ArcExplorer™ —Java™ Edition for Education

Contents

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.

6. Getting Started with AEJEE
   a. Introduce yourself to AEJEE by walking thru the lessons in this packet. Look for more lessons at www.esri.com/arclessons (choose "By Software - ArcExplorer").
   b. Learn more about GIS in schools and the geographic inquiry process from the documents "Exploring Common Ground" and "Geographic Inquiry", downloadable from www.esri.com/industries/k-12/education/literature.html
   c. An excellent brief introduction to principles of cartography can be downloaded from www.esri.com/industries/k-12/download/docs/intrcart.pdf

7. Introduce GIS to your students.
   a. Show students what GIS is and how it is used in the real world using these sources:
      1. www.gis.com
      2. www.esri.com/mapmuseum
      3. www.esri.com/industries.html
      4. www.gisday.com
      5. www.geographynetwork.com
      6. www.esri.com/communityatlas
   b. Take students through "Getting Started with AEJEE" lessons (the rest of this tutorial)

Main Capacities of AEJEE

Display GIS data
- Shapefiles plus various image formats
- Use data stored on local sources (hard drive, CD, LAN)
- Use data distributed over Internet via ArcIMS servers
- Pan and zoom
- Set a specific scale
- Set scale dependency for data
- Measure distance
- Buffer
- Change display projection of decimal degree data on the fly
- Hot Link to files of various types
- Set an overview map for context
- Print or export (.BMP, .JPG, .PNG) map or layout

Display attributes of GIS features
- Identify individual features
- Label all features
- Display dynamic MapTips
- Display full table (including sort by alpha or numeric)

Classify GIS feature data (points, lines, polygons)
- Single symbol
- Unique values
- Graduated
  - Quantile, equal interval, custom classes
  - Ramp or customize colors
  - Show histogram and statistics

Select particular GIS features interactively
- Find by attribute
- Logical query using attributes, values, and math operators
- Select using buffer

Create point shapefiles from XY tables (such as GPS coordinates)
- .TXT (tab-delimited), .CSV (comma separated), or .DBF files

Share projects
- Open existing projects
- Create and save new projects
- Data paths can be edited, and relative paths set, with simple text editor

Create custom layouts
- Maps with legend and scale bar
- Annotate with text and graphics
- Multiple data frames

AEJEE looks and works the same across platforms.

AEJEE for Windows

AEJEE for Macintosh

AEJEE Menu Options (All Interfaces)
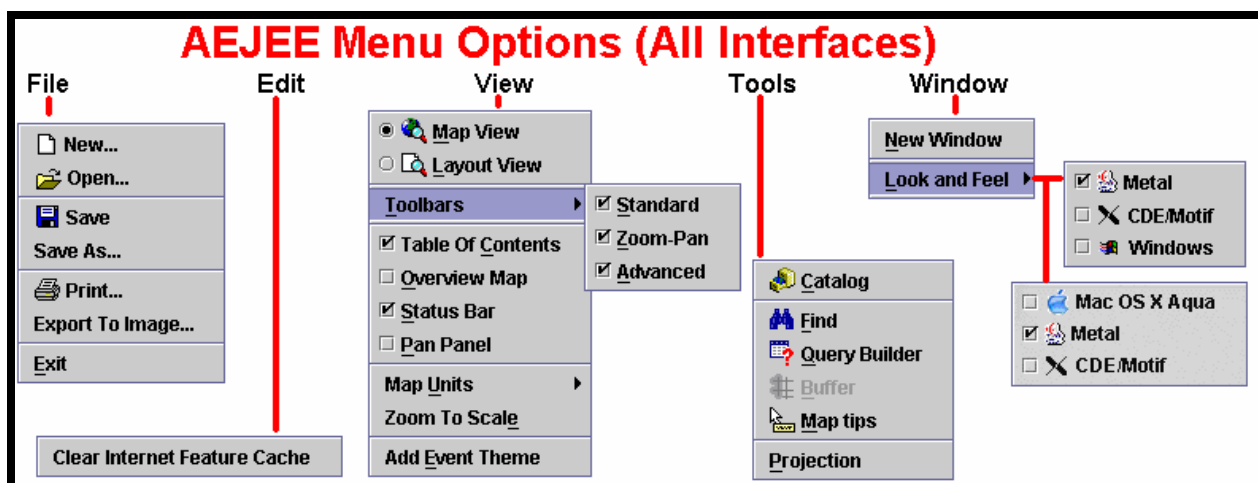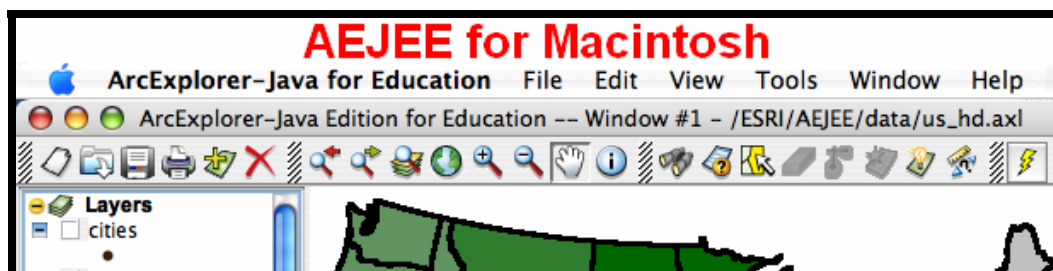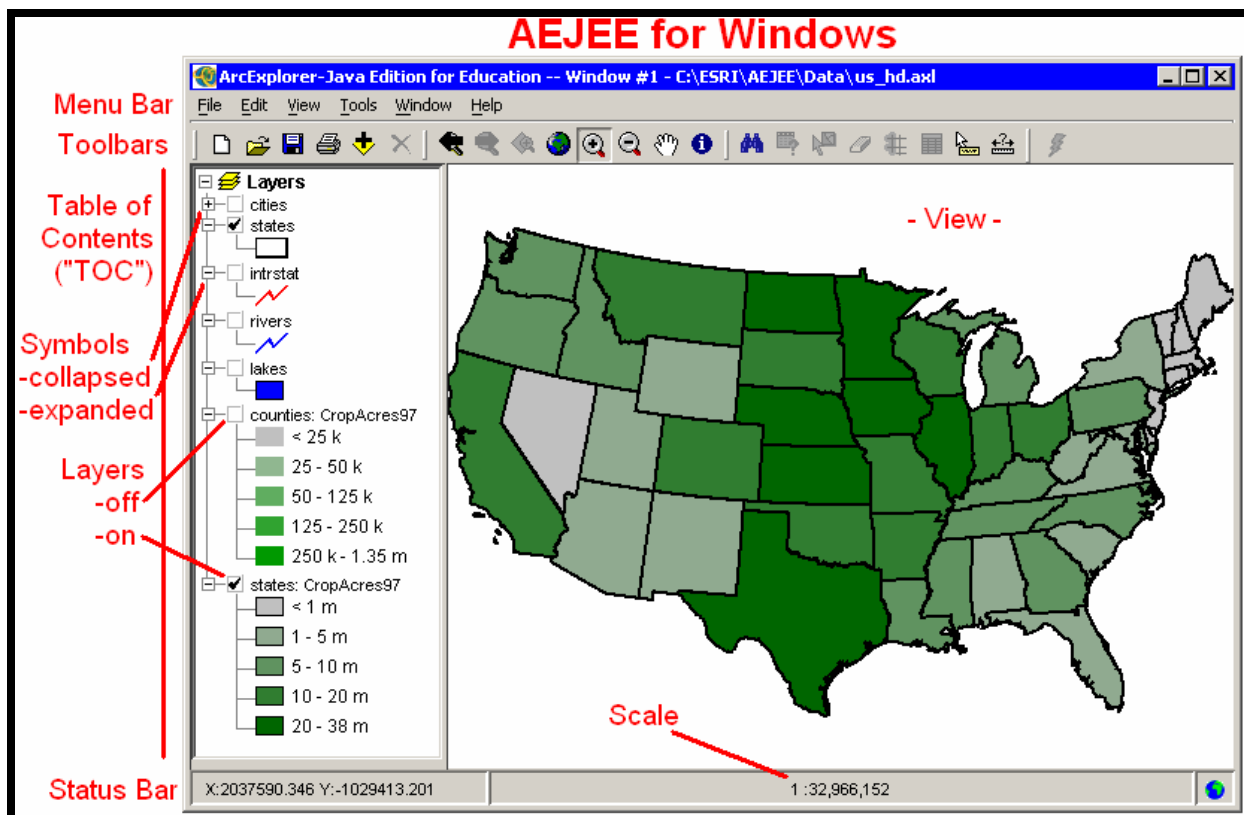
All AEJEE interfaces in "Map" view use the same set of toolbars, with about 20 buttons.
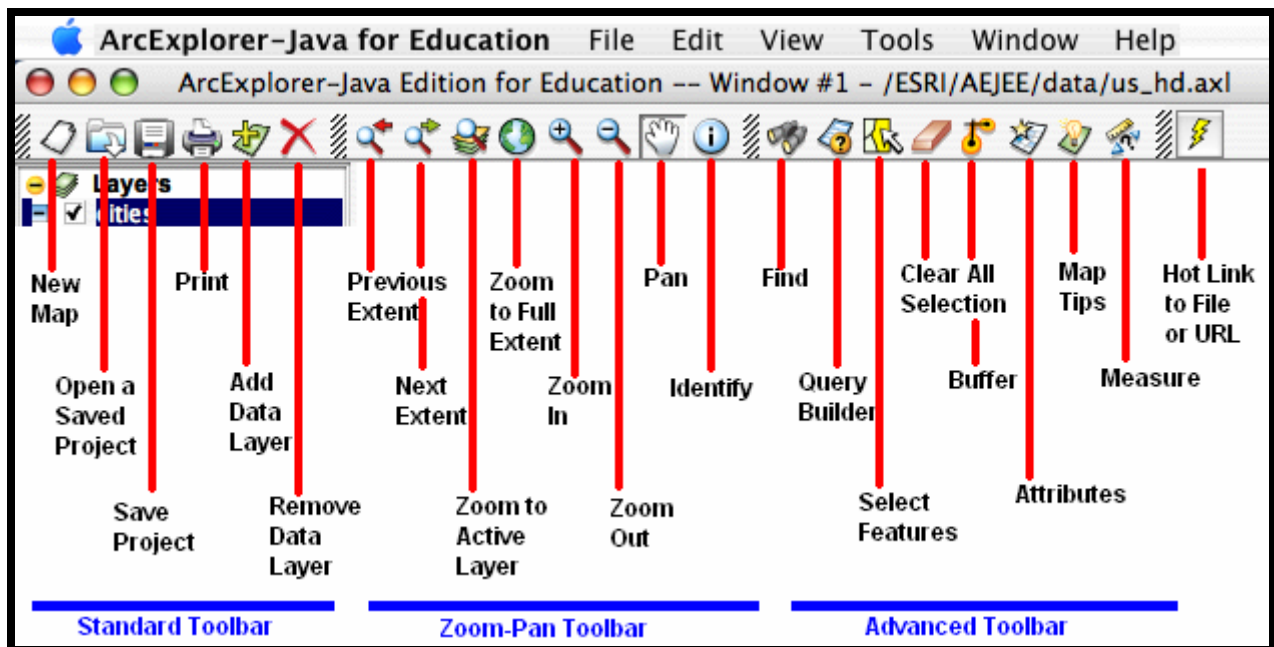
The "Layout" view (shown here in "Metal" mode) includes special tools for customizing output.
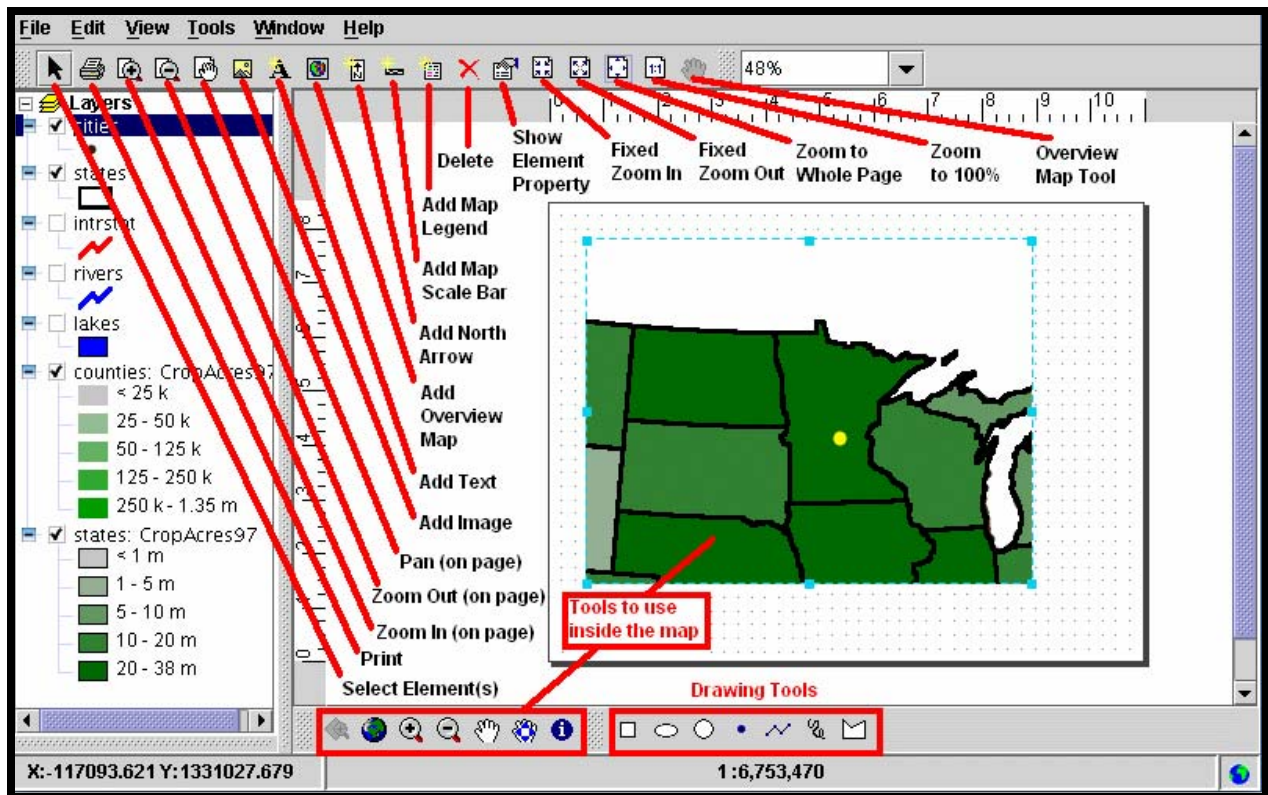
Projects and Data for AEJEE

AEJEE is a GIS data viewer that can handle data stored on locally accessible sources (hard drive, CD, or local network) as well as data coming from the Internet, served by ArcIMS data servers. AEJEE users can save and share projects, which include pointers to the source of the data.

Projects stored with this installation of AEJEE engage data from both local and Internet sources. Projects with names including the letters "**hd**" use data from the hard drive. Projects with names including "**gn**" use data from the Internet, coming from the Geography Network. Projects with names including "**gnhd**" use data from both sources. **Any project engaging data from the Internet requires the computer to be connected to the Internet in order for the project to operate; if a project cannot access a listed data source, the project will not open.**

10grid_hd.axl	=	project data from hard drive only
world_gn.axl	=	project data from Geography Network only
us_gnhd.axl	=	project data from both hard drive and Geography Network
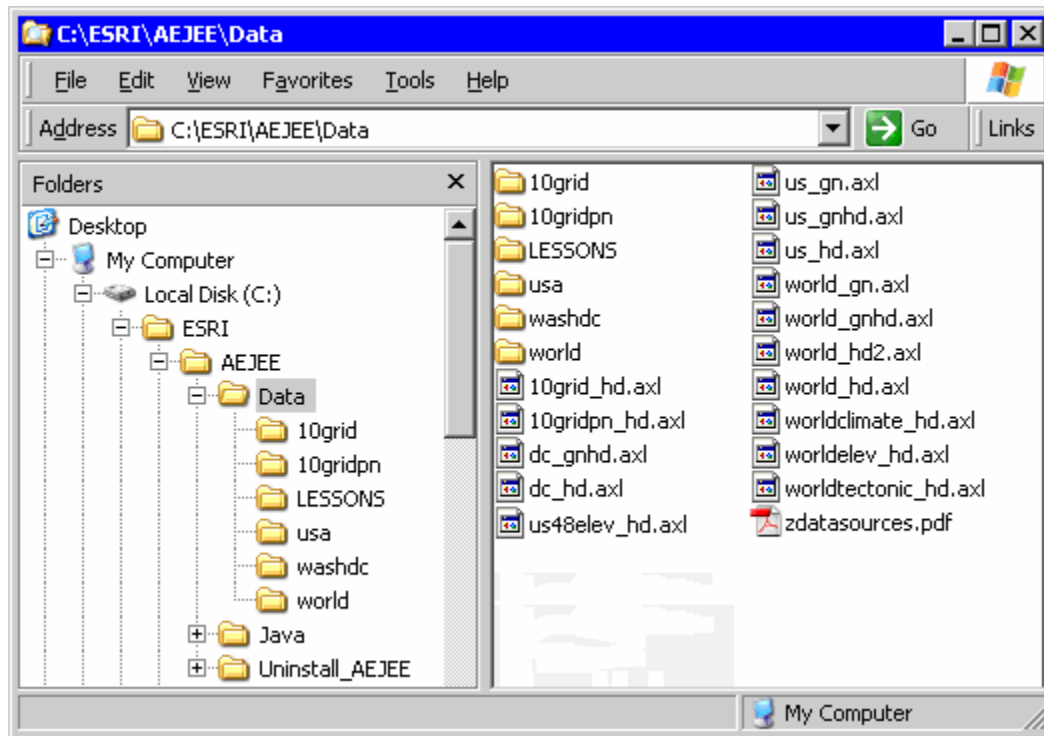
You can use the data that comes with AEJEE to create new projects. You can share those projects with other users of AEJEE, and they will be able to see your creations because they have the same data. You can use data from the Geography Network and other ArcIMS-based servers to create new projects also. You can share those projects with other users of AEJEE, and they will be able to see your creations if they also are connected to the Internet.

Redistribution Rights for software, projects, maps, and data

Issues of copyright can be challenging to understand, but here are some guidelines that should help users of AEJEE take best advantage of the redistribution rights available to you.

Q. 1: Can I give AEJEE to someone else?
A. 1: Users at schools may install AEJEE on any number of computers for instructional, non-commercial use. Teachers and students may install AEJEE on home computers for school work. You may give AEJEE to someone else to install for personal, instructional, non-commercial use, as long as you provide the entire installer, including the license and documentation, and do not charge for provision of the installer. For any other uses, see www.esri.com/aejee and send an email to "k12-lib@esri.com".

Q. 2: Can I make an AEJEE project, save it, and share that project?
A. 2: Yes. The project file is just a "recipe" – a set of instructions for AEJEE to find data in certain places and treat it in certain ways. If you create a project, you are the owner, and may share it with others. Just remember that other AEJEE users will only be able to use the project if they have access to the same data in the same locations, either the same locations on their hard drive or out on the Internet in a place to which they have access. (See Appendix 2 about creating "transportable projects.")

