

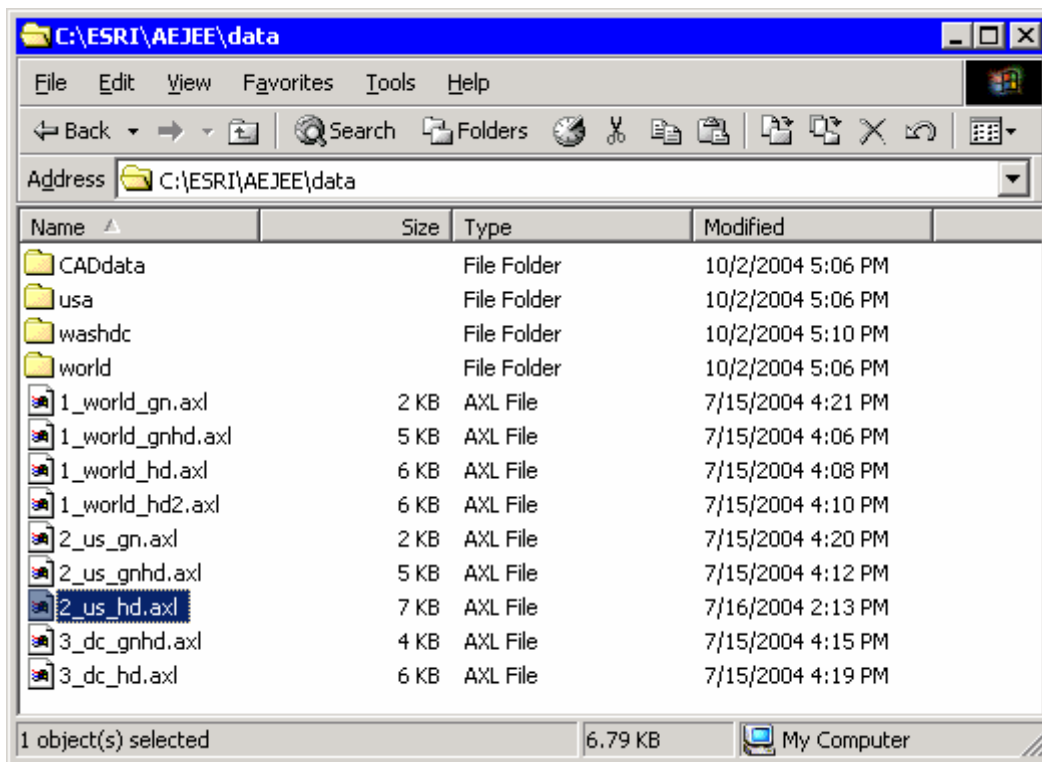
Using ArcExplorer™ Java™ Edition for Education

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.

1. Check the system specifications
 - a. **Windows:** Win98 or above, 100 MB hard drive space, Internet connection; recommend Pentium III or faster processor, recommend more than 64 MB RAM
 - b. **Macintosh:** MacOS 10.3 or above, 100 MB hard drive space, Internet connection; recommend G4 or faster processor; recommend more than 64 MB RAM
2. Download AEJEE from the Internet: www.esri.com/arcexplorer (click "download"). There are separate downloadable installers for Windows and for Macintosh. Please note that the downloads are large -- over 40 MB -- so be prudent in downloading. Use your file compression software to uncompress the downloaded installer, placing it in a folder where you can find it.
3. **WINDOWS INSTALLATION:**
 - a. Using Windows Explorer, navigate to the folder holding the uncompressed installation file, "install.exe".
 - b. Double-click the installer and follow the instructions. AEJEE defaults to install in C:\ESRI\AEJEE. If you change this folder, you will need to change the AEJEE project files before they can work. We recommend installing in the default directory.
4. **MACINTOSH INSTALLATION:**
 - a. Using Finder, navigate to the folder holding the uncompressed installation file "Install".
 - b. Double-click the installer and follow the instructions. AEJEE defaults to install in /ESRI/AEJEE. If you change this folder, you will need to change the AEJEE project files before they can work. We recommend installing in the default directory.
5. Getting Started with AEJEE
 - a. Create an AEJEE Document Kit for yourself or the station(s). Print the AEJEE "Getting Started" lessons, placing them in a binder.
 - b. Introduce yourself to AEJEE by walking thru the lessons above. Look for more lessons at www.esri.com/arclessons.
6. Introduce GIS to your students.
 - a. Show students what GIS is and how it is used in the real world using these sources:
 1. <http://www.gis.com>.
 2. <http://www.esri.com/mapmuseum>
 3. <http://www.gisday.com>
 4. <http://www.geographynetwork.com>
 5. <http://www.esri.com/communityatlas>
 - b. Take students through "Getting Started with AEJEE" lessons

