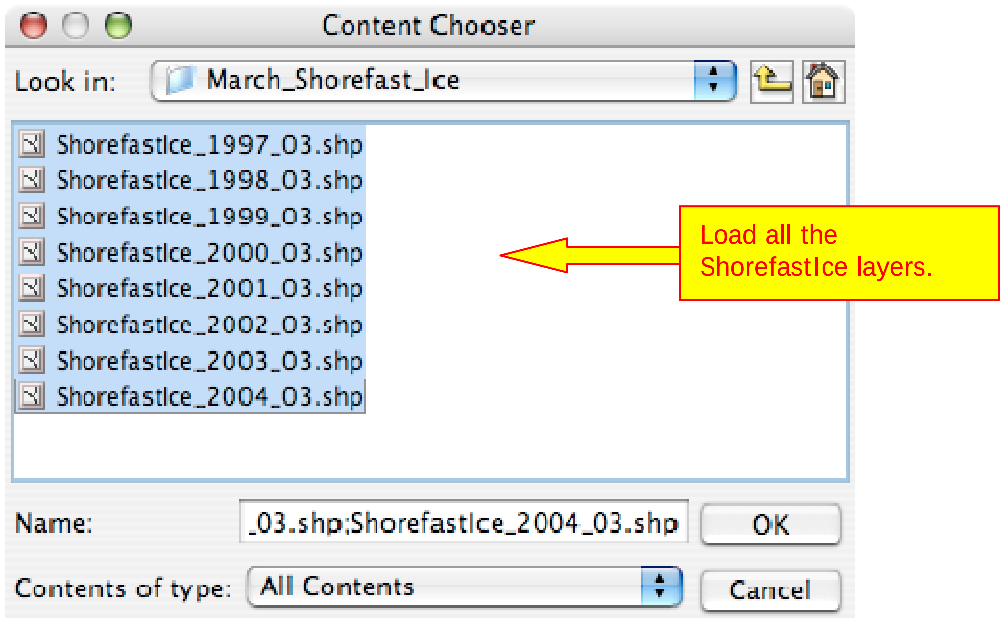
Show your project to a teacher.

Teacher sign-off: __________________________

Explore 2: Multiple Years of Ice Data

1. Start a new AEJEE project.

2. Navigate to the **Ice_Data** folder, open the folder **March_Shorefast_Ice**, and load all of the shapefiles into your project.



These shapefiles show the extent of shorefast sea ice during March for each year from 1997 to 2004. You can tell the date of the ice limit by looking at the name of the shapefile, which includes the year and the month of that data. For instance, ShorefastIce_1999_03 is the shorefast ice limit in March (the 3rd month) of 1999.

3. **Set your map projection** to **Regional Projections/Albers Equal Area (Ellipsoid)/Alaska** in Systems, with a Datum of **NAD83 (North American Datum 1983)** and a Transformation of **NAD83 – Alaska**.

4. **Add NorthernCoastDetailed.shp** from the **North_Alaska_Coast** folder in Ice_Data.

5. **Add Towns** from the **Infrastructure** folder.

6. **Symbolize NorthernCoastDetailed** any way you like.

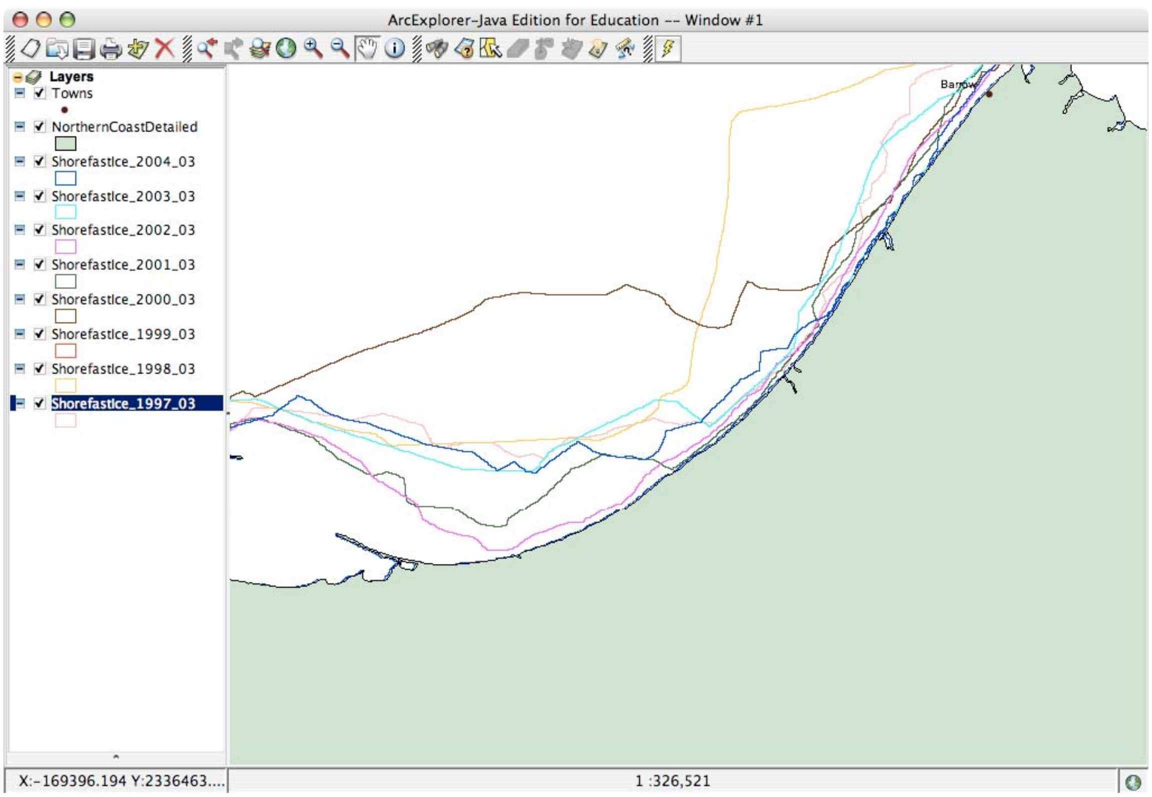
7. **Symbolize Towns** any way you like, and **label** it with the **town names**.