Q. 3: Can I submit a paper or multimedia project with a map I made using AEJEE?
A. 3: It depends. When you make a map, you are establishing the "look and feel" of the display. You are defining how things will look. If you own the data that makes up the map, or if the permissions for the data you use are such that you may create and share images, then you can create a map and include it in a paper. Sometimes, data providers are protective of their data, and you may not have the right to distribute maps that you create. Other times you can distribute maps you create, but only with permission or acknowledgement of the data provider. With AEJEE, the data included may be used in creation of maps for non-commercial educational purposes, and may be used by students and teachers in creation of maps for hardcopy or electronic representation, including but not limited to paper documents, multimedia presentations, or web sites. For data included with AEJEE, use as attribution "Data used with permission of ESRI."

Q. 4: Can I use the data that comes with AEJEE in another project with another tool?
A. 4: It depends. If you are a non-commercial educational user making maps with AEJEE and with other GIS tools, and you want to use the data that comes with AEJEE to create some maps with other tools, such as for a comparative analysis of the differences between AEJEE and ArcView®, you may use the same data in other tools. But not all such external uses are permitted. The digital data included with AEJEE may not be distributed for use in other mapping, database, or alternative software packages without written authorization from ESRI. Send an email to "k12-lib@esri.com" with specific questions.
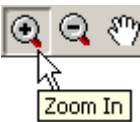
Getting Started with ArcExplorer—Java Edition for Education – Lesson 1
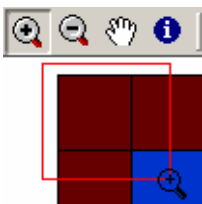
This lesson covers the following ideas, tools, and capacities:
- Opening stored projects
- Turning layers on and off
- Changing the sequence of layers
- Zooming and panning
- Active layer
- Identifying
- Features
- Attributes
- Tables
- Sorting
- Selection
- Selecting by attribute
- Selecting by find
- Selecting by legend symbol
- Selecting by geography
- Selecting by query
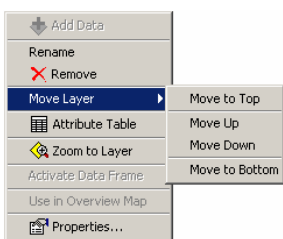
1. Start AEJEE. (You may need to check with your teacher or tech coordinator to find out where AEJEE was installed and where the "startup" file is located.)

2. Begin by opening a project that has been already created for you. Click the "**Open...**" button or choose the menu item "**FILE/OPEN**".

3. Use the window to navigate to where AEJEE data and projects are stored. By default, this is in **[harddrive]/ESRI/AEJEE/DATA**. (You may need to check with your teacher or tech coordinator to verify the location.)

4. Find the file "**10grid_hd.axl**". Click the file name and click "**Open**".

5. Look at the AEJEE window for a minute. Compare what you see with the graphics from the "Intro to AEJEE" document. The column at left is called the "Table of Contents" (or "TOC"), and the map space is called the "View". Right now, the View shows a grey box, and the TOC shows two layers, called "**studyarea**" and "**polygons**".

6. In the TOC, notice that the "**studyarea**" layer is turned on, indicated by a black check mark. Notice that the "**polygons**" layer is turned off. Click the check box for the "**polygons**" layer to turn it on, and notice that it displays in the View. Turn off the "**studyarea**" layer, then turn it on again, and notice that the map doesn't really change. The map builds from the bottom to the top of the TOC. Whichever layers are on top and turned on in the TOC will be on top and turned on in the View. Keep the "**polygons**" layer turned on.

7. Let's see how to move around the map. Look for the "**Zoom In**" tool and click it. Click once anywhere in the View. The map will zoom in a little bit, centered on where you clicked. You can do it again, and again, and again, zooming in a little bit each time.

8. "Oops! I messed up! I want to see everything!" Easy to do. Look for the "**Zoom to Full Extent**" button and click it. No matter where you might be, clicking the "**Zoom to Full Extent**" button zooms the View back to fit everything that is included in the TOC.

9. Now use the "**Zoom In**" tool with a "click-hold-drag diagonally" process, creating a red box around the area into which you want to zoom. Let go, and you'll zoom into the space you just outlined.

10. Move your mouse along the "Zoom-Pan Toolbar" to see what the other tools do, and try them out. You'll use these tools constantly. When finished, click the "**Zoom to Full Extent**" button.

11. In the TOC, right-click the name "**polygons**" to see a context menu for the layer. Slide the mouse to "**Move Layer**", then to "**Move to Bottom**", and left-click. The "**polygons**" layer will go to the bottom of the set of layers in the TOC, and the map will re-draw. Try it again, this time choosing to move the "**polygons**" layer up. The "**polygons**" layer will move up one level in the TOC, which in this case means it will jump back up to the top of the list.

Macintosh users note: on a single button mouse, you can use the "CTRL" key plus the mouse to perform "right-click" activities.

12. Now it's time to engage a process on a specific layer. First, you need to focus the computer on the desired layer. Click once directly on the name "**polygons**" in the TOC to highlight the layer. This process is also called "**making it active**."

13. Each of the features in the "**polygons**" layer has a set of information attached to it. You can see this by choosing the "**Identify**" tool and clicking, one by one, on different features in the "**polygons**" layer. (How many pieces of information does each feature have?) Make the "**studyarea**" layer active and try again. Close the "**Identify Results**" window.

NOTE: The power of any map is that it is a simplified version of the real world. The power of GIS begins with the process of matching geographic features (represented by points, lines, areas, and images) with characteristics about each feature.
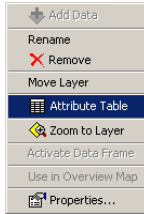
14. You can see the entire set of information about all features in the "**polygons**" layer by making it active, then right-clicking the name "**polygons**" to open the context menu, and scrolling down to choose "**Attribute Table**". In the window "**Attributes of polygons**", notice that you can scroll left and right, and up and down, to see all the information about the features. (How many pieces of information does each feature have? Which columns were not shown when using the "**Identify**" tool?)

NOTE: In the GIS world, characteristics of features are called "attributes". In a table, all the features of that data set will have a similar set of attributes; tables make it easy to organize and explore the information. It's OK if some pieces of information about the features don't make sense right away, but it is helpful to see if you can figure out what they mean.

15. Our study area covers a grid that is 10 squares by 10 squares, or 100 total squares. How many of each type of landform are there? We could count on the map, square by square, or count in the table, looking row by row for all the ones of a certain type, but that's what a computer is particularly good at. In the "**Attributes of polygons**" window, right-click the column header "**Landform**" and choose "**Sort Ascending**". The table shuffles into alphabetical order based on Landform. Click the top row, then hold down the keyboard's "SHIFT" key and click the last row identified as "**Hill**", turning all those rows bright blue. At the bottom of the window, how many does it say have been "**selected**"?

16. Having selected some records in the table, look what happens in the map. The "Hill" squares now have a yellow hatch pattern on top, indicating they are "selected." They were selected in the table, but are also selected in the map. Let's see if it works the other way, first by clearing the selection. Close the table and click the "**Clear All Selection**" button.

NOTE: In GIS, the map and its tables are tied together. Select features in a table and they will be selected in the map; select them in the map and they will be selected in the associated table.
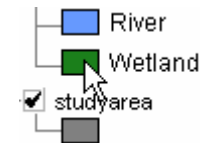
17. Look in the View and notice that there are only three green squares (wetland). In the TOC, click on the green box symbol for "Wetland". Notice that they have become selected on the map, covered with the yellow hatch pattern. Now, open the table for "**polygons**".

18. Right-click any one of the field names and choose "**Sort Selected Data to Top**". See which rows are colored blue, and how many there are. Close the Attribute table and click the "**Clear All Selection**" button.

19.
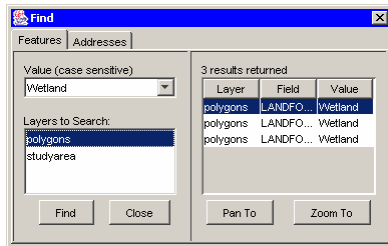
You can also select features one by one using the "**Find**" tool. In the View, click the "**Find**" tool (binoculars), highlight the "polygons" layer, and type "Wetland" (no quote marks, but with a capital 'W') in the left box. Click the "Find" button at the bottom. Three entries appear on the right. Move the "Find" box to the side and click, one by one, on the three listed choices. Close "**Find**".

20.
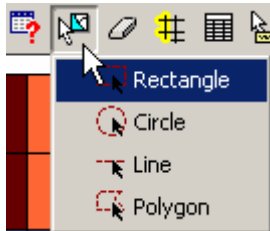
You can also select in the map using your mouse. Click the "**Select Features**" tool and choose "**Rectangle**". Drag a box in the map and see how many polygons you select. You can try it again, dragging a different sized box. Notice that when you select any part of a feature, that entire feature is selected. Try this with the **Circle** tool, and notice that it selects whole squares, not just the circled area. Same with the **Line** tool. When you use the **Polygon** tool and "click-click-click-doubleclick" to draw an irregularly shaped area, you select whole features again. Each time, looking at the Attributes table will show you how many features were selected. When you're finished, close the table and click the "**Clear All Selection**" button.

21. The final step in learning about selections is to explore the "**Query Builder**". Queries let you ask questions, using the power of the computer to highlight answers in the map. Suppose you wanted to find the mountainous areas with elevation greater than 80. You could use the "**Identify**" tool and look at the elevation of each mountainous region. Or you could open the attribute table for "**polygons**" and select by landform, then sort by elevation. Building a query uses the power of the computer to do the work for you.

22. In the TOC, click once on the name "**polygons**" to highlight that name, telling the computer the layer about which you want to ask a question.

NOTE: Be sure to highlight (or "**make active**") the layer on which you want the computer to focus. Confusion in building queries often starts when the computer's attention is not focused on the desired layer.

23. Click the "**Query Builder**" button and look at the resulting window.

Macintosh users note: Sometimes, in windows such as the Query Builder, a single click only focuses the computer on the portion of the window in which you wish to operate. In windows such as these, it is important to see if each click is accomplishing what you wish. A good rule of thumb is "Click once, first; if that doesn't do the job, click a second time; if that still doesn't do the job, double-click."

24.
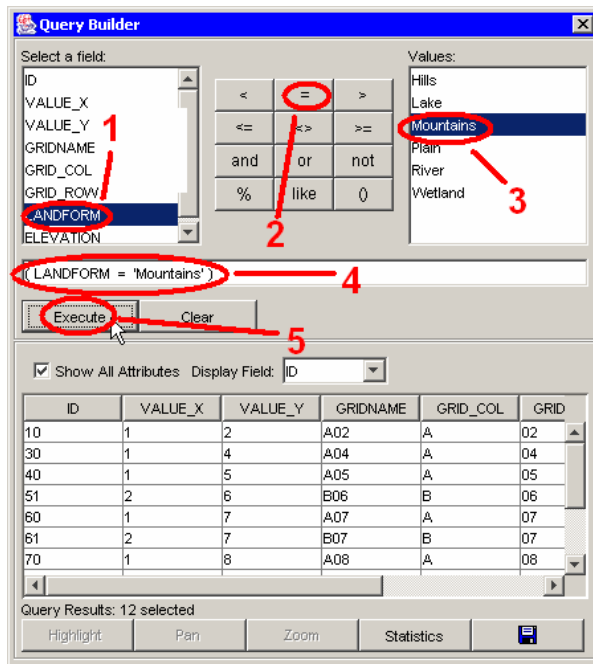
To build the first part of your query, go through the five steps shown here:
1. In the "**Select a field**" window, click "**Landform**". Notice that it begins building a statement in the empty box below.
2. In the "operations" zone, click "**=**".
3. In the "**Values**" window, click "**Mountains**".
4. Verify what you are asking the computer to do, saying aloud the phrase "Please computer select for me all those features in the highlighted layer for which…" and add the sentence you have built …(LANDFORM = 'Mountains')
5. If the sentence makes sense to you, click the "**Execute**" button.

If the results don't look like the bottom part of the window shown here, click the "**Clear**" button and try steps 1-5 again.

25. OK! You're partway done. You can see that there are 12 features in the "**polygons**" layer that are mountainous, but we really wanted to find out the mountains areas over elevation 80. We need to modify our query.

26.
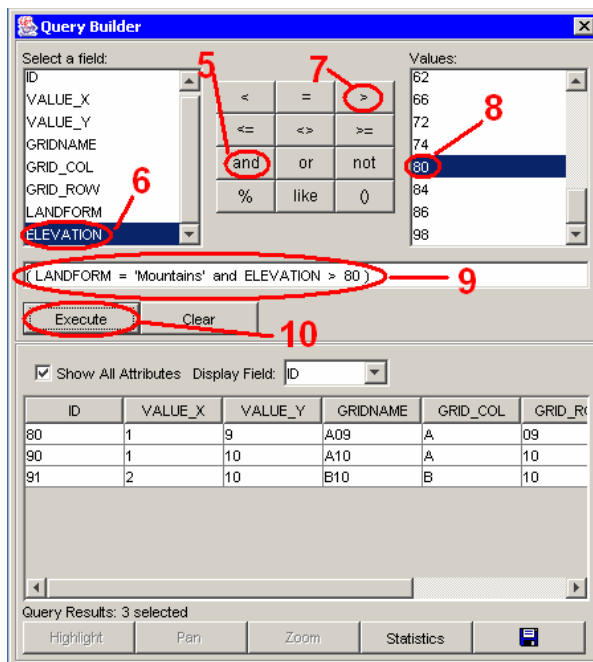
Click the "Clear" button to erase any previous query and results, then use the same steps 1-4 as above. Complete the query by adding steps 5-10 here:
5. After completing the first phrase, click the "**and**" button.
6. In the "**Select a Field**" window, click "**Elevation**".
7. In the "operations" zone, click "**>**".
8. In "**Values**", click "**80**".
9. Verify again by saying aloud the phrase "Please computer select for me all those features in the highlighted layer for which…" and add the sentence you have built …(LANDFORM = 'Mountains' and ELEVATION > 80)
10. Click the "**Execute**" button.

If the results don't look right, click the "**Clear**" button and try it again.

27.
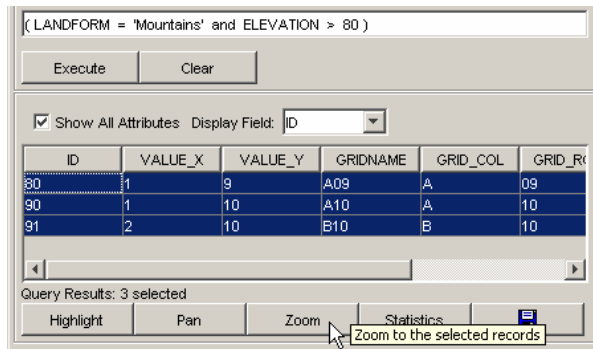
After isolating the three features that meet both criteria, select the three records by dragging the mouse across them in the results table. Once selected, click the "Zoom" button in order to zoom to the selected records on the map.

28.
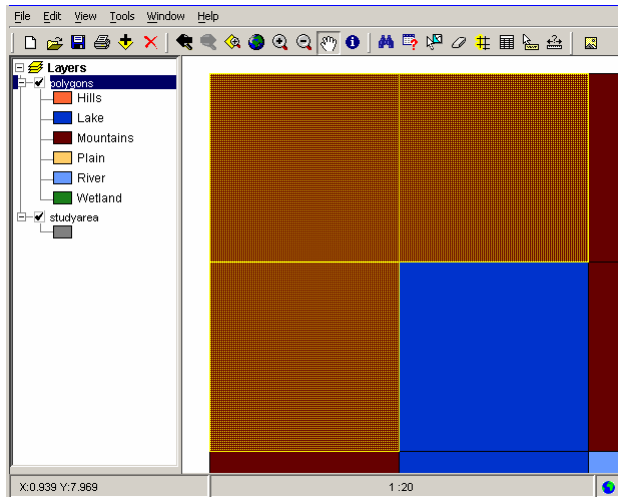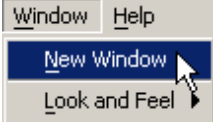
You should see that only three squares are mountainous regions with elevation over 80. There are definitely other mountainous squares, but only these squares match both criteria.

NOTE: Creating these "compound queries" and seeing the resulting map is a great way for GIS users to tap into large data files to explore relationships and discover patterns. With AEJEE, you can build creative queries, comparing attributes or even using math operations within the queries.

29.
    REVIEW: In this lesson, we have covered the following ideas, tools, and capacities:
    - Opening stored projects
    - Turning layers on and off
    - Changing the sequence of layers
    - Zooming and panning
    - Active layer
    - Identifying
    - Features
    - Attributes
    - Tables
    - Sorting
    - Selection
    - Selecting by attribute
    - Selecting by find
    - Selecting by legend symbol
    - Selecting by geography
    - Selecting by query

30. **SELF CHECK:** Now it's time to see if you can use these concepts and skills in a new project. First, create a new AEJEE window by choosing the menu item "**Window/New Window**". (You can move this second window around on the screen as you need to.)

31. Navigate to and open the project "**us_hd.axl**".

32. How many states had less than 1 million acres of cropland in 1997? __ What is the name of the northernmost state with less than one million ("**<1m**") acres of cropland in 1997? __

33. Zoom in to northern Texas. Turn on the counties layer. Five counties make up the northernmost "row" in Texas. Of the five northernmost counties in Texas, which one had the most acres of cropland in 1997? __ (Hint: Look for "**CROP_ACR97**")

34. "**POP00_SQMI**" means "population per square mile in 2000". In all of the U.S., only four counties had over 20,000. Name the four counties __, and describe two different ways to find the answer. __

FOR THE TEACHER:
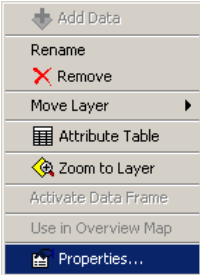
32-A   Twelve states had less than one million acres. The best way to see this is to click the grey symbol under "**states: CropAcres97**" in the TOC, then open the attributes table. Right-click one of the table field names (such as "**STATE_NAME**") and choose "**Sort Selected Data to Top**". Notice that Alaska and Hawaii are both listed in the table, even though they are not shown in the map as it opens up. Therefore, the northernmost state meeting the criterion is not Maine, as appears on the map when it opens, but Alaska, as noted when you click the "**Zoom to Full Extent**" button.

33-A   When you zoom in to northern Texas and turn on the counties layer, you'll see there are three colors in a row. Five counties make up those three colors. Make active the counties layer. One by one, click on a county in northernmost Texas, scroll to the bottom of the Identify Results window, and look for the field "**CROP_ACR97**". You do not need to close the Identify Results window each time, but can click your way from county to county until you discover that Sherman County had 354991 acres of cropland in 1997.

34-A   This can be answered either with a query (**POP00_SQMI > 20000**) or by opening the Attribute table and sorting the field **POP00_SQMI** in descending fashion. Either way, you should find that only four counties (New York, Kings, Bronx, and Queens) exceeded 20,000 people per square mile in 2000.

Getting Started with ArcExplorer—Java Edition for Education – Lesson 2

This lesson covers the following ideas, tools, and capacities:
- Classification
- Symbolization
- Histogram
- Naming layers
- Labeling features
- MapTips

1. Start AEJEE. Choose to open an existing project by clicking the "**Open...**" button or choose the menu item "**FILE/OPEN**". Navigate to where AEJEE data and projects are stored and choose "**us_hd.axl**". Click the file and click "**Open**".

2. Set your map so only the layer called "**states: CropAcres97**" is turned on. It has been set up to show each state in one of five categories, according to how many acres of cropland it had in 1997. The darkest looking states had the most (over 20 million acres), and the lightest states had the fewest acres of cropland.