Getting Started with ArcExplorer™ Java™ Edition for Education – Lesson 1

1. ArcExplorer Java Edition for Education (or "AEJEE") defaults to install in the "ESRI" folder at the root level of your hard drive. The "AEJEE" folder contains the AEJEE application and a "data" folder. By double-clicking the AEJEE icon, you can begin the application.
2. Once you have begun the application, the easiest way to explore what it can do is to open an existing file. Inside the /ESRI/AEJEE/data folder are several subfolders plus some files named like "2_us_hd.axl". These are "project" files. Start by choosing to open the file "2_us_hd.axl". This will open up a map about the US. (The "hd" in the name shows that it uses sample data from the hard drive, in contrast with projects containing "gn" for "Geography Network"; more about this later.) The "2_us_hd.axl" project explores data about farm acreage in the US.



3. The project opens with a map showing the 48 conterminous states, colored from green to grey. To the left of the map is a column containing several layers of data; the column is the "Table of Contents" (or "TOC"). The map at the right has been built using the layers in the TOC which have a black checkmark to the left of the name - "states" and "states: CropAcres97". Those layers with an empty checkbox are available for display in the map but are not currently turned on. The map opens with two layers on and five layers off.
4. You can turn layers on and off as you like, by clicking one time in the checkbox to the left of the layer name. An empty box means the layer will not show; a black check mark means the layer will show. Each time you make a change, the map re-draws, starting with the bottommost layer in the TOC first, on up to the topmost layer. Each layer has been set up in advance to show particular information with a specific symbol.

AEJEE for Windows

Menu Bar
Tool Bars
Table of Contents ("TOC")
Layers - off - on
map space
scale
Status Bar

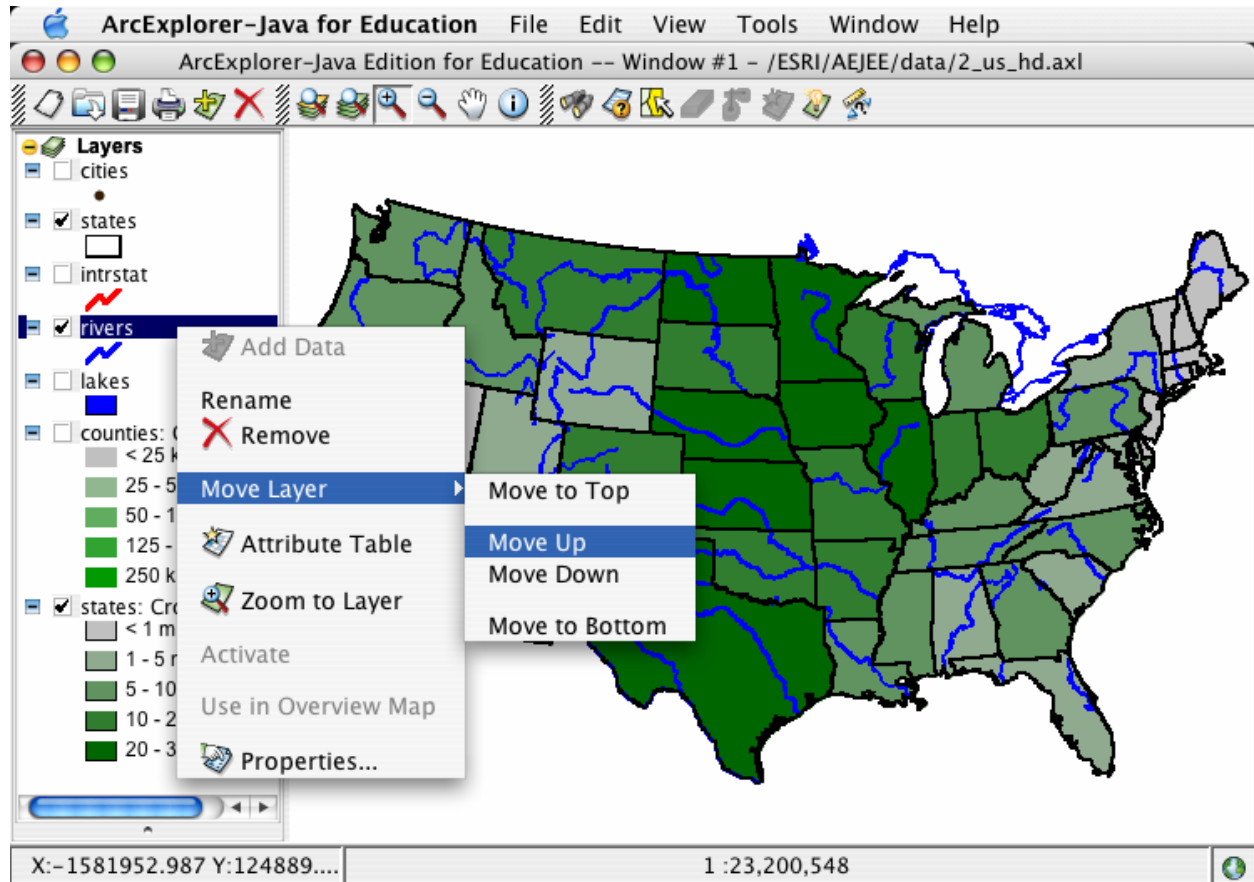
X:1034368.74 Y:-1509344.222
1:29,541,162