8. **Symbolize all the March_Shorefast_Ice layers** so that the Style is **Transparent fill** and **the line colors are all different** so you can easily tell the difference between the different layers.

9. **Zoom in** on an area of the coast that interests you, making sure that your view includes all the shorefast ice extent lines that extend out to sea from that area.

10. Make your **Table of Contents** screen a little **wider** so you can see the full names of all your data layers.

Your map might look something like this:



11. Just like you did with the one-season data in the last activity, pick a point on the coast as your starting point and **use the Measure tool** to **measure the distance from that point on the coast to the edge of the shorefast sea ice for each of the years of data** you have in your project. Remember to try to make all your measurements along a single, imaginary straight line extending out from the point you have chosen as your starting point. Use **Kilometers** as your units, and record your measurements in the space provided below:

March 1997 ______________________________

March 1998 ______________________________

March 1999 ______________________________

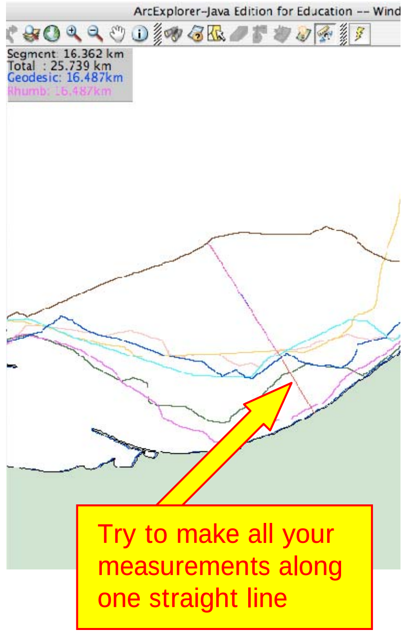
March 2000 ______________________________

March 2001 ______________________________

March 2002 ______________________________

March 2003 ______________________________

March 2004 ______________________________



Interpreting Data

Which year had the most shorefast sea ice for your chosen location on the coast?

____

Which year had the least? ________________________

In general, was there any pattern or trend to the extent of shorefast sea ice over time for your chosen location on the coast?

____

If you observed a pattern or trend, please describe it:

____

____

Compare your results with someone else in your class who chose a different part of the coast. Did you get the same results?

____

What is your best guess about why or why not?

____

____

____

If global warming is real, what would you expect the data to look like?

____

____

____

Do your results tend to support or refute global warming?

____

Do you think this is enough data to prove or disprove global warming?

____

Why or why not?

____

____

____

____

____

Save your project in your MapTEACH_work directory.

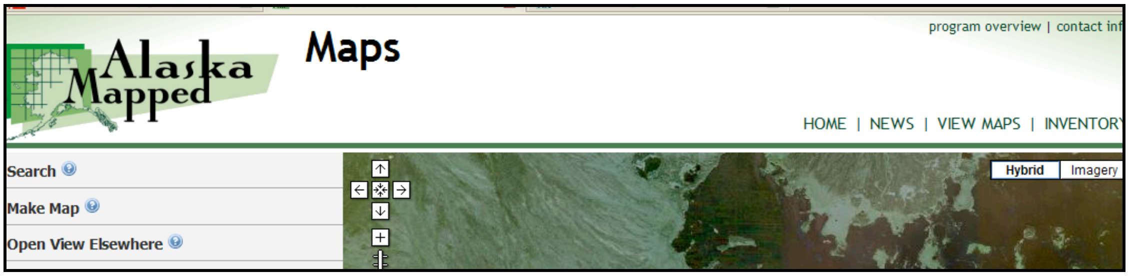
Show your project to a teacher.

Teacher sign-off: __________________________

MapTEACH:

Appendices

Technical Appendix A
Preparing Alaska Base Map Imagery for Local Mapping Projects
TEACHER INFORMATION



Summary: This document shows how to download and prepare a satellite base map image and its accompanying "worldfile" and "projection file" for local mapping projects in AEJEE using the free website tool "Alaska Mapped." (If you need assistance with extracting data from Alaska Mapped, go to the user forum at http://forum.gina.alaska.edu/forums/5/topics/38 and post your concern.)

Objectives: Teachers (or advanced students) will prepare an AEJEE-ready satellite image using "Alaska Mapped."

Estimated Time: 30 minutes

Correlation to Alaska Standards:

Geography A-6	Use spatial (geographic) tools and technologies to analyze and develop explanations and solutions to geographic problems.
Technology A-1	Use a computer to enter and retrieve information.