3. Right-click on "**states: CropAcres97**" and scroll down to choose "**Properties**". This provides access to the window where you can control how the layer is displayed.

NOTE: The power of a map is that it is a model, a simplified version of reality, which allows the viewer to see particular patterns. In order for maps to do this well, characteristics of the real world must be represented in a manner that is easy for the viewer to understand. Classifying (or grouping) and symbolizing the information so that a viewer can make sense of it easily is a key challenge in making any map. In GIS, the map making process goes hand-in-hand with the map viewing process; GIS users get to experiment with different strategies for display. GIS users follow these steps:

- Think about a topic or a place ...
- Ask a question about it ...
- Make a map ...
- Explore the patterns that appear ...
- Enhance the data or modify the analysis ...
- Ask a new question …
- Repeat ...

GIS allows the user to modify the data being examined as well as the manner of representation. Later lessons will deal with adding data; this lesson focuses on the process of classification and symbolization.

4.
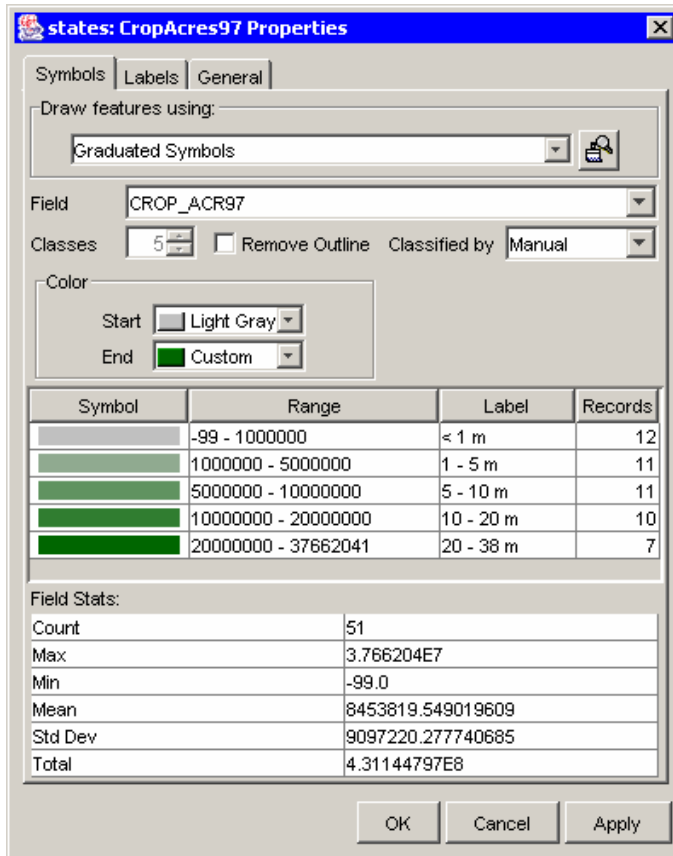
All the elements of the current window focus on classification and symbolization, because the "**Symbols**" tab at the top is in front. Notice that the layer is currently drawn with a "**Graduated Symbols**" method, using the field "**CROP_ACR97**". The layer has been broken into five classes, colored from light gray to deep green, and classified manually in nice round numbers, with labels that are a little easier to read than the raw numbers.

5.
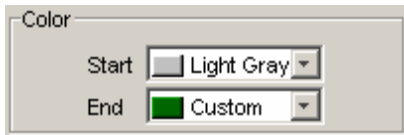
First, let's adjust the color scheme. Suppose that, instead of light gray to deep green, you want a palette from light yellow to dark brown. Go to the "**Color**" portion of the window and click the pull-down next to "**Light gray**".

6.

Since there is not a light yellow choice already available in the list of colors, you'll have to choose a "**Custom**" color. In the Color Chooser window, click the light yellow, then click "**OK**". Back in the symbols editor, your symbols have already changed a little bit. Now, click on the pull-down next to the "**End**" color (currently dark green), then scroll up and choose dark brown. The colors will ramp from light yellow to brown. Click "**OK**" to apply your new color scheme.

7. Customizing the colors is good, but we need to do more. Bring up the "**Properties**" window for "**states: CropAcres97**" again.

8.
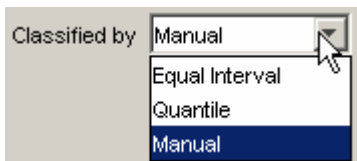
Let's move to classification. Click the pull-down for "**Classified by**" and notice the three choices. The current selection, "**Manual**", means that the user sets the break points individually. The manual method allowed us to have nice round numbers, but, under the "Records" column, you can see that different classes have different numbers of records.

9. Classified by Manual ▾

Equal Interval
Quantile
Manual
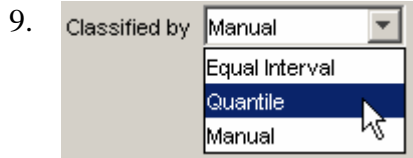
Suppose we want to have an even number of records in each class. Choose "**Quantile**." This will break the total universe of records (here, 50 states plus DC) into the number of groups identified in the "**Classes**" window.

10.

| Field | CROP_ACR97 | ▾ |
| Classes | 5 ▾ ☐ Remove Outline Classified by | Quantile ▾ |

Color
Start ☐ Custom ▾
End ▇ Brown ▾

Symbol	Range	Label	Records
	-99 - 846752	Less than 846752	11
	846752 - 4322425	846752 - 4322425	10
	4322425 - 78918...	4322425 - 78918...	10
	7891802 - 17629...	7891802 - 17629...	10
	17629001 - 3766...	17629001 and Gr...	10

Now, the 51 records are broken as evenly as possible, even if some of the break points between classes might be close together, and the ranges of values in classes might not be even. For instance, the span covered by the lightest color is under 1 million; the second and third spans cover about 3.5 million each; the fourth covers almost 10 million, and the last covers over 20 million. Click "**OK**" and see how the map changes.

11. Classified by Manual ▾

Equal Interval
Quantile
Manual

It might be interesting to see how the map looks when the classes all cover a similar span. (Examples of equal interval groups would include "0-7, 7-14, 14-21" and "5-10, 10-15, 15-20".) Choose to classify by "**Equal Interval**" and see the results.

12.

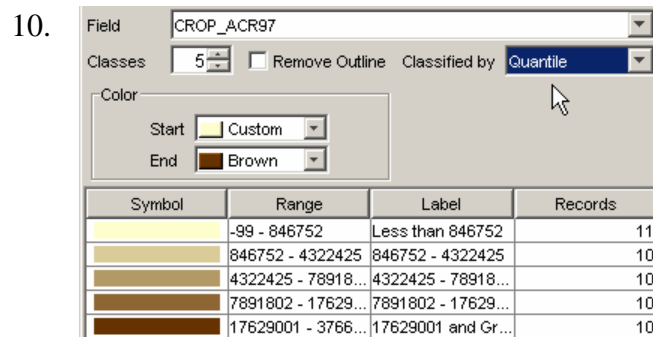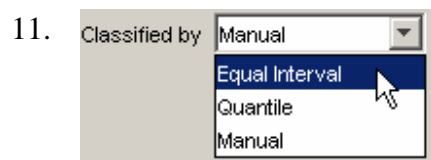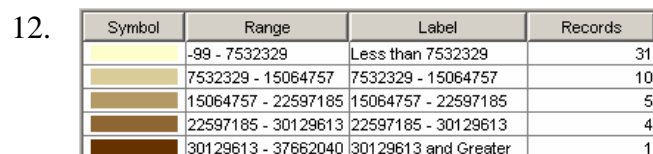| Symbol	Range	Label	Records
	-99 - 7532329	Less than 7532329	31
	7532329 - 15064757	7532329 - 15064757	10
	15064757 - 22597185	15064757 - 22597185	5
	22597185 - 30129613	22597185 - 30129613	4
	30129613 - 37662040	30129613 and Greater	1

Now you can see that each class covers a span of similar size, but the number of records in a class varies widely. Click "**OK**" and see how the map changes.

13. It's important to note here that we did not change WHAT was being mapped, only HOW it was being mapped. The equal interval map looks very different from the other two. It's not necessarily "wrong", nor "right", just "different."

NOTE: Whether a map is "right" or "wrong" is a judgment call. Making maps involves communicating, and can be influenced by many things. Sometimes, people who want to emphasize a specific view of a topic can make their map in a certain way. It is important to remember that all maps are models – simplified representations of reality. The decisions made by the mapmaker can influence how the map viewer interprets the data.

14. Classes 5 ▾

What if you don't want five classes? What if you want four, or six? Try changing the number of classes and seeing how that affects the map in "**Equal Interval**" and "**Quantile**" fashion.
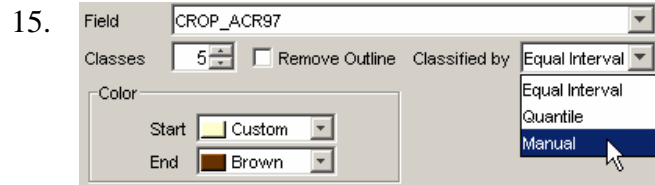
15. Set the number of classes back to five, and choose "**Manual**". As soon as you select manual, a new window opens for "**Class Breaks and Histogram**".
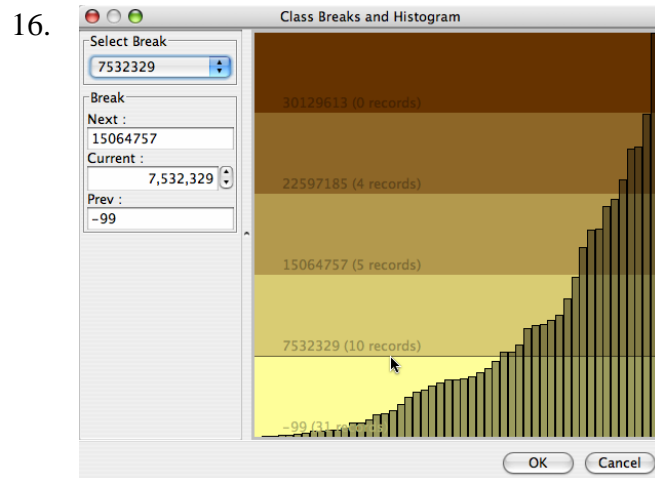
16. The colors show the range of values, and the vertical bars show the records within each class. (The color bands and numbers visible will depend on the classification used just before clicking "Manual".) Move the mouse on top of a line separating color bands in the histogram. By carefully clicking on the line separating color bands, you can drag the "breakpoint" up or down. As you drag, the break number will show the change. However, this method can leave you with breakpoints that are hard to use. Instead, let's use the number boxes at left to set breakpoints.

17. Click the "**Select Break**" pull-down. The two extreme numbers represent the top and bottom of the range and cannot be changed. We can only change the middle four numbers. Let's use the same breakpoints that we had at the start of the lesson: 1 million, 5 million, 10 million, and 20 million. We'll have to choose them one by one, and type the new number into the box for "**Current:**"

18.
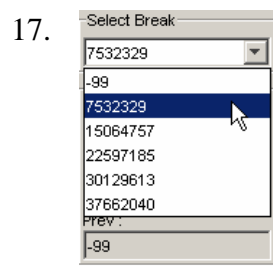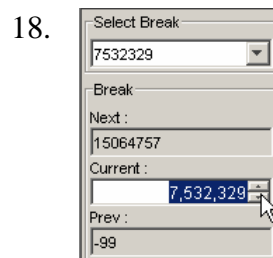- In the "**Select Break**" pull-down, choose the second smallest number (here "7532329"). Highlight the number in the "**Current**" window by dragging your mouse across it, and erase it. Type "1000000" and press the Enter key on your keyboard. Notice that the pattern in the histogram shifts.
- In the "**Select Break**" pull-down, choose the third smallest number. Replace it with "5000000", and press the Enter key.
- In the "**Select Break**" pull-down, choose the next number. Replace it with "10000000", and press the Enter key.
- Finally, in the pull-down, choose the next to largest. Replace it with "20000000", and press the Enter key. Click "OK".

19.

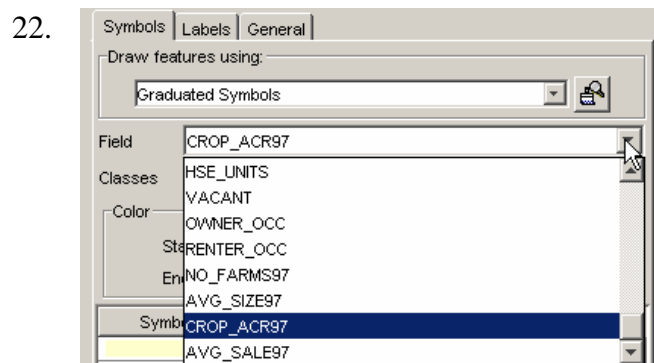| Symbol	Range	Label	Records
	-99 - 1000000	Less than 1000000	12
	1000000 - 5000000	1000000 - 5000000	11
	5000000 - 10000000	5000000 - 10000000	11
	10000000 - 20000000	10000000 - 20000000	10
	20000000 - 37662040	20000000 and Grea...	7

We now have nice, round numbers, but they're a little hard to read. You can't change the data in the "**Range**" column, but you can click in the "**Label**" column and change the text to your liking.
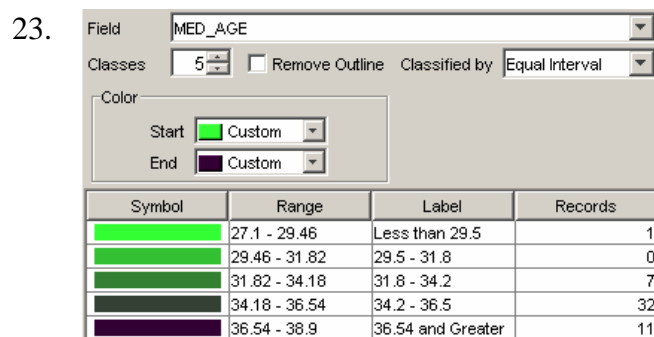
20.

Symbol	Range	Label	Records
	-99 - 1000000	< 1 M	12
	1000000 - 5000000	1 - 5 M	11
	5000000 - 10000000		11
	10000000 - 20000000	10000000 - 20000000	10
	20000000 - 37662040	20000000 and Grea...	7

Change the "Label" cells to read "<1M", "1 – 5 M", "5 – 10 M", "10 – 20 M", and "20 – 38 M". Click "**OK**".

21.   Now let's look at information about the people, from the 2000 Census. Open the "**Properties**" window for "**states: CropAcres97**"

22.

Symbols | Labels | General
Draw features using:
Graduated Symbols
Field: CROP_ACR97
  HSE_UNITS
  VACANT
Classes
  OWNER_OCC
Color
  St RENTER_OCC
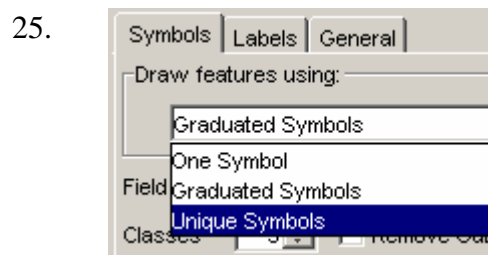 En NO_FARMS97
  AVG_SIZE97
  Symb CROP_ACR97
  AVG_SALE97

In the Symbol window, click the "**Field**" pull-down. Notice that "**CROP_ACR97**" is almost at the bottom of the list. Click on the "up/slider/down" buttons at the right of the window and scroll up to find "**MED_AGE**", about halfway up the list. ("Median age" means half the people are younger than this and half the people are older than this.) Click it to choose it, and choose "**Equal Interval**" as the classification method.

23.

Field: MED_AGE
Classes: 5   ☐ Remove Outline   Classified by: Equal Interval
Color
  Start: Custom
  End: Custom

Symbol	Range	Label	Records
	27.1 - 29.46	Less than 29.5	1
	29.46 - 31.82	29.5 - 31.8	0
	31.82 - 34.18	31.8 - 34.2	7
	34.18 - 36.54	34.2 - 36.5	32
	36.54 - 38.9	36.54 and Greater	11

The legend automatically uses the existing color scheme. Try some new colors, such as deep green to light gray, or bright green to deep purple, or cyan to navy. Click "**OK**" and see how things look on the map. Do colors stand out? Is it easy to tell the difference between the colors, and know what one state is? If you cover the legend, can you tell which states are the high and low numbers?

24.

☑ states: CropAcres97
  Less than 29.   🔻 Add Data
  29.5 - 31.8   Rename
  31.8 - 34.2   ✕ Remove
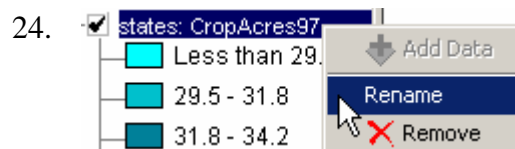
The map looks OK now, but the name in the legend is wrong. In the TOC, right-click on "**states: CropAcres97**" and rename it to "**states: MedianAge2000**". (Press ENTER key to finish.)

25.

Symbols | Labels | General
Draw features using:
  Graduated Symbols
  One Symbol
Field Graduated Symbols
  Unique Symbols
Classes

Now let's see what other choices for symbol schemes are available. We have explored using "**Graduated Symbols**", where numerical values get "ranked" and symbols are assigned accordingly. Now, let's try "**Unique Symbols**", used where values vary but don't have a "rank" associated with these differences. Click the symbology pull-down and choose "**Unique Symbols**".

26. Under "**Field for values**", choose "**STATE_NAME**". A random color scheme is applied by default. Click "**OK**" and see how you like the map. (And be sure to change the layer name to just "states".)

NOTE: For qualitative data, such as name, where there is no ranking implied, cartographers typically choose a randomized color scheme. For quantitative data, such as population or temperature, cartographers typically choose a graduated color scheme. The key in each case is to help the viewer understand the data. See the "Intro to Cartography" document referenced in the "Intro to AEJEE" for more guidance.
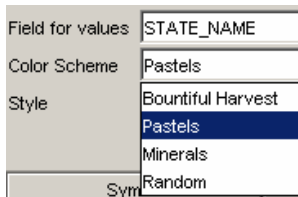
27. If the "**Random**" colors are just a bit too bright for you, open the Properties window again and replace "**Random**" with "**Pastels**". Or try either of the other options. Notice that each method results in states having a somewhat random color applied.
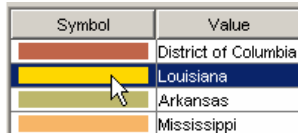
28. What if everything is fine but you need to change the color for a single state? Easy! In the "**Symbols**" window, click the color symbol for a specific state. In the color palette that appears, click the new color, then click "**OK**" and "**OK**" again to apply changes.
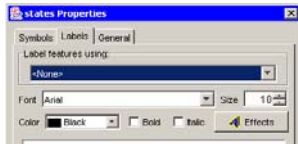
29. The map looks interesting but it would be nice to have the two-letter postal codes appear on top of each state, to assist in identification. Open the "**Properties**" window for "**states**". At the top, click the "**Labels**" tab. Notice that the current listing for "**Label features using:**" reads "**<None>**". Change that to "**STATE_ABBR**". Leave the Font as is, but change the size to **12**. Click the "**Effects**" button and choose "**Glow**". Click "**OK**", and "**OK**" again to apply changes.
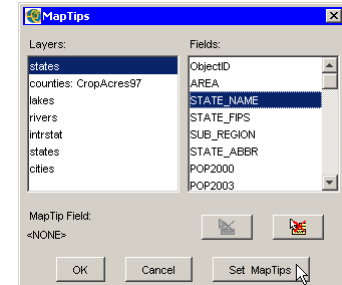
30. Finally, just in case you'd like a little more information about the state you're looking at, you can set "**MapTips**". This displays the contents of one field from one layer beneath the cursor as it moves around the map. In the Advanced toolbar, click the "**MapTips**" button. In the "**Layers**" column, choose the topmost "**states**" layer. In the "**Fields**" column, choose "**STATE_NAME**". Click "**Set MapTips**", then click "**OK**". Move your mouse slowly around the map, and see the changes. What would happen if you had chosen a population field? How many pieces of information can you display in a useful manner at one time?