AEJEE for Macintosh

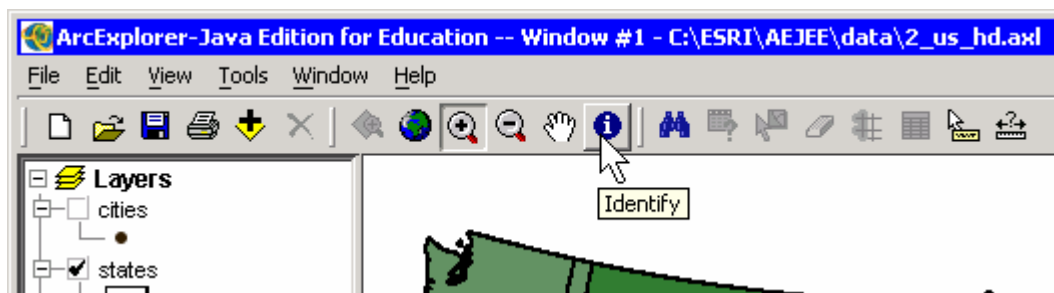
ArcExplorer-Java for Education File Edit View Tools Window Help
ArcExplorer-Java Edition for Education -- Window #1 - /ESRI/AEJEE/data/2_us_hd.axl

X:2324203.949 Y:1168257...
1:21,198,284

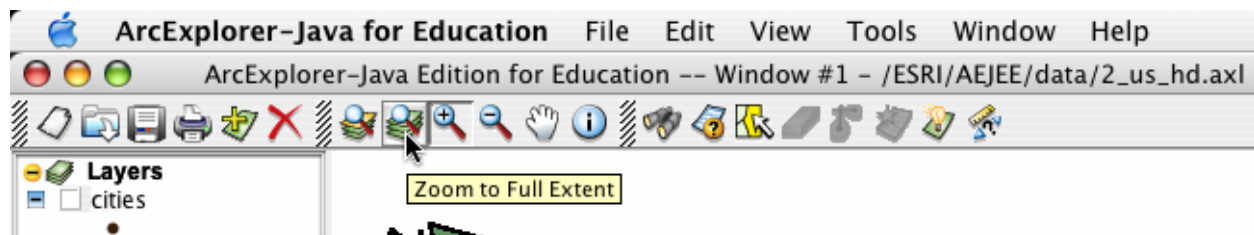
- If you turn on the "rivers" layer, and have the "states" layer above it turned on also, you can see that parts of some rivers are also state borders. In this case, the black state border will display atop the blue river in the map, because the state layer is above the river layer in the TOC. In the TOC, right-click on "rivers", scroll down to "Move Layer", and choose "Up" to move the rivers layer up one layer in the TOC. Do it again to move the "rivers" layer above the "states" layer. Finish by moving the "states" layer back above the "rivers" layer.



- 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 state had the least. Do you know the name of the big southernmost dark green state?