BACKGROUND FOR THE TEACHER

Several of the lessons included in the MapTEACH curriculum involve making AEJEE maps using GPS and other data collected locally by students. Satellite imagery can be a useful and informative base map layer upon which students can display their own data. It is not feasible for MapTEACH to be able to anticipate every possible area that any given student project would need satellite base map data for, therefore we have developed a procedure so teachers and advanced students can generate their own image layers for use in their local-area AEJEE projects.

Good imagery makes a map more interesting. However, imagery pushes the limits of AEJEE and there are limits on file sizes and formats. Also, to allow imagery to align correctly with vector data and other images, users must prepare a “worldfile” and a “projection file” to accompany the image file. This document shows how to download and prepare local raster imagery and its accompanying files for AEJEE using the free website tool “Alaska Mapped.” The website is part of the Alaska Statewide Digital Mapping Initiative and is run out of GINA (Geographic Information Network of Alaska) at the University of Alaska - Fairbanks. GINA is currently in the process of updating the “Alaska Mapped” website. As a result, please be aware that in the near future the “Alaska Mapped” web interface will have a different look and feel than it does in this document. If you need assistance with extracting data from “Alaska Mapped” go to the user forum at http://forum.gina.alaska.edu/forums/5/topics/38 and post your concern.

Some important concepts and tips for success:

- Different browsers behave differently with regard to saving files off of websites. We suggest Firefox because it behaves most predictably across computing platforms (Mac, PC, Linux) and requires fewer steps. However, this lesson also works with Internet Explorer on Windows and Safari on Mac.
- The three files that comprise an AEJEE-ready image (image file, projection file, worldfile) need to share **identical file names** differing only in their three-letter **file extensions**.
  - The **projection file** always has the extension “.prj”
  - The **worldfile** has an extension specific to the image format. Here’s the formula: worldfile extension = image file extension with middle letter removed and appending a “w”
    - Example: worldfile for a JPEG image (.jpg) = .jgw
    - Example: worldfile for a GIF image (.gif) = .gfw
    - Example: worldfile for a TIFF image (.tif) = .tfw

  So an AEJEE-ready JPEG image would be a collection of three files like this: imagename.jpg, imagename.jgw, imagename.prj (where imagename is the name of the image)

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
  - Windows: Win2000 or WinXP, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor and more than 64 MB RAM
- AEJEE software can be provided by MapTEACH on a DVD delivered to you, or you can download the latest version from ESRI at http://www.esri.com/software/arcexplorer/index.html
- MapTEACH GIS data also can be sent to you on a DVD.

INSTRUCTIONAL PROCEDURES (if used as a class lesson)

Getting Ready

If you choose to use this as a lesson in class, try it out on a classroom computer ahead of time. You will better anticipate tasks that your students might find challenging, and feel much more comfortable giving directions and answering questions. Make any modifications that will help your students be more successful.

Gear-up

You can search for locations for which you would like imagery by place name or by latitude and longitude. If your location of interest does not have a common place name, you may need to use another source to determine the latitude and longitude. We suggest using Topozone, GoogleMaps or YahooMaps ahead of time if place name searches don’t work.

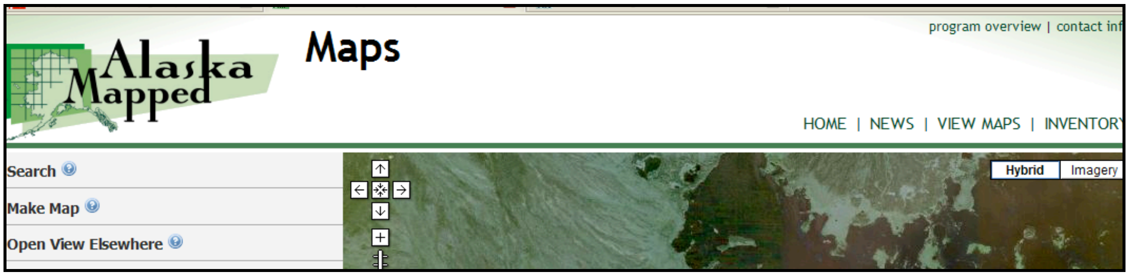
TEACHER RESOURCES

Wikipedia provides information about worldfiles at:
http://en.wikipedia.org/wiki/World_file