31. **REVIEW:** In this lesson, we have covered the following ideas, tools, and capacities:
    - Classification
    - Symbolization
    - Histogram
    - Naming layers
    - Labeling features
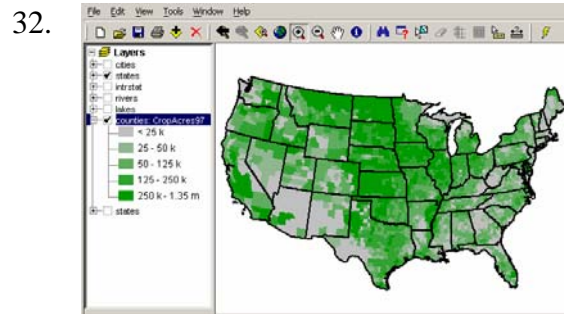
32. **SELF CHECK:** Now it's time to see if you can use these concepts and skills on a new layer of data. Turn off the bottom-most "**states**" layer, and turn on the topmost "states" layer and the "**counties: CropAcres97**" layer. Collapse the symbols of all the layers except for the counties by clicking the "**+/-**" box at the left of each layer. Your starting map should look like the one shown here.
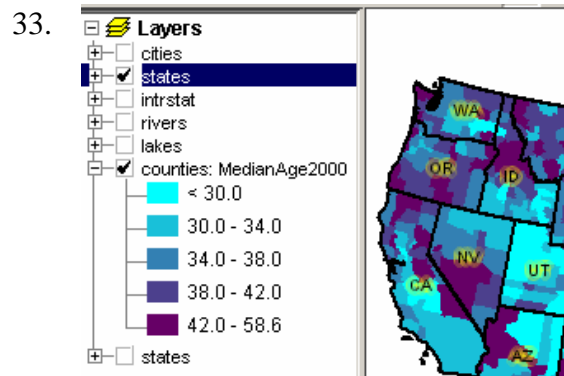
33. Create a map of Median Age by county, using classes, symbology, and layer name as shown here. How many counties had a median age over 42.0? ___

34. Create a county map using population per square mile in 2000 ("**POP00_SQMI**"). If you classify by quantiles into five classes, what is the range of the class with the narrowest range of values?

35. "Household size" looks at the number of people living in a single housing unit (apartment, townhome, house, etc.). Create a map of average household size ("**AVE_HH_SZ**") by county, using three classes divided in quantiles. Name three states that seem to have a large portion of the state showing large household size ___, and three states that seem to have a large portion of the state showing small household size ___.

FOR THE TEACHER:

32-A The key in setting up this map is to be sure to turn off the states layer at the bottom and turn on the states layer near the top of the TOC. Most of the work will be with the layer of counties, but you'll need to do some with the states.

33-A Creating a similar map requires changing the county mapping scheme ("MED_AGE" field, Manual classification method, cyan to purple colors) and noticing that 338 counties fall into the top class. Then the student needs to change the county layer name and set the "states" layer to provide labels using "STATE_ABBR".

34-A This requires the student to change the county field to "POP00_SQMI", change the method to "Quantile", and ensure there are five classes. Then the student needs to look at the ranges, and do the fairly simple mathematical comparison. The lowest class, "0.0-11.6", has the narrowest range of values.

35-A
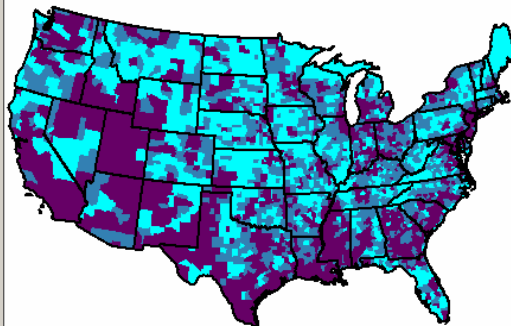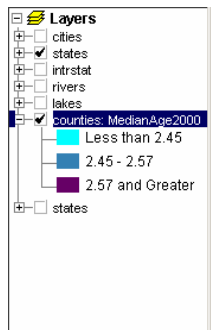
Answers here will vary because the students are being asked to interpret. States that seem to have mostly higher counts might include AK, HI, NJ, UT, MS, CA. States that seem to include mostly lower counts might include ME, KS, ND, MT, IA.

Getting Started with ArcExplorer—Java Edition for Education – Lesson 3

This lesson covers the following ideas, tools, and capacities:
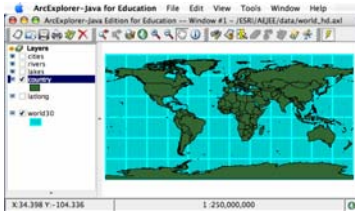- Map projection
- Scale
- Measuring distance
- Overview map
- Exporting an image
- Layouts

1.   Start AEJEE. Choose to open an existing project by clicking the "**Open…**" button or choose the menu item "**FILE/OPEN**". Navigate to where AEJEE data and projects are stored and choose **world_hd.axl**. Click the file and click "**Open**".

2.   The map opens showing the world in what is called a "geographic" or "lat-long" display. Look at the Status Bar at the bottom of the screen and move your mouse around the map. It will show the location of the mouse using latitude and longitude, expressed as decimal degrees.

3.   This "decimal degree" display works because the data are stored in a decimal degree coordinate system. AEJEE can also "project on the fly" any feature data (shapefiles of points, lines, and polygons) that are stored in decimal degree. Let's try.
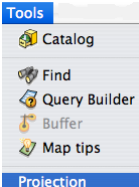
4.   Create a new AEJEE window by choosing the menu item "**Window/ New Window**". Open the project "**world_hd2.axl**"
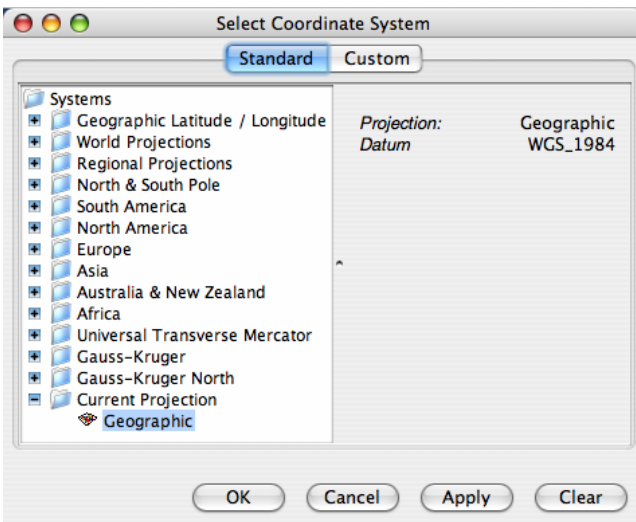
NOTE: One of the biggest challenges facing cartographers is that of representing a spherical surface on a flat piece of paper or computer screen. Even if the earth were perfectly spherical (which it is not), showing a 3D object in a 2D space would involve distortion of distance, area, shape, or direction, or some combination thereof. Whole courses of study exist to deal with coordinate systems, projections, and datums; it is worthwhile exploring these. This lesson uses these definitions:

- **coordinate system** = reference system of points, lines, and/or surfaces, and rules defining positions of points in space (e.g. geographic, or Cartesian). GIS data are typically stored with reference to a specific coordinate system.
- **projection** = mathematical formulas by which a curved surface is portrayed on a flat surface (e.g. conformal, equal area, or azimuthal)
- **datum** = collection of defined positions of the earth surface, giving a frame of reference for measuring (e.g. North American Datum of 1983, or "NAD83")

5.   The data in the two projects are exactly the same; only the projection is different. AEJEE projects (the **.axl** files you open) store information about the projection used at the time of saving.

6.   It's quite easy to change the projection. Bring the first map window (with the rectangular display) to the front. Choose the menu item "**Tools/Projection**".

> **NOTE:** Whenever you work with multiple map windows in AEJEE, it's crucial to make sure the desired map window is in front when you begin an operation.

7.   It can look a little intimidating at first, but AEJEE contains a large number of pre-defined, standard coordinate systems. Usually, all you need to do is select the one you want. Notice that the "**Standard**" tab is currently selected. If you click "**Custom**", you can modify various parameters. For now, return to "**Standard**" and notice that the current projection is highlighted at the bottom. From the list, click the "**+**" next to "**World Projections**" to spill it open. Open "**World Projections (Sphere)**", and scroll down to choose "**Orthographic**". For now, ignore the information that appears at right, and just click "**OK**".

8.   Your two map displays should now be identical, so close the window showing "**world_hd2.axl**".

9.   Try a few other world projections, using the same process. Try in order these several types: Robinson, Sinusoidal, Peters, Mercator, and Bonne. (If your map ever seems to "disappear", right-click the "**country**" layer and choose "**Zoom to Layer**".) Which projection do you like best? Why?

10.   Now let's try a custom projection. First, set the projection to "Eckert IV", a nice "equal area" projection. Click "**Apply**" rather than "**OK**", so the "**Select Coordinate System**" window stays open. Suppose we want to remain in this projection but, instead of an Atlantic-centered map, which breaks the world at the 180th meridian, we'd like to have a map centered on the Pacific ocean. We can do this by customizing the projection.

11.
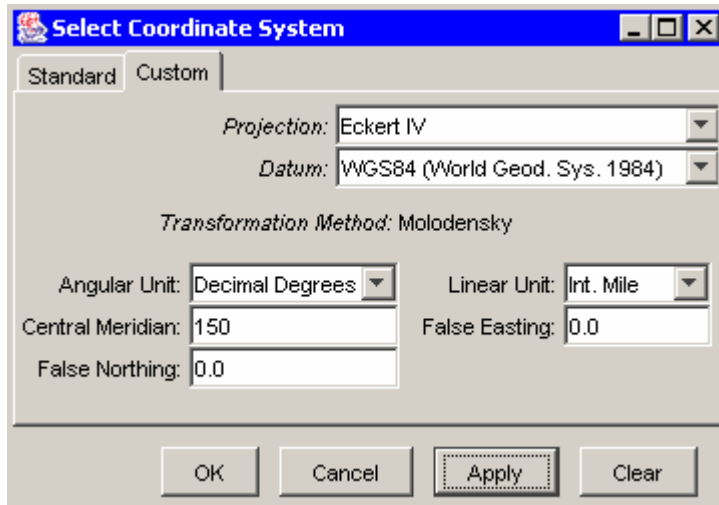
In the "**Select Coordinate System**" window, click the "**Custom**" tab near the top. Notice that you can click back and forth between "**Custom**" and "**Standard**" if you want to refer to information. For now, in the "**Custom**" window, set your pull-downs to match the picture here. Setting the central meridian at 150 means the "left and right edges" of the map will be at 30 degrees west. Click "**OK**", then "**Zoom to Full Extent**".

12.
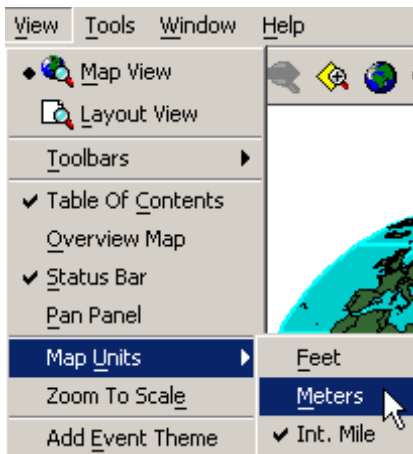
One more adjustment to make back in the map. Having adjusted the projection, the scale bar may provide an incorrect reading like "1:1". If so, we need to adjust the units. Under the menu item "**View/Map Units**", choose "**meters**", because the projected space is expecting the data to be presented as meters. Now your map should give you an appropriate scale.

NOTE: "Scale" can be a challenging concept to handle. It may be easiest to think of the map's scale as it is represented here – a ratio, or fraction. In a map with a scale of 1:300,000,000, one "unit of measure" (any size) on the map represents 300,000,000 of those same units in real life. The visible number is the "denominator" in a fraction. Making that visible number larger creates a smaller fraction, and a "smaller scale map;" a smaller denominator means a "larger scale map". See the "introduction to cartography" document referenced in the "Intro to AEJEE" for more guidance.

13.
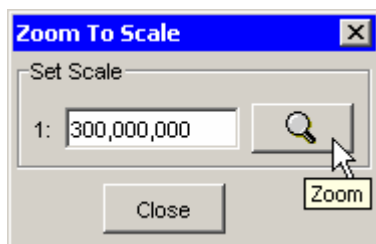
Now that the map is set as you like, suppose you'd like to have the scale be a nice round number, perhaps **1:300,000,000**. It's easy to set the scale. Choose the menu item "**View/Zoom To Scale**". Click in the box that appears and type the desired number (you can use commas or leave them out, as you prefer), and click "**Zoom**". The map scale will adjust as you have indicated.
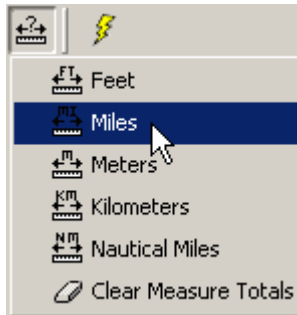
14. Having set the projection and established a scale, let's explore measuring distances. In the "**Advanced**" toolbar, click the "**Measure**" tool. A series of choices appears. While the others may be useful for different maps, for now choose "**Miles**". This will give us measurements in miles.
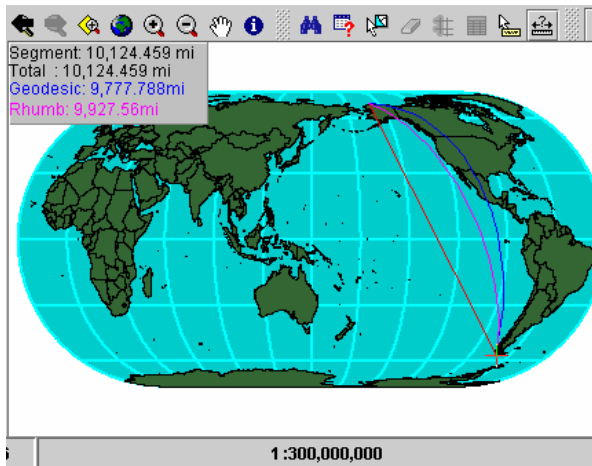
15. Click-and-hold on the northern edge of Alaska and drag to draw a straight line to the southern tip of South America. As you move, a trio of lines appears, and a new box appears listing several numbers. The blue line is a "**geodesic**" line, or great circle route. The magenta line is a "**rhumb**" line, or line of constant angle from start to finish. The red line (with black numbers) is the "**segment**" and "**total**" length as drawn on the map. If the numbers seem confused, remember that the map is projected, and the shortest distance on a sphere is a great circle. Clear the measurements (double-click in the map) and try another measurement, from northern Alaska to the southern tip of Africa. Then try it from Seattle to northern Japan.
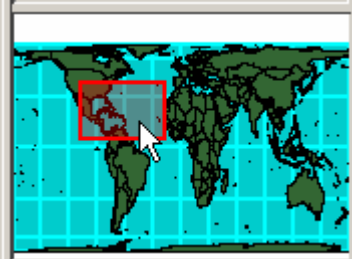
16. Change the projection to "Peters" (use "Standard" tab), zoom out to the world, and try those three measurements again. Notice how the projection capacity and measuring tool combine to show the challenge of representing a sphere in 2D.
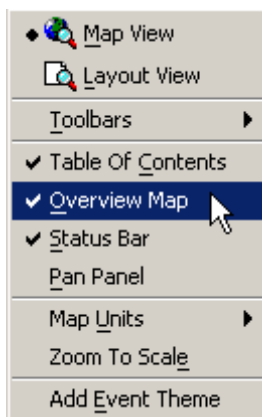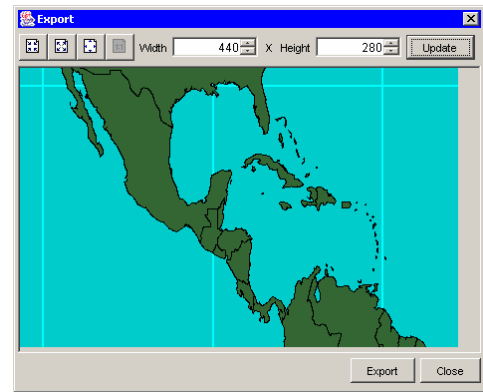
17. Sometimes, while zooming around a map, it is helpful to have an overview of where you are on the map. AEJEE allows you to set an overview map space and use in the overview map any layer from the TOC. From the menu bar choose the menu item "**View/Overview Map**". A new space will appear at the bottom of the TOC, separated from the rest of the TOC. In the TOC, right-click "**world30**" and choose "**Use in Overview Map**". This layer is displayed in the overview, with a red border around the area currently displayed in the map. Do the same again with the "**country**" layer. Finally, in the main map, zoom in around one continent and see what happens in the overview map.

18. The overview map isn't just a handy reference. It can also be a quick way to wander around the map. Zoom in to a small region on the main map, and notice the red area highlighted in the overview map. Now, with your mouse, drag the highlighted area in the overview map to a different part of the overview map. What happens to the main map? This can be a very useful way to compare regions in a map.

19. When the map shows just what you want, you may want to print the map, or export it as a graphic. If you're connected to a printer, try using the menu item "**File/Print**". You can print the contents of the view – just the main map. (See the "Intro to AEJEE" document for a discussion of distribution rights.)

20. You can also export the contents of the main map by choosing "**File/Export to Image**". The export window allows you to choose the size of the image, by changing one dimension (width or height) and clicking "**Update**". When you're ready, choose "**Export**" and select the destination (such as "/ESRI/AEJEE") and the file type (such as JPG or PNG). You can then incorporate it in a printed or electronic document. (See the "Intro to AEJEE" document about distribution rights.

21. But what if you want to set up your exported image to include a legend, a scale bar, and perhaps some additional graphics on the map? You need to create a "layout". First, create the map you'd like to export. Try something basic, like the map above. Then, from the menu bar, choose "**View/Layout View**".

NOTE: Once you have "the right map", designing an attractive and functional layout is a matter of graphic design and communication skills. It is critical to be familiar with standard practices in graphics software before working with layouts.

22.
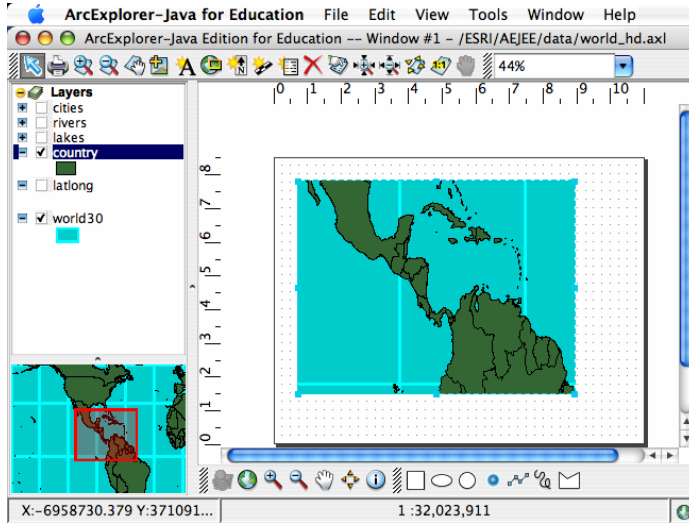
Refer to the "Intro to AEJEE" document for an overview of the layout interface. Click the "**Zoom to whole page**" button to see a miniature of the entire page.