MORE RESOURCES FOR STUDENTS OR TEACHERS

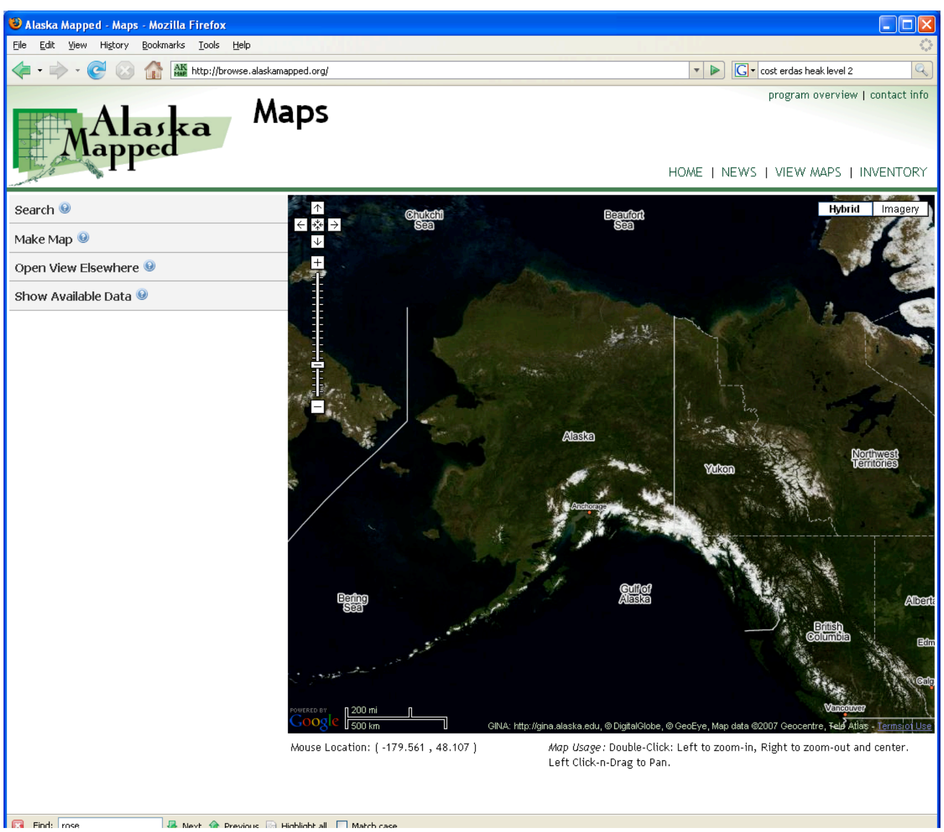
MapTEACH has also produced a document for preparing other kinds of AEJEE-ready imagery for GIS professionals or advanced practitioners with access to ArcGIS 9.x software. The document is included as Technical Appendix B.

Technical Appendix A
Preparing Alaska Base Map Imagery for Local Mapping Projects
STUDENT EXERCISE



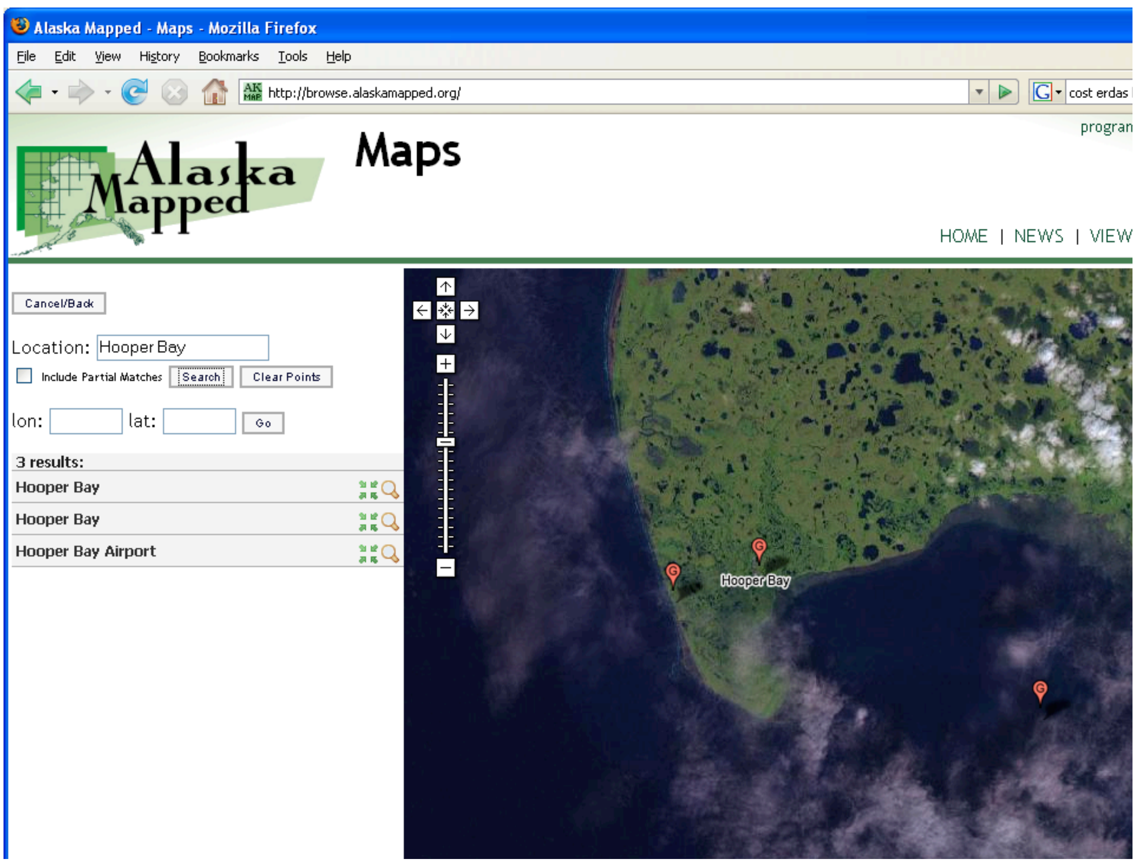
Step A: Browse to Website
1. Open a browser like Firefox or Safari, or Internet Explorer.
2. Browse to **http://browse.alaskamapped.org**
3. Note the interface includes four options on the left side (Search, MakeMap, Open View Elsewhere, and Show Available Data). Each has "help" information available by clicking the "?" button. We will focus on the "**Search**" and "**Make Map**" functions.

The site should look like this when first opened:



Step B: Find your Location or Area of Interest

1. **Pan** and **zoom** using the **navigation tools** in the upper left corner of the map or…
2. Use your **mouse**:
   - Double-left-click on a location to **zoom-in**
   - double-right-click to **zoom-o**ut (hold down ctl key on a Mac for right-click)
   - click-n-drag to **pan**
3. Use the **Search function.** For example if you search "Hooper Bay" you get three locations, Hooper Bay the town, Hooper Bay the bay, and Hooper Bay the airport.



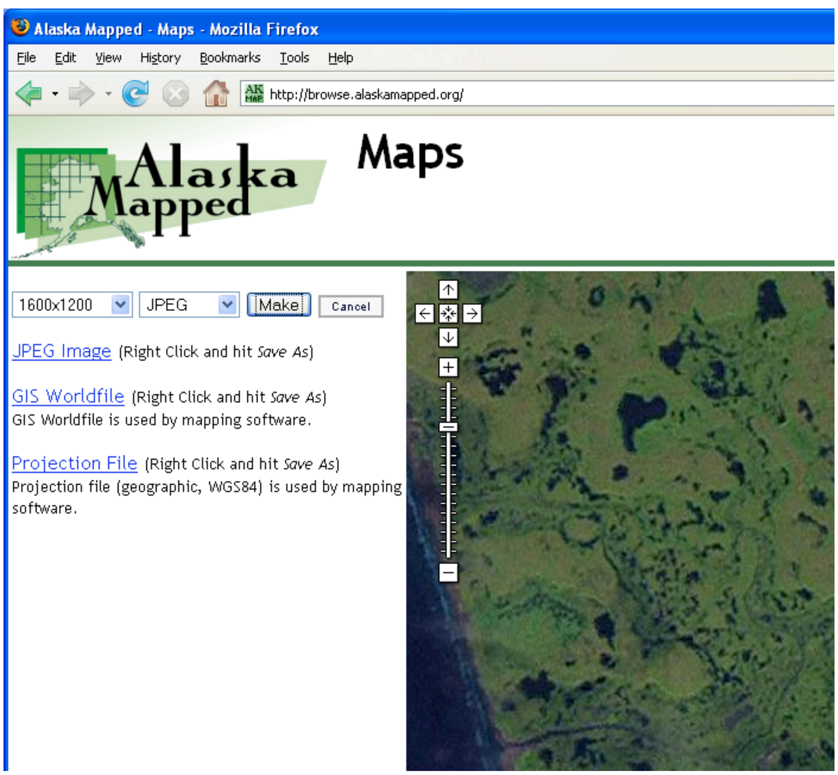
4. The **best** available imagery will automatically turn on as you zoom-in or arrive at a search location. "Best" is usually defined as **least cloud cover**, **highest detail**, and **most recent**. For Hooper Bay, this appears to be a Landsat image at 30-meter resolution.

Step C: Generate the Image for AEJEE

1. First turn off the labels by clicking the "**Imagery**" button in the upper right of the map. This makes it an Imagery-only map suitable for use as a base map. [Note: If you need the labels or roads, by all means keep them on but be aware that they will be a permanent part of your image once you download it]. If you did not use the search feature to arrive at your location of interest, proceed to step "D."
2. If you used the search feature to find your location, turn off the search result points by clicking the "**Clear Points**" button. If you arrived by pan and zoom you will not need to do this.
3. If you used the search feature to find your location, exit search mode by clicking the "**Cancel/Back**" button. Note: **DO NOT click the browser's Back button!** It will reset the map to the starting page or will leave the site all together. If you arrived by pan and zoom you will not need to do this step.
4. Now click "**Make Map**" on the left side of the browser window.
5. You will be given options for size in pixel dimensions. Select 1600 x 1200. For Image format select JPEG.
6. Click the "**Make**" button.

Step D: Save the Image to your Computer

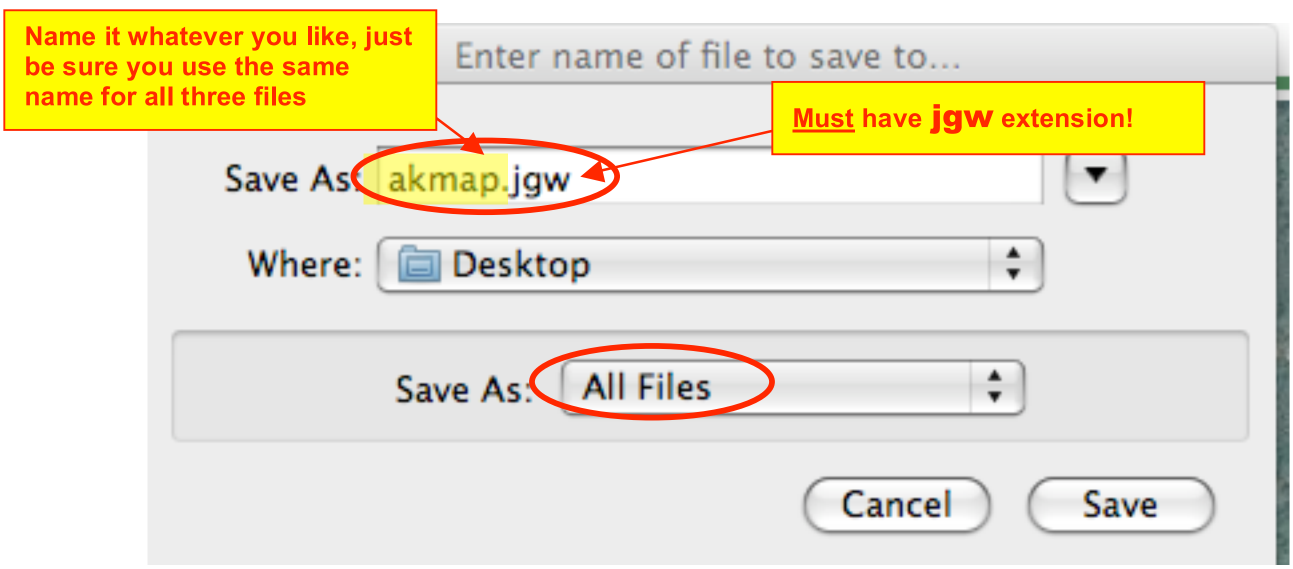
1. The browser window should look something like this:



2. The three files you need have been generated for you and now must be saved to your hard drive on your computer. Since different browsers handle this task differently, the directions have been separated into either "**Firefox and Internet Explorer**" or "**Safari**". Follow the directions for the browser you are using.

Firefox and Internet Explorer Directions

a. Right-click the "**JPEG Image**" link (or ctl-click on a one-button Mac mouse). If you are using Firefox, select "Save Link As…"; if you are using Internet Explorer on Windows select "Save Target As…".
b. Firefox and Internet Explorer will ask where you want to put the file and what you want to call it. You can name the files anything you want and put them anywhere you want as long as all three share the same exact name, are grouped together, and use the appropriate extensions (For example: fairbanks.**jpg**, fairbanks.**jgw**, fairbanks.**prj**)
c. **Repeat step** "a" for the "**GIS Worldfile**."
d. Firefox and Internet Explorer will ask where you want to put the file and what you want to call it. **Change the extension of the file from ".wld" to ".jgw"**. Be sure to select **"All Files"** from the Save As menu, and click "**Save**".



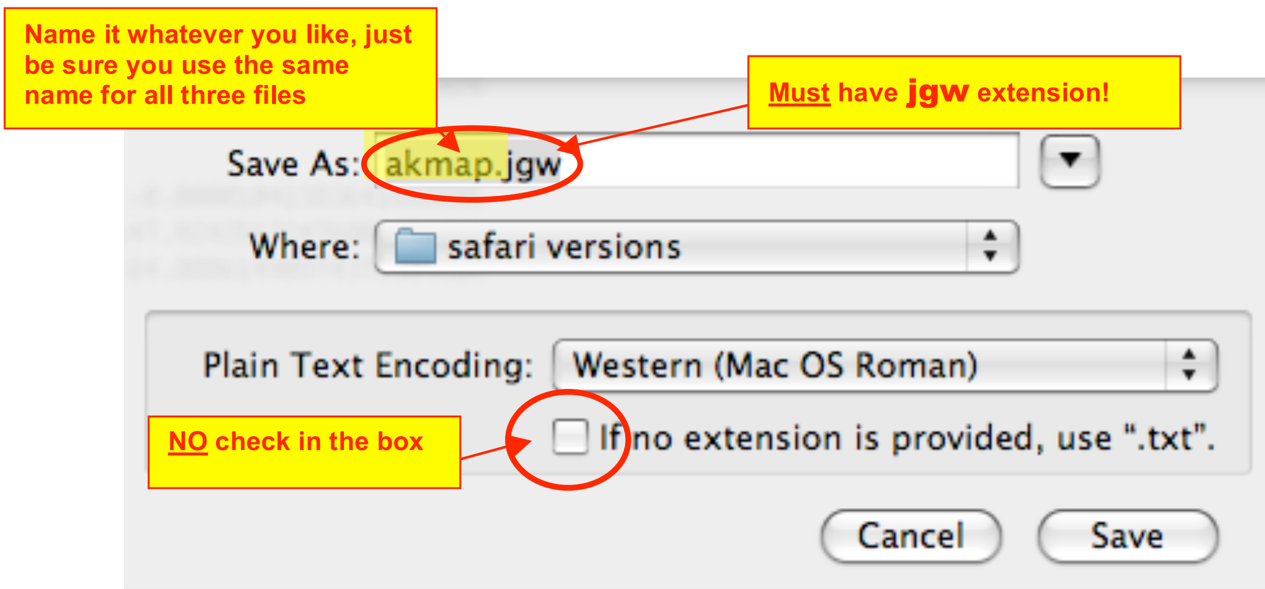
e. **Repeat steps** "a" and "b" for the "**Projection File**."

Safari Directions

a. Right-click the "**JPEG Image**" link (or ctl-click on a one-button Mac mouse). Select "Download Linked File As…"
b. Safari will ask where you want to put the file and what you want to call it. You can name the files anything you want and put them anywhere you want

as long as all three share the same exact name, are grouped together, and use the appropriate extensions (For example: fairbanks.jpg, fairbanks.jgw, fairbanks.prj) .