23. The layout opens with only one element -- a map element. Right-click the map graphic element and choose "**Properties**". Click the "**Frame**" tab, and set a border using a solid line, width "**2**". Leave everything else unchanged and click "**OK**". Be sure the map element leaves enough empty space on the page for the other elements. If there is not enough empty space, re-size the map element by left-clicking it once to select it, then use the graphic handles to re-size.

24. In the layout, click the map element once to select it. Now click the "Add map legend" button. A small graphic with handles will appear on the page. Drag the legend to some empty space in the page. Right-click the legend element and choose "Properties". Under the "**Frame**" tab, set a solid line border of width "**2**", and set a "**Gap X**" and "**Gap Y**" of "**6**" points. Leave the rest unchanged and click "**OK**".

25. In the layout, click the map element once to select it. Now click the "**Add map scale bar**" button. Choose the "**Alternating Scale Bar**" and click "**OK**". A small graphic with handles will appear on the page; drag it to some empty space on the page. It's likely that the scale did not appear in nice round numbers, so right-click the scale and choose "**Properties**". In the "**Scale and Units**" tab, set "**When resizing...**" to "**Adjust number of divisions**". Change "**Division value**" to a nice round number. Then set "**Units/Label Position**" to "**below bar**". Leave the other properties unchanged and click "**OK**". Back on the layout, your scale bar should adjust itself and show nice round numbers.

26. In the layout, click the map element once to select it. Now click the "**Add overview map**" button. Another small graphic appears on the page, showing a miniature of the overview map you had set up. Drag this to some empty space on the page.

27.   In the layout, click the map element once to select it. The zoom tools below the layout control the area of the main map, just like they did before you switched into "Layout" view. Suppose you want to zoom out from the area being shown in the map just a little bit. Click the "**Zoom Out**" magnifying glass and click once in the center of the map. The map will zoom out a bit, but still occupy the same space on the page. Because the scale bar and the overview map are tied to the main map, the scale bar and the overview map will each adjust a little bit.

28.   Next, you want to add a couple of text elements to the page. Let's start with a title. Click an empty space on the layout to de-select any elements that might be selected. Click the "**Add Text**" button. A small graphic window containing the words "Right-click this text" appears on the page. (Look closely; it may be hard to find.) Drag the text box to an empty space on the page. Right-click the text graphic element and choose "**Properties**". In the textbox, type "My First AEJEE Layout". Click the "**Change Properties...**" button and choose a simple font like **Arial**, set the size to **36**, choose "**Bold**", and click "**OK**". Back on the layout, it should be easier to see; move it to the top of the page. In similar fashion, create a text box indicating the map's author.

29.   Finally, let's add a simple graphic, highlighting some feature in the map. Click the "**New Line**" tool below the map. Click and drag a line (click to start, double-click to stop) from a feature you want to label to some empty space where you can put a label. Graphic handles will appear on the box bounding the line, so right-click it, choose "**Properties**", and make the line a red dashed line of width "**2**". Create a text box to provide the desired info about that feature.

30.
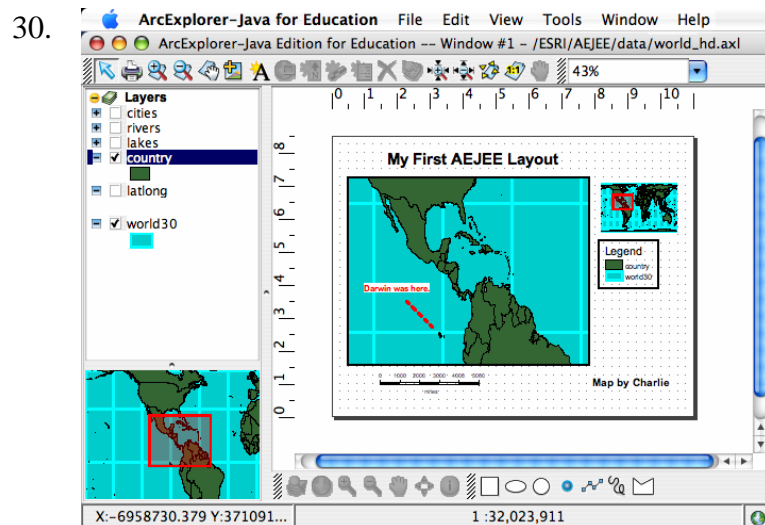
Ready to export your layout? From the menu bar, choose "**File/ Export to image**". A dialog box appears, asking for the desired dots per inch; 72-300 is a reasonable number for printing and creating electronic files. Enter the number and click "**OK**". An export preview appears, in which you can adjust the output size. Finally, choose "**Export**", set the destination folder and file type, and export your image.

31.   **REVIEW:** In this lesson, we have covered the following ideas, tools, and capacities:
- Map projection
- Scale
- Measuring distance
- Overview
- Exporting an image
- Layouts
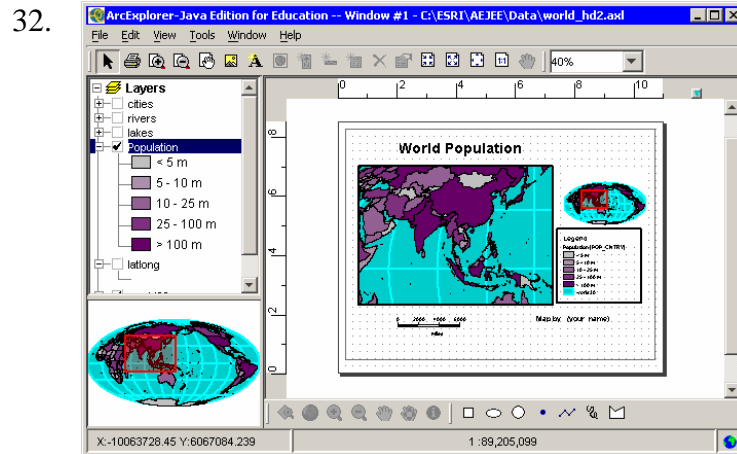
32.

SELF CHECK: Now it's time to see if you can use these concepts and skills on a new set of data. Create a new AEJEE window ("**Window/ New Window**") and open the project "**world_hd2.axl**", which you have seen before. Change the map to a Pacific-centered Mollweide map projection, use "POP2005" as the classification field, and create a layout like the one below.
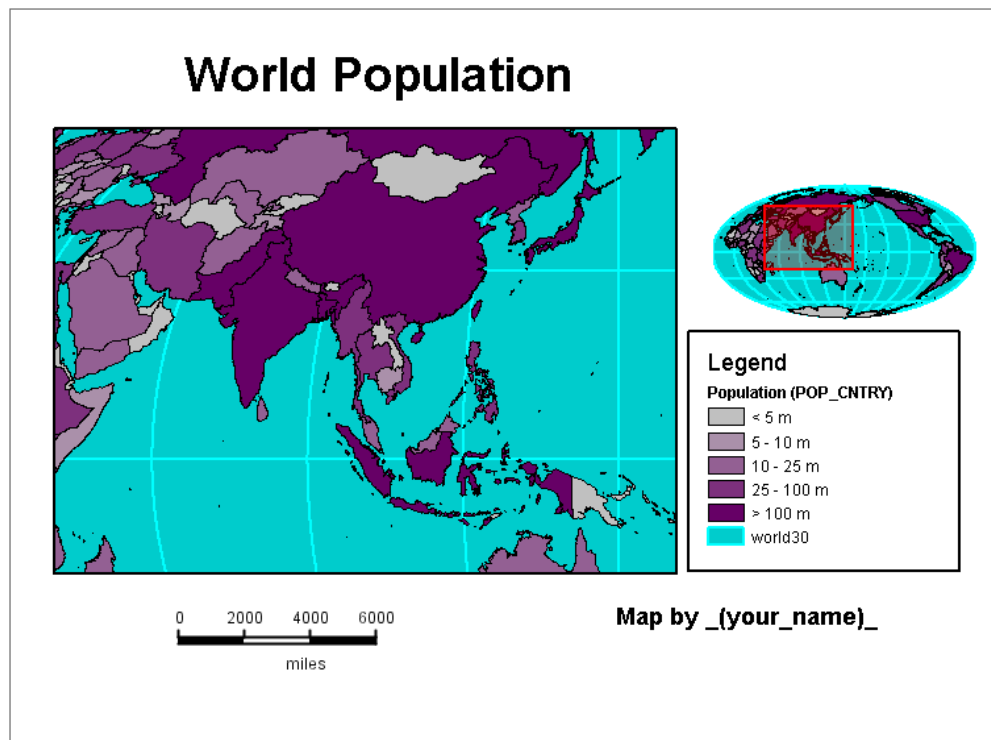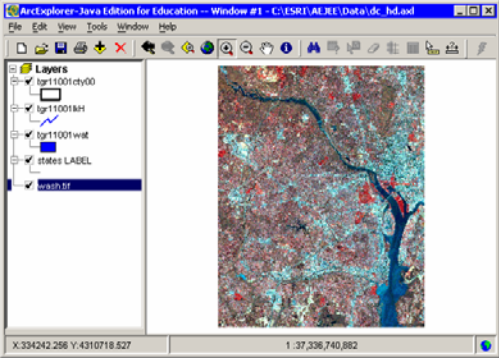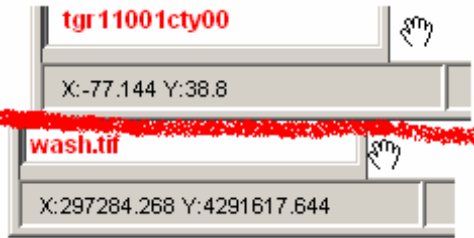
Getting Started with ArcExplorer—Java Edition for Education – Lesson 4

This lesson covers the following ideas, tools, and capacities:
- Integrating image data
- Saving projects
- Adding data
- Event (XY) themes
- Hot links
- Buffer
- Catalog

1. Start AEJEE. Choose to open an existing project by clicking the "**Open…**" button or choose the menu item "**FILE/OPEN**". Navigate to where AEJEE data and projects are stored and choose **dc_hd.axl**. Click the file and click "**Open**".

NOTE: One of the exciting opportunities for map makers is integrating image data (such as satellite images or aerial photos) with "vector" data (features such as points, lines, polygons). It can be challenging to make sure that the resources are in formats that can work together, that the GIS and image data carry "metadata" (data about the data), and that the user can understand and make use of the metadata. AEJEE cannot project image data, but can project vector data that are stored in a decimal degree coordinate system. This means AEJEE can work with many image data sets … if the user understands about working with images and shapefiles. Metadata are vital!

2. The map opens with an image showing the Washington DC region. The TOC shows other layers are on, but they seem invisible. But if you right-click on "**tgr11001cty00**" and choose "**Zoom to layer**", the image disappears and the other layers appear. Right-click on "**wash.tif**" and zoom to it, and they shift back.

3. When you make either the image or the other layers visible, and move the mouse around the map, the locator numbers in the status bar are wildly different.

4.   The satellite image is stored in a coordinate system called "Universal Transverse Mercator", in "Zone 18", using the "North America 1983" datum. This can be abbreviated as "UTM 18, NAD83". By setting the view's projection to match this, we can integrate features stored in decimal degree.
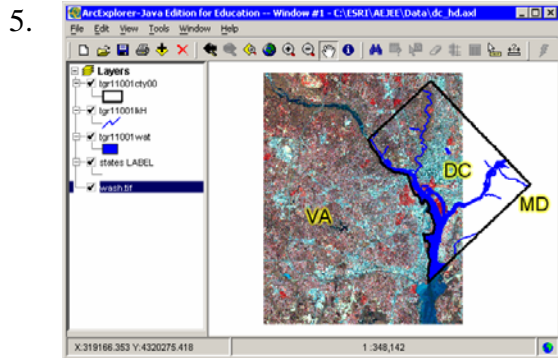
5.   Change the projection of the view to "**UTM Zone 18N**", in the "**Universal Transverse Mercator**" folder. Then zoom again to "**wash.tif**". The image and the features now line up! The shapefiles in the TOC are data stored in decimal degree, and can project on the fly to match image data.

6.   Now that we've made an important change to the project, it's time to save the project, but under a new name so we don't overwrite the old one. From the menu bar, choose "**File/Save As…**". Navigate to where the AEJEE projects are stored (typically **/ESRI/AEJEE/DATA**), and name this "**dc_hd2.axl**". Having renamed this and preserved the original, you can either continue renaming to save each version of your work, or just save the latest version.

7.   Atop the image are some shapefiles that came originally from the U.S. Census Bureau, and the names look a little unusual here. Every county (or equivalent) in the U.S. has a unique 5-digit code, and Washington DC is known as "11001". Let's start by giving those layers more understandable names. Change "**tgr11001wat**" to "waters", "**tgr11001lkh**" to "streams", and "**tgr11001cty00**" to "DC boundary".

NOTE: The shapefiles came from the ESRI TIGER Data website (www.esri.com/tiger). From here, GIS users can download data about any county in the U.S. See www.esri.com/industries/k-12/atlas/tiger.html for a tutorial about accessing the data.

8.   Now let's add another layer to our map. Click the "**Add Data…**" button and navigate to where the AEJEE data about DC are stored (typically "**/ESRI/AEJEE/DATA/WASHDC**"). Several files are visible there, and some are already in the project. Click "**tgr11001lka.shp**" and click "**OK**".

9.   The new line feature comes in at the top of the TOC. Zooming in, you can tell that these are roads, so rename this layer to "roads". Then open the "**Properties**" and change the symbol to a black line, single width. You've made some pretty significant changes to your project, so you should save (or "save as") again.

10.   The whole satellite image is interesting, but we want to zoom in to the bluish area at the heart of Washington DC, just north of the junction of the two main rivers – the Potomac and the Anacostia. Zoom to a scale of about 1:60,000 or closer. You should be able to see the red east-west stripe that is the Mall.

11.   We want to add some point data for interesting sites, gathered with a global positioning system (GPS). First we need to create a data table to bring into AEJEE. Open up a simple text editor, such as NotePad (PC) or TextEdit (Mac; set TextEdit preferences to create new documents as "plain text", then make a new document). Create a plain text document that looks exactly like this:
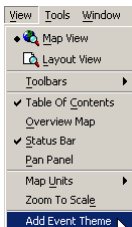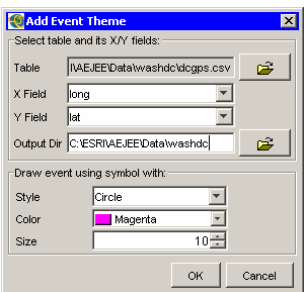
```
site,lat,long,name,HOTLINK
1,38.889,-77.035,Washington Monument,http://www.nps.gov/wamo
2,38.889,-77.050,Lincoln Memorial,c:/ESRI/AEJEE/DATA/WASHDC/linc.jpg
3,38.898,-77.036,White House,c:/ESRI/AEJEE/DATA/WASHDC/whse.txt
4,38.889,-77.009,Capitol,c:/ESRI/AEJEE/DATA/WASHDC/cap.pdf
```

> **NOTE#1:** HOTLINK files must be "absolute paths." Be sure the paths above are correct for your computer. For Mac users, change the three characters "**c:/**" in items #2, #3, and #4 above to "**file:///**".

Make sure you have only these five lines, with no extra spaces or characters that are not shown above. (Notice the latitudes are identical except for the White House, and the longitudes are all negative. Also, note that "HOTLINK" must be capitalized.) Save this as a plain text file called "**dcgps.csv**" (for "Comma Separated Values") in the folder "**/ESRI/AEJEE/DATA/WASHDC**". Exit your text editor and return to AEJEE.

> **NOTE#2:** Make sure your computer does not add ".txt" at the end of the file name. AEJEE expects all ".txt" files to be "tab-delimited", and all "comma-delimited" files to be ".csv". Ask your tech coordinator about file extensions.

12.   The file "**dcgps.csv**" is now a set of data that is almost but not quite ready to use in AEJEE. It needs to be converted from a simple text file to a true GIS data set -- a shapefile (which is actually a combination of files). AEJEE cannot create shapefiles of lines or polygons, but can convert simple XY data tables of points (or "events") into a point shapefile. From the menu bar, choose "**View/Add Event Theme**"

13.   Navigate to the file "**dcgps.csv**" and select it. For the "**X field**", choose "**long**" (longitude); for the "**Y field**", choose "**lat**" (latitude). AEJEE is going to convert the table into a shapefile, so it has to store the data, and the default is to use the folder where the table is; this is a good storage spot. After conversion, AEJEE will add the data to the TOC using symbols shown at the bottom; because your map already has a lot of information, you'll want to choose a symbol that will stand out – large dots with a noticeable color. When ready, click "**OK**".

14.
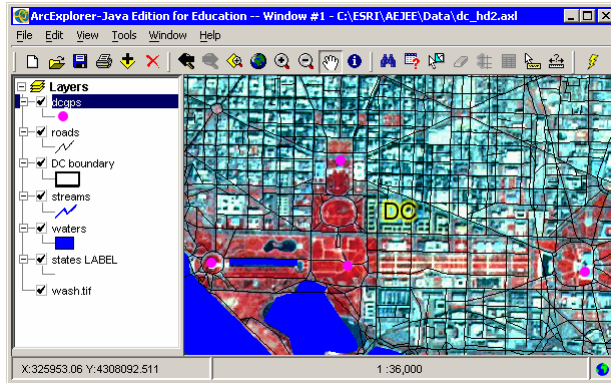
Now, you have a new data set visible in your project! Zoom to the layer or adjust the scale to optimize the display. You could even label the new features.

NOTE: Hot links in AEJEE launch whatever application is the default viewer of a given file type. The HOTLINK field must contain an "absolute path" to a given document; if the path is wrong or there is no default application for a file type, AEJEE will perform no action when called upon to access a hot linked document. Also, because some programs take time to open and appear, it is useful if you have these programs already running in the background before clicking the hot link.

15.   Because your coordinates were stored in decimal degree, and the view is already projected, the points appear in their proper location. Use the identify tool to review the attributes of the point features, especially the "**HOTLINK**" field.