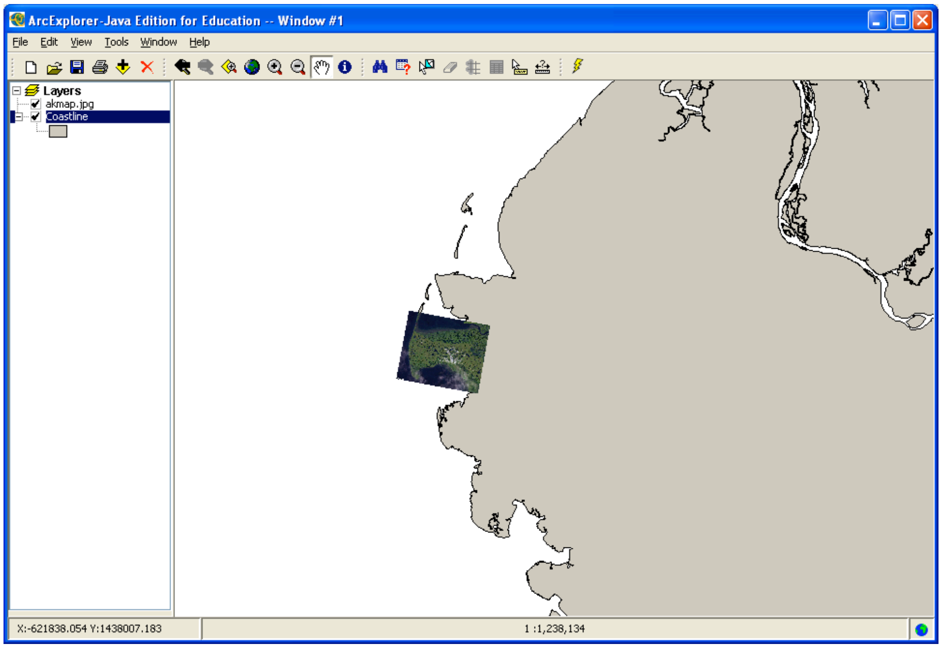
c. Repeat steps "a" and "b" for the "**GIS Worldfile**." You will need to **change this file name** later to make it work with the .jpg file in AEJEE. (Steps e-f below)
d. **Repeat steps** "a" and "b" for the "**Projection File**" using the "**.prj**" extension.
e. **Start Applications/TextEdit** on your computer and then **open** the downloaded "**.wld**" file (Notice that it has automatically been renamed with the extension "**.wld.txt**" which will not work in AEJEE.).
f. Do a **"Save As"** and rename the **"wld.txt**" file with your image name and the extension "**.jgw**".



g. **Uncheck** the box that says "If no extension is provided, use ".txt"."
h. Click "**Save**".

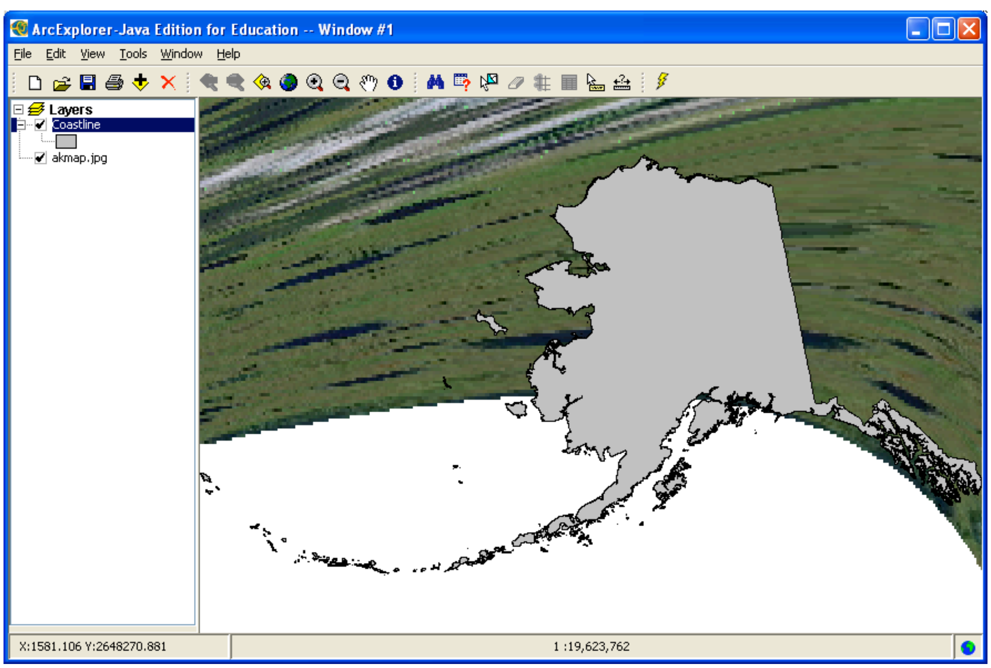
Step E: Test your Image in AEJEE

1. Open a new AEJEE map.
2. Navigate to /ESRI/AEJEE/Data/Data_MapTEACH_WGS84/Base_Data/ and add **Coastline_Simple.shp** to your map.
3. Add your newly created image.
4. Set the Tools/Projection to Regional Projections/Albers Equal Area/Alaska (with WGS84 datum).
5. Zoom-in on your area of interest.
6. It might look something like this:



7. If you can't see your image, it could be because you are not zoomed in close enough, or because it is hidden by another layer, or because you forgot to set the projection. Check all of these factors first. If your image still does not appear or appears distorted, chances are your world file has the wrong extension or your three file names do not match exactly.

Here the worldfile has the default extension ".wld" (Oops, needs to be ".jgw"!):



TECHNICAL APPENDIX B
Preparing Raster Imagery in ArcGIS for AEJEE
(ArcExplorer Java Education Edition – for Mac/Win)

To use projections in an AEJEE map with raster file imagery, you must assign projection information to the raster imagery you wish to use. Unlike ArcMap or ArcCatalog .aux files or world files for JPEGS or other raster formats. AEJEE relies on “PRJ files” like those used by shapefiles. Until version 2.3, GeoTIFF header tags were not recognized but now are.