16.
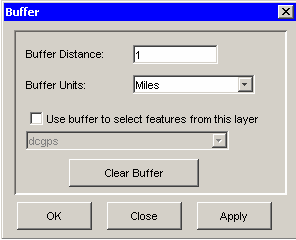
Click the "**Hot Link**" button and then click the White House (northernmost dot). It should call up a very short text file about the White House. Then click on the Capitol (easternmost dot), which should call up a PDF file in your PDF viewer. Then click on the Lincoln Memorial (westernmost dot), which should call up a small image in your default JPG viewer. Finally, click on the Washington Monument (central dot); this will open your web browser and, if you are connected live to the internet, bring up a Web page.
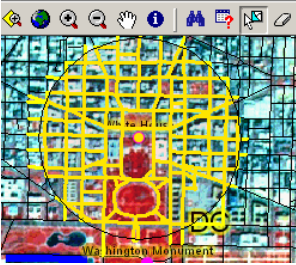
17.
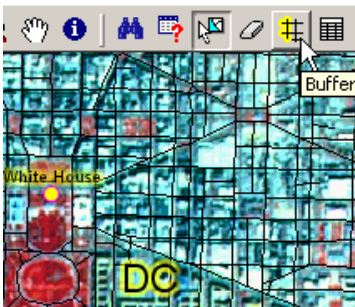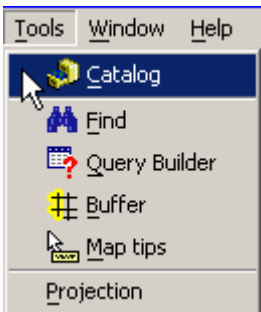
Suppose that we now want to see something about distance from a single feature, like the White House. Click on the "**Select Features**" tool and choose "**Rectangle**". Click and drag a small box around the symbol for the White House. A yellow dot appears, indicating the White House has been selected. Then click the "**Buffer**" tool.
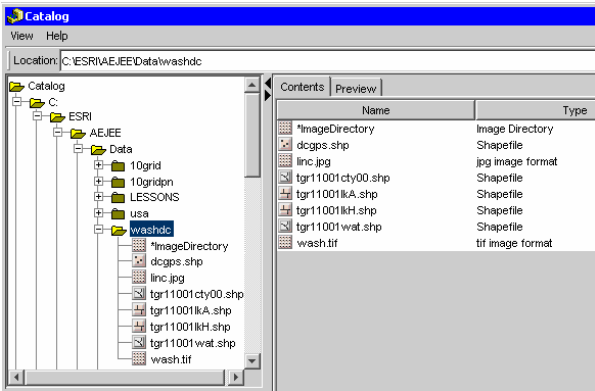
NOTE: Selecting features according to distance from another feature is a key power of GIS. Users often need to know what's near, or not within a certain distance. For law enforcement, habitat protection, marketing, and myriad other purposes, "distance from a feature" is crucial.

18.

Choose as a distance 1 mile, and click "**OK**". Around the White House will appear a lightly shaded circle with a radius of 1 mile. (It may help to turn off the "**wash.tif**" image, and then turn it on again.) Which of the three other GPS features is not within a mile of the White House?

19.

Erase the 1-mile buffer by clicking the "**Clear All Selection**" button. Use the "**Select**" tool to select the White House again. Click on the "**Buffer**" tool and choose as a distance 0.5 miles, and this time ask AEJEE to select features from the layer "**roads**", then click "**OK**". The yellow road segments are all within a half-mile of the White House.

20.   Save your project as "**dc_hd3.axl**".

21.

The last portion of this lesson deals with a special capacity built into AEJEE. Suppose you want to explore the data available for AEJEE. You could add it all, bit by bit, layer by layer, but that can be extremely tedious. It would be a lot easier if there were a neat little tool for browsing data. There is … the Catalog. From the menu bar, choose "**Tools/Catalog**".

22.

Using a "tree hierarchy" and the ability to "spill open" or "close up" folders one at a time, the Catalog allows you to see quickly what data sets might be available for use. Navigate to the folder **/ESRI/AEJEE/DATA/WASHDC**.

23.   In the left column, click the item "**dcgps.shp**". What does it say on the right? Notice the right side has a "**Contents**" tab and a "**Preview**" tab. Click "**Preview**", and set the tab at the bottom of the "**Preview**" window to "**Geography**". Under the "**View**" menu, choose "**Toolbars/Pan-Zoom**"; these tools should look familiar. Click with the "**Identify**" tool on one of the dots. Change the tab at the bottom of the "**Preview**" window from "**Geography**" to "**Table**". Compare what you see in the "**Preview**" window for some of the other features.
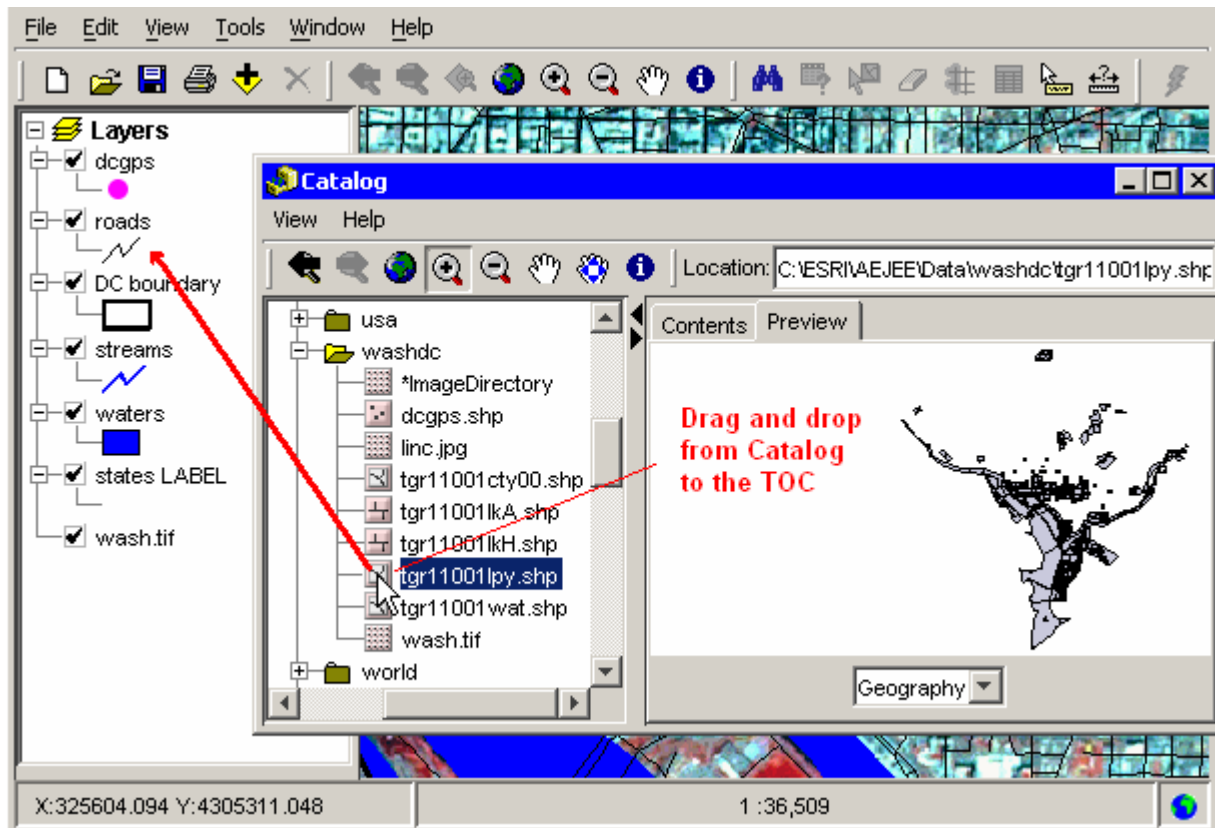
24.   Finally, locate the polygon shapefile "**tgr11001lpy.shp**" in the left
           column. (The icon in the left column shows that it is a set of polygons, rather
           than lines or points or an image.) After previewing it in the right column, drag
           the icon from the left column into the TOC. These new polygons will drop in
           below the roads. Close the Catalog.

25.   **REVIEW:** In this lesson, we have covered the following ideas, tools, and
           capacities:
           - Integrating image data
           - Saving projects
           - Adding data
           - Event (XY) themes
           - Hot links
           - Buffer
           - Catalog

26.   **SELF CHECK:** Now it's time to see if you can use these concepts and skills on a new set of data. Create a brand new AEJEE project, saved as "**dc_selfcheck.axl**", consisting of these layers:

* "**dcurban.jpg**" (stored in UTM1983 Zone 18)

* "**dcgps.shp**" labeled in the TOC as "Points 1-4", shown as red stars

* "**dcgps2.csv**" built as a new text file, converted to a shapefile, shown as blue stars, and containing these three lines:

```
site,lat,long,name,HOTLINK
5,38.905,-77.037,National Geographic,http://www.nationalgeographic.com
6,38.889,-76.971,RFK Stadium,http://www.dcsec.com
```

* "**tgr11001lka.shp**" labeled in the TOC as "roads", shown as black lines

* "**tgr11001cty00.shp**" labeled as "DC Boundary", shown as a grey polygon

Then, find out which items from "**dcgps.shp**" are within one mile of the National Geographic.

FOR THE TEACHER:

26-A   This project is a comprehensive task. The students need to:
- create and save a project
- add layers
- project the view into UTM1983 Zone 18
- build a data table with hot links and convert it into a shapefile
- set the layer names and display characteristics
- select a feature and create a buffer which selects features from another layer

The final results should look something like this:
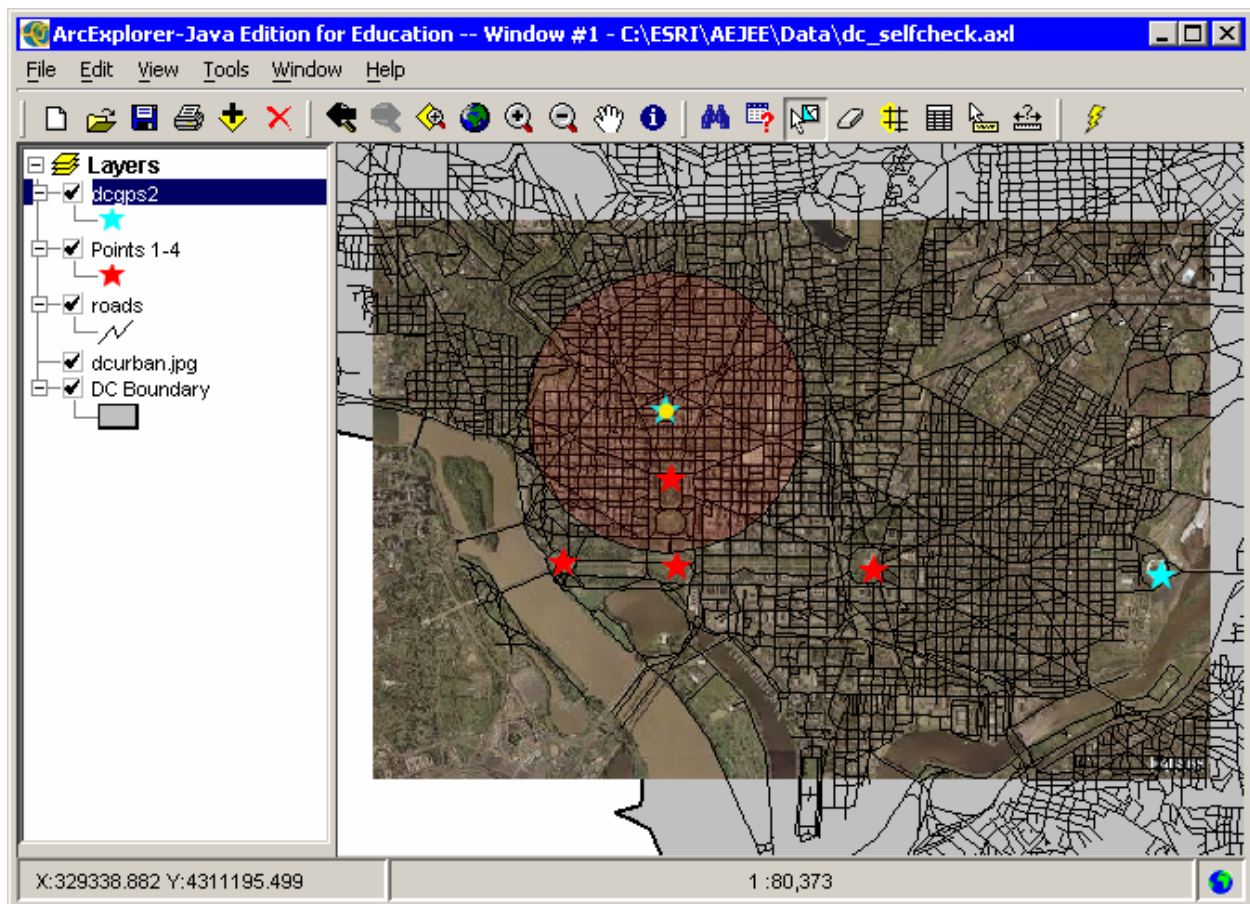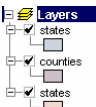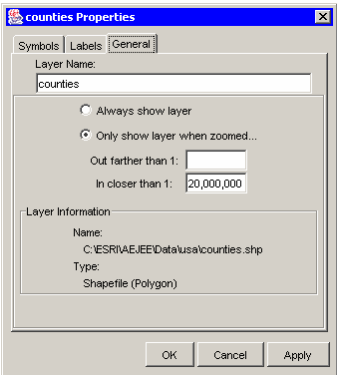
Getting Started with ArcExplorer—Java Edition for Education – Lesson 5

This lesson covers the following ideas, tools, and capacities:
- Scale dependency
- Accessing data from ArcIMS servers

NOTE: In order to do this lesson successfully, you must be connected live to the Internet, because the lesson will use data from the Geography Network.

1. Start AEJEE. This lesson will build a project from scratch, so there is no project to open.

2. Start building the project from scratch by adding in two layers from the data folder **/ESRI/AEJEE/DATA/USA**. Add the layers "**counties.shp**" and "**states.shp**". Move the "**states**" layer to the bottom of the TOC. Add the "**states.shp**" layer again, so that there is one "**counties**" layer sandwiched between two "**states**" layers.

3. Save your new project. Choose the menu item "**File/Save**", and navigate to where AEJEE data and projects are stored. Label this as "**XYZ_us_gnhd.axl**", but replace "XYZ" with your initials.

4. Set the top "**states**" symbol to be an empty box (**Style: "Transparent fill"**) with a black outline of width "**2**". Click "**OK**". Back in the map, the states have become almost invisible because the counties are too numerous.

5. We can set the counties to appear only when it makes sense for them to show, using "scale dependency". Zoom in so the states of TX, OK, and NM pretty much fill your map space. Note the scale shown in the status bar. This is roughly the scale at which we want county outlines to turn on. (Using a small map space, no wider than the toolbar, this might be about 1:20,000,000; if your map occupies a lot of screen space, a different scale might work better for you.)

6. Right-click the "**counties**" layer and choose "**Properties**". Under the "**General**" tab, click the button for "**Only show layer when zoomed…**" and, in the box for "**In closer than 1:**", type "20,000,000" (or another nice round number). Click "**OK**".

7. Click the "**Zoom to Full Extent**" button … and the counties disappear! Zoom in little bit at a time, approaching the 1:20,000,000 scale, and then past that mark, to see the effect.

NOTE: Scale dependency is a powerful capacity to use when you have data sets of different resolution. GIS data providers who distribute data live online often rely on this.

8. Now it's time to add some more data … from the Internet! Click the "**Add Data…**" button. In the "**Content Chooser**" window's "**Look In:**" box, choose "**Internet Servers**".

NOTE: Serving data live over the Internet is a powerful capacity. Data can be updated at any time. Viewers can often rely on experts preparing appropriate packages in appropriate presentations. The Geography Network is one such framework, presenting a large storehouse of data, much of it available to be used for free. It helps to understand more about the GN, and a good set of lessons is available from the ArcLessons archive, www.esri.com/arclessons. (Do a keyword search for "Geography Network".)
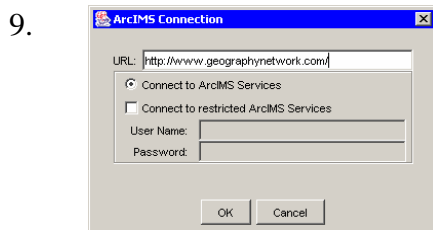
9. Double-click the "**Add Internet Server**" icon. The "**ArcIMS Connection**" window appears, with a default pointing to the Geography Network. Click "**OK**".

10. A large, scrollable list of data sources will appear. Scroll through the list and look at the choices. Some of the names may be a little hard to distinguish right away, so we'll work with some specific choices. Look for "**Atlas_Precipitation**", click it, and click "**OK**". After a few seconds, a new window appears, with an "image data" icon and "**Atlas_Precipitation**". Click it, and click "**OK**".

11.
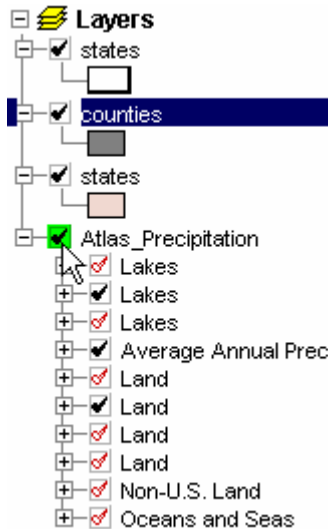
The new layer comes in at the bottom of the TOC. The checkbox next to the name begins pulsing green, indicating it is pulling data across the Internet. While it is preparing to draw, notice that all data sets come in with their legend "collapsed", and that some have a black check mark while others have an outlined red check mark. GN data sets often use scale dependency. The black-checked layers are set to display at this scale, while the layers with an outlined red check are on but not at the right scale for display. This is why you may see layers with similar names right next to each other, such as "`Land`" here; the four layers have a different resolution and are set to display at appropriate scale.

12. Problem: Your "`counties`" layer and your bottom "`states`" layers are both opaque, and covering the data you have added. Right-click on the bottom "`states`" layer and send it to the bottom of the TOC. Change the symbology of the "`counties`" layer to be "`Transparent fill`" (like you did with the top "`states`" layer) with black border of width "`1`", and click "`OK`".

13.
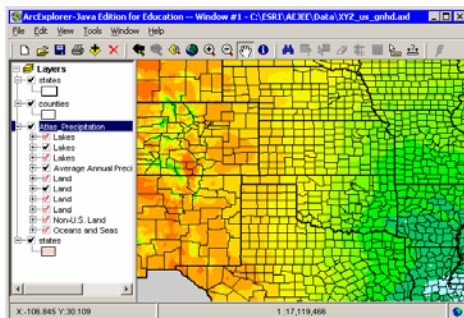
Fabulous! You have a great map, with important reference data from your hard drive integrating with valuable data from the Internet! You can spill open the legend next to "Average Annual Precipitation" and see what the colors mean. Zoom out to see the 50 states (notice that not all data sets cover all areas equally), and save your project.

14. There's one last tweak to make for this project. It would help if the map were projected, instead of being "decimal degree". The data coming from the GN is special – it can be projected on the fly, back at its source. (Not all data coming over the Internet can be projected, and you can't tell which until you try.)

15.
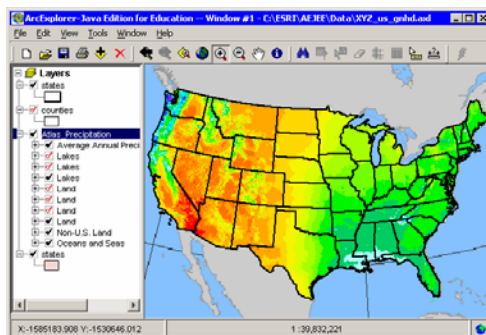
Choose "`Tools/Projection`". Under "`Systems`", choose "`Regional Projections`", then "`Albers Equal Area`", and "`United States`". Click "`OK`". Note that your base layer of states draws immediately to show where you are. Without waiting for the rest to appear, zoom in around the 48 conterminous states. When the rest of the data appear, notice that everything has projected into the proper display. Save your map!
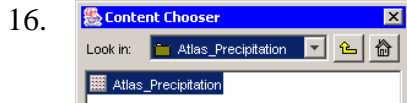
16. Now we need a world project. Choose "**Window/New Window**". Start by adding some data from the Geography Network. Click the "**Add Data…**" button. Since you were last inside the "**Atlas_Precipitation**" folder, you need to click the "**up**" arrow to get back to the main choices. Find "**ESRI_Relief**", click it and click "**OK**". Once again, you're presented with just one icon for "image data" and the name "**ESRI_Relief**". Click it and click "**OK**".

17. When the new map appears, choose to save your project. Navigate to **/ESRI/AEJEE/DATA** and save the project as "**XYZ_world_gn.axl**", replacing 'XYZ' with your initials.

18. The new map is pretty, but lacks references. AEJEE only carries a little bit of world data with it, so we'll add more rich data from the Geography Network. Click "**Add Data…**" again, and navigate up one level to find and add "**ESRI_World**"

19. The new data comes in at the bottom of the TOC with a huge volume of layers, most of which are turned off when zoomed all the way out. But the real problem is that the "Relief" layer is on top and opaque. Turning it off allows seeing the layer underneath, but removes the nice view of landforms. What we really need to do is make the top layer "see-through".
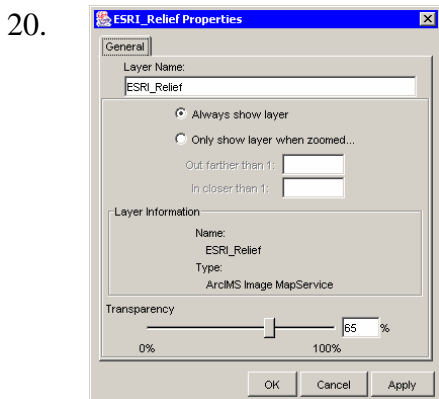
20. Right-click "**ESRI_Relief**" and open up the **Properties**. Notice that the window offers much less control than is available for a data set coming from the hard drive. (This is true even for a "rich" data layer like "**ESRI_World**".) All you can do here is set a scale dependency and "**Transparency**". Set the slider bar to about 65% and click "**OK**". Try several different levels of transparency and zoom levels to see what works best for your map. (Notice as you zoom and pan that the map will draw quickly what it can, using whatever is in the computer memory, then pauses for a few seconds as it retrieves more data. Wait for the "pulsing green boxes" to indicate the data have all been retrieved.) When you're finished, zoom to full extent and save the project.

21. The last test is to see if these maps can reproject without any other data sets in the view. From the menu bar of your world map, choose "**Tools/Projection**". Spill open "**World Projections**", then "**World Projections (Sphere)**". Choose "**Eckert IV**", and click "**OK**". The command will go back to the server to prepare the data for AEJEE in a projected format and send it back for display … perfectly! (Remember, not all server data will re-project this way. You'll just have to try layers and see.)

22.   **REVIEW:** In this lesson, we have covered the following ideas, tools, and
            capacities:
            - Scale dependency
            - Accessing data from ArcIMS servers

23.   **SELF CHECK:** Now it's time to see if you can use these concepts and skills on
            a different set of data.

24.   Create a new window and open the project "**dc_hd.axl**". From the
            Geography Network, add the data set "**Census_Density**" (population
            density at varying scales, from the 2000 Census), and set this as the bottommost
            layer. Alter the projection so that all layers work together. (Remember that the
            DC image is "UTM 1983 Zone 18".) When zoomed to the layer "**wash.tif**",
            which data set is visible – Density by State, County, Tract, Place, Block Group,
            or Block? At what scale does "**Density by Block**" appear?

25.   Create a new window and add from the Geography Network a data set that you
            have not yet used. Write a brief synopsis of what is included in that data set.

FOR THE TEACHER:

24-A   Remember that the "`wash.tif`" image is stored in "`UTM 1983 Zone 18`", and that the view must be projected into this for the image to work with the other files. The scale of data that appears when zoomed to the layer "`wash.tif`" will depend on how large the map space is; a large map space will yield a larger scale map, and population data at finer resolution, while a small map space will yield a smaller map scale and population data at coarser resolution. Block data appear when zoomed closer than 1:50,000.
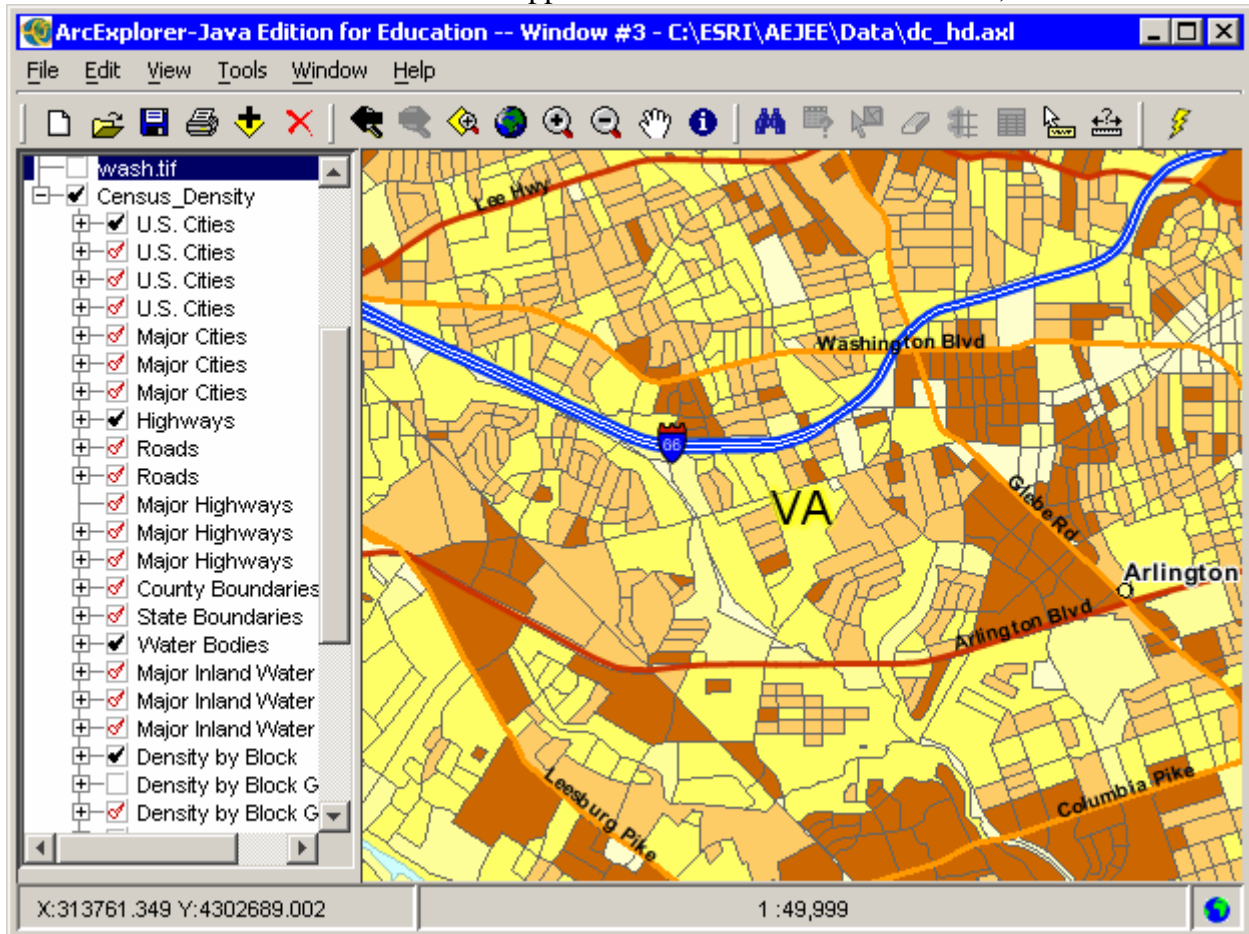
25-A   Answers here will vary according to the data explored. Good layers to investigate abound!

Getting Started with ArcExplorer—Java Edition for Education – Appendix 1

This section covers the following ideas, tools, and capacities:
- Additional installed data and projects

1. This tutorial package walks through the use of a number of projects that come with AEJEE, but it does not use all the projects and data. There are some important capacities available in the included projects. Users are encouraged to work creatively with querying, classification, symbolization, labeling, and map tips to get greatest benefit from these.

2. **10gridpn_hd.axl** – Unlike the other "10grid" project, this project uses a coordinate system where the 0,0 mark is in the center of the study area. The "pn" indication in the name is a reminder that this project includes both positive and negative numbers. Both "10grid" projects can be used for mapping areas of 10 units by 10 units, as teachers might do in a classroom, on the school playground, or out in the field. Teachers can then decide to work with the 0,0 mark either in the lower left corner (10grid) or in the center (10gridpn). By carefully recording point data (such as "an ant colony at 3.5,8.3") and creating XY data tables, the points can be brought in and mapped. Explore the attributes for all the data in each folder, because there are many mapping and analysis opportunities available.

3. **us48elev_hd.axl** – This project includes elevation data for the conterminous 48 states. It starts with a fast-drawing shaded relief but also includes a slower-drawing, higher resolution shaded relief. Because these layers are set as translucent, the allow the detailed 48-state elevation data to be visible as well. This map makes a good starting project for explorations of 48-state content, such as watersheds, US history, or temperature patterns. The display is in "Albers Equal Area, USGS" (with central meridian at 96-west and latitude of origin at 23-north).

4. **us_gn.axl** – This project is basically a street map of the 50 states, using the "Census_TIGER2000" data from the Geography Network. It's a nice project with which to explore a wide variety of topics where fast reference data, down to neighborhood street-level, may be useful. The opening presentation is in decimal degree but, as demonstrated in Lesson 5, can be projected if necessary.

5. **us_gnhd** – This project presents what amounts to a finished version of the precipitation map that gets built in Lesson 5. It uses the Geography Network, and displays the final content in "Albers Equal Area" (with central meridian at 96-west and latitude of origin at 37.5-north).

6. **worldclimate_hd.axl** – This project shows world climate and vegetation patterns at a coarse scale. The data are presented as georegistered images, so they cannot be projected, nor used in an analysis, and you cannot get finer resolution data by zooming in. But they do present a good backdrop for numerous explorations, and they integrate nicely with shapefile data. The vegetation image uses "veg_legend.bmp" (found in the "world" folder) for the legend, and the four temperature images all rely on a single legend, "temp_legend.bmp". When using this project, you may want to call up the legends in a separate graphics program, or print them out, for reference.

7. **worldelev_hd.axl** – This project shows world elevation and ocean depth, in meters. The project opens with an elevation image being displayed, and an elevation shapefile visible but not turned on. The project is stored in a decimal degree display, but can work in other projections by turning on the elevation shapefile. The elevation shapefile is a little more coarse than the elevation image, but it does allow working in different projections (such as the Pacific-centered Eckert IV used in Lesson 3). The legend for the elevation data is "elev_legend.bmp".

8. **worldtectonic_hd.axl** – This project includes world elevation and ocean depth in an image form, plus the following shapefiles: major tectonic plates, major faults, earthquakes greater than 4.0 magnitude from 2001-2005, and volcanoes. The data can be used to explore a wide range of global geophysical conditions.

Getting Started with ArcExplorer—Java Edition for Education – Appendix 2

This section covers the following ideas, tools, and capacities:
- Transportable projects
- Absolute location of data
- Relative location of data

This section is a reference for AEJEE users preparing projects and data for use by others.

1. AEJEE is able to save and open "projects" -- combinations of data presented in a particular fashion. Saving projects allows you to work on them again and again, and to share them with others. But the project file (such as "dc_hd.axl") is simply an ASCII textfile recipe, showing AEJEE where to find data and how to display it. In order for a project to work properly, the prescribed data sets need to be available in the prescribed location.

2. A **"transportable project"** is one which is prepared for use on a different computer. It is said to be transportable if the project can be installed in a specified location and work without the user needing to make changes to the project. Since all projects need to point to the data being used, a transportable project needs to point to data where
   - the data are known to be available to others in a specific location, such as the data automatically installed with AEJEE
   - the data are all coming over the Internet from ArcIMS servers
   - the data are presented along with the project

3. When saving a project, AEJEE stores information about the **"absolute location"** of the data sets used – the specific path structure where the user can see the data, such as
   - **"/ESRI/AEJEE/DATA/USA"** (the slash at the start means this path starts at the root level of the hard drive)
   - **"http://www.geographynetwork.com"** (comes from an Internet server)

   In these cases, the project file can be located anywhere on the user's computer, and AEJEE will know where to go to find the data, because the project contains explicit pointers. Move the project file to a different folder and it will still work, as AEJEE knows exactly where the data are stored.

4. AEJEE can also read projects in which the location of the data is presented as a **"relative location,"** where the path is in relation to the location of the project file itself, such as
   - **"data"** (data are in a nearby folder called "data"; note there is no slash before "data")
   - **"../world"** (data are found one level up from the project, in a nearby folder called "world")
   - **"mydata/subfolder1"** (data are in "subfolder1", which is in a nearby folder called "mydata")
   - **""** (no path information is given, meaning the data are to be found in the same folder where the project itself is located)

   In each of these cases, the data are all shown in relation to where the project is. The project and data can be moved in tandem, but if they are separated, the project will not be able to find the data in the expected location and so will not open.

5. Let's explore this by opening a project in AEJEE and immediately doing a "SAVE AS" to create a copy that we can modify. Begin AEJEE and open "world_hd.axl". Without making any changes, immediately choose to save this in the same folder as "pathtest1_hd.axl".

6. Open up either WordPad for Windows or TextEdit for Macintosh. Choose FILE/OPEN and navigate to the folder containing your AEJEE projects (such as /ESRI/AEJEE/DATA) and select the file "pathtest1.axl".
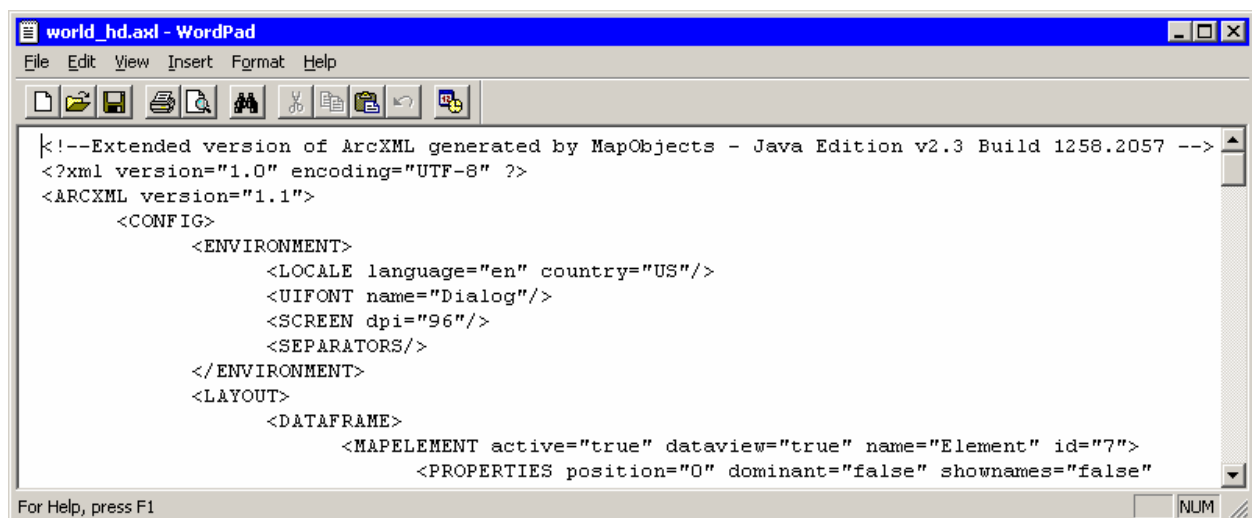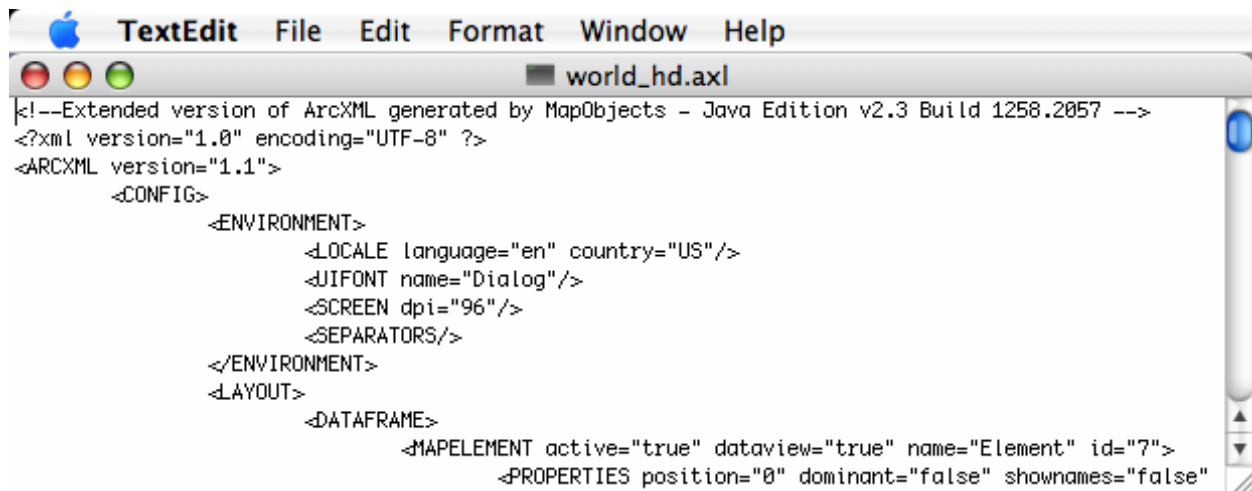
7. Scroll down to the bottom and back up to the top to inspect it. You can see the document lists aspects of the project in a format that looks like the source code for an HTML file. In fact, ArcXML is very much like HTML. It consists of some capitalized parameters and then values being used.

8. Look after the big long paragraphs for the section from "`<FOLDERS>`" to
    "`</FOLDERS>`": The sections will look slightly different depending on whether you are
    on Macintosh or Windows.

    {{Macintosh version}}

    ```
    <FOLDERS>
       <FOLDER name="ws-0" type="shapefile">
          <ATTRIBUTE name="directory" value="/ESRI/AEJEE/data/world"/>
       </FOLDER>
    </FOLDERS>
    ```

    {{Windows version}}

    ```
    <FOLDERS>
       <FOLDER name="ws-0" type="shapefile">
          <ATTRIBUTE name="directory" value="C:\ESRI\AEJEE\data\world"/>
       </FOLDER>
    </FOLDERS>
    ```

9. Both versions show that all the data in this project are stored in one folder, and both show
    the path starting from the root level of the hard drive. Close inspection will reveal two key
    differences in the "value" portion. First, the Windows hard drive has a drive letter and
    colon. Second, the Windows version saves with backslashes instead of forward slashes.
    AEJEE on a Windows computer could read the Macintosh project file, but the changes are
    enough to prevent AEJEE on a Macintosh from reading these Windows projects files.

10. But you can make the Windows version readable by
    both systems. Just open up any "project.axl" in your
    text editor, find the "FOLDERS" section, remove
    any "C:" references, change the "\" characters to "/",
    and then re-save as "project2.axl". (If you need to
    modify the absolute location of folders being
    referenced, do that in this step.)