AEJEE also has performance limitations with large raster images. We suggest using pixel dimensions of 2500 or less (in either direction) and using JPEG or PNG-24 compressed format. While PNG has the advantage of supporting transparency, be aware that PNG format exported from ArcMap often alters image color values significantly.

Performance is adversely affected when AEJEE needs to re-project raster imagery. We suggest pre-processing imagery to the projection that you will use in AEJEE. However, we also suggest using WGS_84 exclusively as the datum for your work in AEJEE if you intend to save your projects. This is because upon reopening a saved map in AEJEE, the datum is automatically reset to WGS_84 regardless of the datum it was saved with. This can cause long delays in opening a map as AEJEE re-projects your raster images. This is a known bug (CQ00308198) in AEJEE and one would expect that it will be subject to change in future versions. Vector data re-projects quickly and is not a factor in this discussion.

[Most of these issues can be avoided if ArcIMS image services are used in AEJEE rather than local raster files. However, in many cases that is not an option as it requires a well-formed and highly available ArcIMS image service and user access to the Internet.]

This is the protocol we are currently using with ArcGIS 9.2:

A. Checking Native projection
   1. Open ArcCatalog
   2. Right-click image icon in the “Catalog Tree” (use the “Window” menu to open the Catalog Tree if it is not visible)
   3. Scroll-down to check “Spatial reference” and datum to confirm (if no spatial reference is defined additional steps are required – see “*defining spatial reference”* below.)

B. Re-project the raster image
   1. Open the “ArcToolbox” panel (use the “Window” menu or toolbox icon).
   2. Expand “Data Management Tools/Projections and Transformations/Raster”
   3. Double-click “Project”
   4. Set “Input raster” (input coordinate system should auto-fill)
   5. Set “Output raster” note the comments in the Help panel. You must specify an extension or the output will default to a GRID format. We suggest .tif
   6. Set “Output coordinate system.” For example, to set UTM_6N_WGS84, use the “Select” button, and then double-click on Projected Coordinate Systems/UTM/WGS 1984/WGS 1984 UTM Zone 6N.prj. Click “Apply” and click “OK”
   7. If you are moving from one datum to another, you will need to pick a transformation method [see list at end of this document].
   8. Choose “CUBIC” for the resembling technique for smoother feature representation in the imagery.
   9. We suggest leaving the Output cell size at the default setting.
   10. Click “OK” to start the processing.

C. Convert the new GeoTIFF to a JPEG
   1. Open ArcMap
   2. Add the new GeoTIFF to a blank map. Allow pyramids to be made, though AEJEE may not use them. If the projection worked, you should get no errors and you should see the units of measurement (e.g. “Meters” or “Degrees”) in the lower right corner of the map where cursor coordinates are reported.
   3. If necessary, adjust contrast of the image using the “Symbology” properties of the image layer (right-click the layer name and select “properties”).
   4. From the “File” menu, select “Export Map…”
   5. Choose an output location.
   6. Enter a file name
   7. Select a file type (there are 10 options), we recommend JPEG
   8. Enter a resolution (we recommend at least 200 dpi) but let Width and Height guide your choice of resolution since the size of your map also influences the number of pixels. We recommend arranging less than 2,500 pixels as the longest dimension.
   9. Select the “Write World File” option for possible future.
   10. Click the “Save” button.

D. Assigning Spatial Reference Info
1. Open ArcCatalog
2. Right-click image icon in the "Catalog Tree" (use the "Window" menu to open the Catalog Tree if it is not visible)
3. Scroll-down to check "Spatial reference" and datum to confirm. If no spatial reference is defined, click on the "Edit…" button and use the "Select…" button to navigate to the projection file you need. For example, to set UTM_6N_WGS84, use the "Select" button, and then double-click on Projected Coordinate Systems/UTM/WGS 1984/WGS 1984 UTM Zone 6N.prj. Click "Apply" and click "OK". Then repeat "Apply" and "OK".
4. Now ArcCatalog and ArcMap will recognize the spatial reference info. However, for AEJEE, you need to make a .PRJ file to match the new projection. Do this in Windows Explorer.
5. Navigate to a copy of the correct PRJ file (on most systems this will be here: C:\Program Files\ArcGIS\Coordinate Systems\Projected Coordinate Systems\UTM\WGS 1984\
6. Highlight the correct PRJ file, right-click and select "Copy"
7. Navigate to the directory containing your newly created JPEG or other file from Step "C" above and paste the PRJ file (right-click, Paste).
8. Change the name of the PRJ file to match (exactly) the name of your image file but keep the extension .prj [It is not a bad idea to keep a copy of the original PRJ file in the directory for future reference].

*Most Common Alaska Datum Transformations

NAD_1927_To_WGS_1984_7	1176	Alaska
NAD_1927_To_WGS_1984_21	1249	Alaska - Aleutians east of 180 E
NAD_1927_To_WGS_1984_22	1250	Alaska - Aleutians west of 180 E
NAD_1927_To_NAD_1983_Alaska	1243	Alaska
NAD_1983_To_WGS_1984_1	1188	Alaska
NAD_1983_To_WGS_1984_2	1251	Alaska - Aleutians