    > NOTE: Be alert when saving these
    > files from your text editor. If the
    > computer appends a ".txt" extension
    > to your new file, AEJEE will not
    > see it as a viable project. Check to
    > see how your project file was
    > stored, and re-name as necessary.

11. Suppose that, instead of a project with absolute locations, you want to make your project
    file contain relative locations. This takes three quick steps:
    a) Decide where the project file will be stored in relation to the data, then make the
        desired changes to the path structure as shown in Steps #4 and #10 above;
    b) In the FOLDERS portion of the project file, where you see
            `<ATTRIBUTE name="directory"`
        change that to read
            `<ATTRIBUTE name="relative"`
    c) Save the project file with a new name in the location that you chose in (a) above.

12. AEJEE itself can only save projects using absolute locations. Creating relative locations must be done outside of AEJEE, with a text editor. If you create a project using relative locations for data, then return to AEJEE and make any changes to the project (such as zooming in or renaming a layer) and re-save the project, the act of saving the project while in AEJEE changes your relative locations to absolute locations. Therefore, be sure you are all done with your project changes before converting absolute locations to relative locations.

13. An additional challenge appears when creating hot links for use by both platforms. As demonstrated in Lesson 4, both platforms of AEJEE expect hotlinked files to be in an absolute location. However, the PC version expects a drive letter (such as "C:\") for any local files, while the Mac version does not use drive letters but needs "file:///". If the data are to be prepared and shared with the general public, make a choice and document it for the user, indicating how they may need to change the hotlink data.

14. For these reasons, when creating packages of data plus project for AEJEE users, it is good practice to follow this method:
    - In a single "super-folder", place the project file/s and data folder/s being used. The projects should be readily visible outside the data folders. If the projects employ a relative path structure, the entire "super-folder" can be moved anywhere (or compressed, moved, and uncompressed) and the projects will work properly.
    This is the method employed for AEJEE itself, which you can see by exploring the /ESRI/AEJEE/DATA folder.
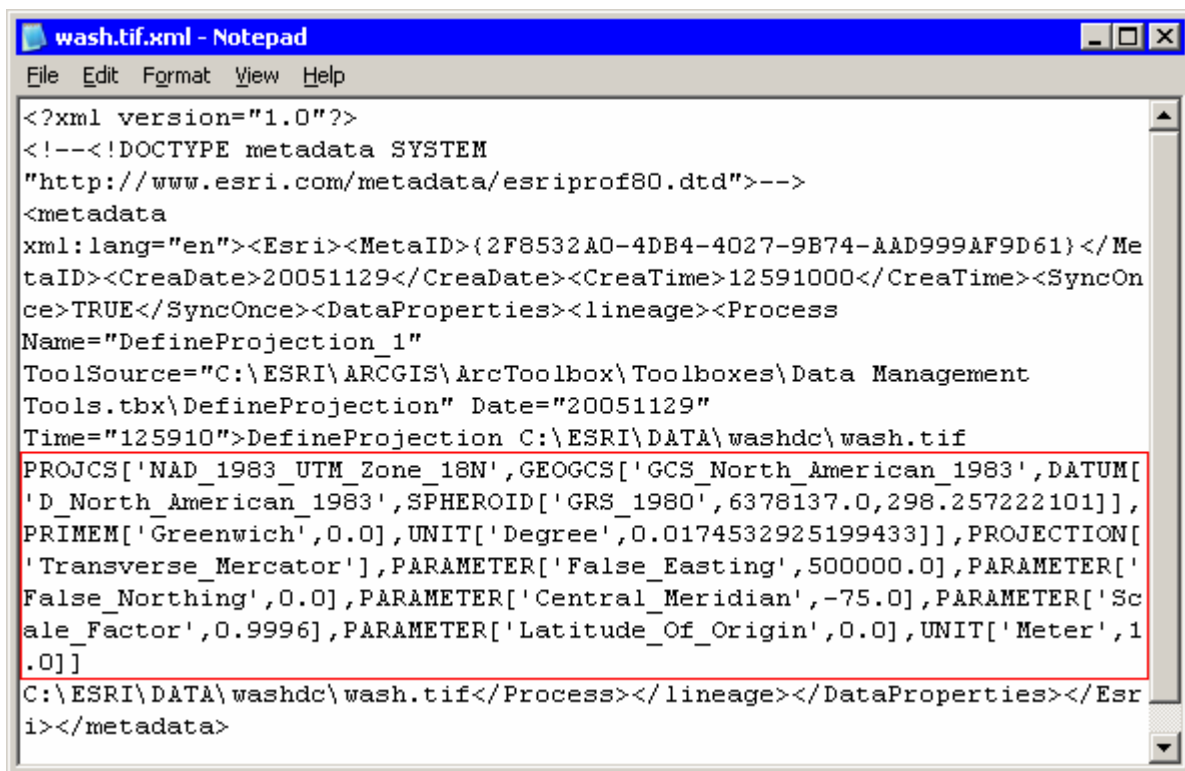
This section covers the following ideas, tools, and capacities:
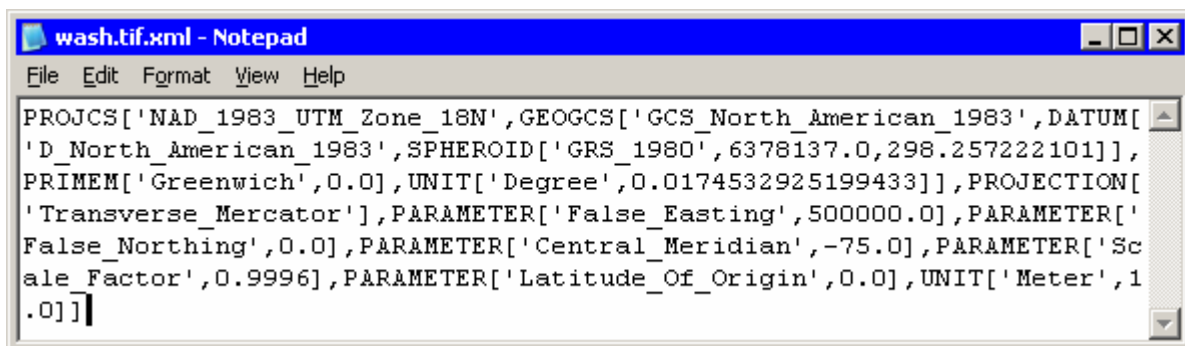- Geo-registering images with ArcView 9

This section is a reference for those who are preparing image data for users of AEJEE. It requires access to ArcGIS Desktop, and will assume ArcView 9.

1. The project "dc_hd.axl" engaged an image from the hard drive. The image has been "geographically registered" -- it knows the portion of the earth that it represents. The image itself is several megabytes in size, but it is the presence of two tiny files that provide the spatial intelligence. Navigate into the folder /ESRI/AEJEE/data/washdc and look for the files "wash.tif" (the big image file) plus "wash.tfw" (a world file, showing the coordinates for the image) and "wash.prj" (a projection file, showing the projection in which the image was stored).

2. As you saw in earlier lessons, AEJEE can project decimal degree features (points, lines, polygons) to match up with images. But images need to have these two files in place in order to display in an accurate location. AEJEE cannot create the world files for images, nor the PRJ files -- you need full GIS software to do this. ArcView is an example of a GIS software package that can do this.

3. ArcView 9 can use images with world files; most images available for use in GIS packages contain a world file. World files are listed as "TFW" for "TIF" images, "JGW" for "JPG" images, "SDW" for "SID" images, and so forth. The world file is designed the same in each case, and AEJEE can use these world files.

4. ArcView 9 is able to write out projection information for images, but it creates the file in a format that isn't quite right for AEJEE. You can use a text editor to change the data presented by ArcView 9 so that it is more useful for AEJEE.

5. In your file manager, set the properties for any world files to "read only", in order to protect them, or create a duplicate copy before attempting the following process.

6. In ArcView 9, engage the "Define Projection" toolbox. Select the image, choose the coordinate system, and click "OK". The toolbox will create an ".XML" file. Exit ArcView 9.

7. Open the ".XML" file with TextEdit (Mac) or WordPad or NotePad (PC). Look halfway down for the section of text immediately following the path to the image and name. (The data of interest is outlined here in red.)
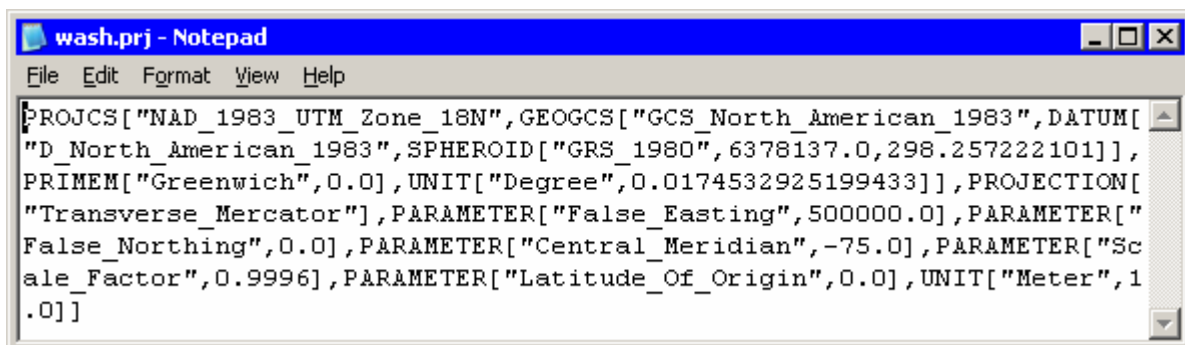
```
wash.tif.xml - Notepad
File  Edit  Format  View  Help

<?xml version="1.0"?>
<!--<!DOCTYPE metadata SYSTEM
"http://www.esri.com/metadata/esriprof80.dtd">-->
<metadata
xml:lang="en"><Esri><MetaID>{2F8532A0-4DB4-4027-9B74-AAD999AF9D61}</Me
taID><CreaDate>20051129</CreaDate><CreaTime>12591000</CreaTime><SyncOn
ce>TRUE</SyncOnce><DataProperties><lineage><Process
Name="DefineProjection_1"
ToolSource="C:\ESRI\ARCGIS\ArcToolbox\Toolboxes\Data Management
Tools.tbx\DefineProjection" Date="20051129"
Time="125910">DefineProjection C:\ESRI\DATA\washdc\wash.tif
PROJCS['NAD_1983_UTM_Zone_18N',GEOGCS['GCS_North_American_1983',DATUM[
'D_North_American_1983',SPHEROID['GRS_1980',6378137.0,298.257222101]],
PRIMEM['Greenwich',0.0],UNIT['Degree',0.0174532925199433]],PROJECTION[
'Transverse_Mercator'],PARAMETER['False_Easting',500000.0],PARAMETER['
False_Northing',0.0],PARAMETER['Central_Meridian',-75.0],PARAMETER['Sc
ale_Factor',0.9996],PARAMETER['Latitude_Of_Origin',0.0],UNIT['Meter',1
.0]]
C:\ESRI\DATA\washdc\wash.tif</Process></lineage></DataProperties></Esr
i></metadata>
```

8. Omit all the text preceding "PROJCS" and following the double bracket after "UNIT"


```
wash.tif.xml - Notepad
File  Edit  Format  View  Help

PROJCS['NAD_1983_UTM_Zone_18N',GEOGCS['GCS_North_American_1983',DATUM[
'D_North_American_1983',SPHEROID['GRS_1980',6378137.0,298.257222101]],
PRIMEM['Greenwich',0.0],UNIT['Degree',0.0174532925199433]],PROJECTION[
'Transverse_Mercator'],PARAMETER['False_Easting',500000.0],PARAMETER['
False_Northing',0.0],PARAMETER['Central_Meridian',-75.0],PARAMETER['Sc
ale_Factor',0.9996],PARAMETER['Latitude_Of_Origin',0.0],UNIT['Meter',1
.0]]
```

9. Change all the ' marks to " marks. Then save the file as the .PRJ file (in this case,
    "wash.prj"), in the same folder with the image. Now AEJEE can match features with the
    images!


```
wash.prj - Notepad
File  Edit  Format  View  Help

PROJCS["NAD_1983_UTM_Zone_18N",GEOGCS["GCS_North_American_1983",DATUM[
"D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],
PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION[
"Transverse_Mercator"],PARAMETER["False_Easting",500000.0],PARAMETER["
False_Northing",0.0],PARAMETER["Central_Meridian",-75.0],PARAMETER["Sc
ale_Factor",0.9996],PARAMETER["Latitude_Of_Origin",0.0],UNIT["Meter",1
.0]]
```

This section covers the following ideas, tools, and capacities:
- Enhancing attribute data for use in AEJEE
- Finding more data for use in AEJEE
- Exploring ArcLessons
- Moving up to ArcView

Enhancing Attribute Data for use in AEJEE

1. AEJEE is an effective tool for displaying GIS data. But what happens if the shapefiles being displayed do not contain the desired attributes? AEJEE does not have the capacity to enhance these. However, AEJEE users do have options for more elaborate data.

2. The easiest way to enhance data is to work with ArcView. ArcView is a full-power GIS tool, with the capacity to create and modify data. ArcView users can edit attribute tables directly, or join external tables and then export the modified data as a new shapefile. This is the most reliable approach, because the user can choose exactly the data elements and formats desired and use industry-standard techniques.

3. If an AEJEE user doesn't have access to ArcView, another good bet is to seek the desired data from some online sources. There are many collections of shapefile data available online, and many collections of ArcIMS services that may provide the desired content.

4. A final way to enhance the data is to open the attribute table for a shapefile within a standard database or spreadsheet program that can read .dbf files and enhance it there. This is a fairly straight-forward process if you follow certain rules, but can be troublesome if the rules are breached. The .dbf filetype has some very specific rules about field names (no more than 10 characters, only numbers and letters and no special characters except an underscore, and the first character should not be a number). Also, the modified file must be saved with records sorted exactly as they were when opened, in order to pair attributes to the correct feature. The ArcLesson repository holds a lesson containing a 4-minute movie demonstrating the process using Excel. Go to www.esri.com/arclessons and do a custom search for lessons about ArcExplorer with a keyword "attributes".

Finding More Data for use in AEJEE

5. What if you crave more GIS data than you can produce? There are several strategies for finding data that can be used in AEJEE.

6. Standard Web search – Your favorite Internet search engine can be a big help. Do a search with these three elements: "GIS", "data", and the placename for which you seek data. Many times, you will find that countries, states, counties, or cities have stores of data available to the user online. You may need to try several levels of geography in your search, but start at the most local level first. You may not find data about a village, but you may find it for the surrounding county, nearby metropolitan area, or state or province. You may not find the desired content area, but you might find some useful data.

7. GIS metadata server search – Some very rich resources are GIS metadata servers. They go out and explore the realm of GIS data providers and report the results back to the searcher. Sometimes the results come back in a format that can be a challenge for novices to comprehend immediately, but read the information carefully and you should at least find important clues as to the content, geographic extent, and format of presentation. Two good metadata servers are:
   - The Geography Network - www.geographynetwork.com
   - The Geospatial Onestop - www.geodata.gov

8. Many organizations and agencies host ArcIMS services that can provide rich resources to the AEJEE user. One service in particular can provide access to an enormous array of ArcIMS services, in addition to a method for quickly seeing how the data look:
   - Kansas Geological Survey's MapDex – www.mapdex.org

Exploring ArcLessons – www.esri.com/arclessons

9. The ArcLessons repository is a collection of lessons created by ESRI and users of ESRI software. The packages cover a wide range of subject areas, grade levels, geographic regions, GIS skills, and GIS tools. Some packages consist of a single document for use with generic data for a single activity, while others present the data and activities for a week-long unit. The database can be searched for specific elements or browsed by category.

10. AEJEE-specific lessons can be found by searching based on software "ArcExplorer." However, it is useful to remember that many lessons, even if designed for other tools, may contain data or activities that can be incorporated by the savvy AEJEE user.

Moving Up to ArcView – www.esri.com/arcview

11. What happens when an AEJEE user needs even more power? The next move is to ArcView, a full-fledged, industry-standard GIS tool. But the transition is made fairly easy by the design of AEJEE. All the concepts engaged by AEJEE, all the GIS skills, all the data wisdom, and all the geographic inquiry approaches that users build with AEJEE can be used in ArcView. Where AEJEE presents the basics of GIS by offering limited choices, ArcView offers unlimited choices to tackle the ideas of data visualization and analysis.

12. An excellent project through which U.S.-based K-12 schools can learn GIS and earn a grant of full ArcView software for instructional use at the school is the "U.S. Community Atlas" – www.esri.com/communityatlas. AEJEE is all the software needed to complete a Community Atlas project.

13. Several books from ESRI Press (www.esri.com/esripress) provide instruction in ArcView, and include personal timeout versions of the software; this is an excellent way for a teacher to explore enhanced capacity. Finally, teachers and students can also request a personal timeout evaluation copy from the ArcView website (www.esri.com/arcview).

Getting Started with ArcExplorer—Java Edition for Education – Appendix 5

What's new in this version of AEJEE?

AEJEE is built using ESRI's MapObjects Java technology. As the parent tool grows, so does AEJEE. In addition, special customizations have been made to AEJEE, to address more effectively the special needs of users in educational settings. There have been many changes in AEJEE since the previous release, but not all are directly visible. Here are the most significant and noticeable modifications.

1. AEJEE's version number now matches the version number of its parent program, MapObjects Java. Choosing "About" in the "Help" menu shows this.

2. AEJEE 2.3 uses Java Runtime Engine ("JRE") 1.5.

3. AEJEE 2.3 can understand projects with "relative paths" pointing to locations of data. See Appendix 2.

4. Because of item 3 above, AEJEE no longer needs to be installed in a specific location for the on-board projects to work. The default continues to be [hard drive]/ESRI/AEJEE, but it can be installed elsewhere and the projects will work.

5. In AEJEE 2.3, the default folder accessed when choosing to open a saved project or add data is "AEJEE/DATA", wherever AEJEE might be installed.

6. In AEJEE 2.3, the identify tool focuses on the topmost layer that is selected (also known as "active" or "highlighted").

7. In attribute tables of AEJEE 2.3, the user can sort selected records to the top of the table.

8. Various small improvements in the layout portion of AEJEE 2.3 make the process of creating layouts easier. A noticeable example is that the "Add text" tool now creates a more visible box with instruction on how to modify it.

9. The Help menu of AEJEE 2.3 includes a link to the tutorial.

10. Some data in the USA and world folders has been updated.

Have a special question about AEJEE? Have an opinion on what works great and what needs enhancement? Post your questions and comments on the ArcExplorer Forum (http://forums.esri.com/Forums.asp?c=24), or send an email to k12-lib@esri.com.

For more information …

Getting started with GIS is like getting started with cooking, photography, gymnastics, or puzzles. You get started and you find that there are more and more "layers" to the activity, more and more options that deserve exploration, more and more opportunities visible in everyday activities. GIS users typically look for more and more places to learn. If you've made it this far, you're probably already looking.

Some important Web sites to explore about GIS and education:
- www.esri.com/k-12
- www.esri.com/highered
- www.esri.com/libraries
- www.esri.com/arclessons
- www.esri.com/communityatlas
- www.esri.com/esripress
- www.gis.com/education

Some important Web sites to explore about GIS and careers:
- www.gis.com/careers
- www.esri.com/industries.html
- www.esri.com/mapmuseum

Some important Web sites to explore about GIS technology:
- www.gis.com/whatisgis
- www.esri.com/products.html

Got a question that the above sites don't answer? Send an email to k12-lib@esri.com