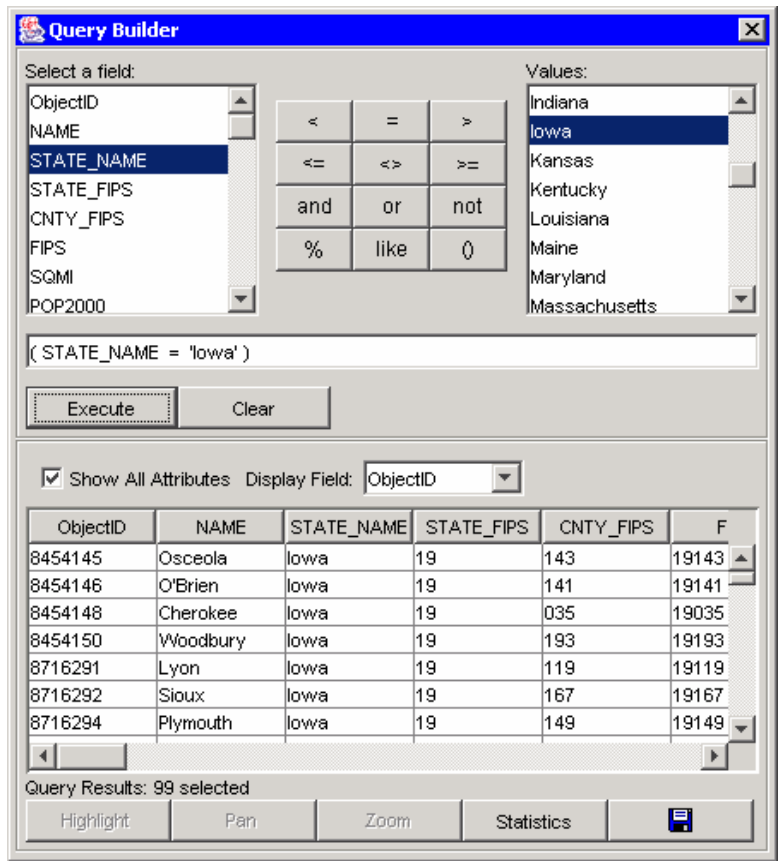
7. What if you don't know the name of the state? You can use the computer to find out. Above the map is a set of tools and menus. When you pause your mouse over a tool, a word or phrase called a "tooltip" appears, telling what the tool does. Look for the little circled "i" tool, which is the "Identify" tool. Click it. Click on the same big southernmost dark green state you named before. What shows up is an "Identify Results" window, providing a set of information about the state you clicked. In the left-hand column, you can see the name of the feature you selected, which should say "Texas". In the right-hand area, you can see many pieces of information about the state. In the right-hand column, scroll down to the bottom, to find "CROP_ACR97". This is the set of information being displayed in the map. In the TOC for your map, you should see that the number of acres for Texas is properly represented by a dark green color.
8. Each feature in the map is tied to a set of information about that feature. If you click with the identify tool on another state, you'll find data about that state. Click on the southeasternmost state, and you should see information about Florida, including its crop acreage. Click on the northeasternmost and you'll see information about Maine, including its crop acreage. In any given layer, each feature in that layer carries the same kind of information.
9. The same light-to-dark pattern is used for counties as well. By turning on the "counties: CropAcres97" layer and the "states" layer above it, you can see counties within the states, Looking at the pattern of counties across the states, you can see the areas that have a lot of farming (darker green) and those that have less (lighter green or grey). Can you name the states with lots of dark green counties?
10. Set only the layer "counties: CropAcres97" on. State boundaries have disappeared. Turn on the "states" layer. If you use the Identify tool when the "states" layer is on, AEJEE gives information about the state you click on. By turning off the "states" layer, and leaving on the "counties: CropAcres97" layer, you can now find information about one of the counties. AEJEE will identify features in whatever is the topmost layer being displayed. If you look at the info about some of the dark green counties, you can see that their info includes "STATE_NAME." In what states do you find the darkest green counties?
11. You can find out names of other features, such as rivers and lakes, by setting those layers as the topmost layer displayed and using the identify tool. What two rivers in Texas flow through the zone of Texas counties with the highest cropland?



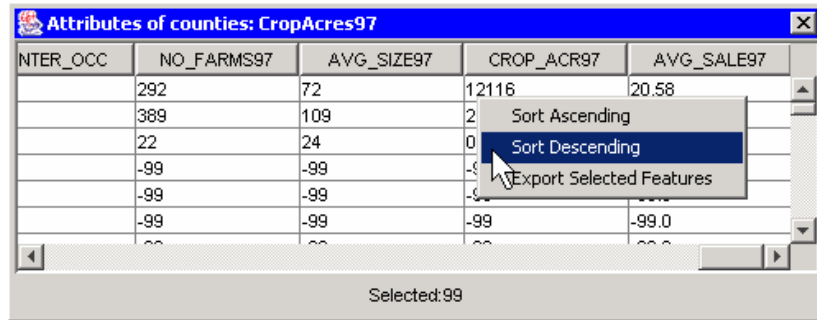
12. The tools immediately to the left of the Identify tool are for panning and zooming. Again, pause the mouse over the tools to see what they do. Find and click the "Zoom to Full Extent" button; you'll zoom out to the

extent of everything that is in the TOC. Which has more cropland - Alaska or Hawaii?

13. Use the "Zoom In" tool to zoom to the single state of your choice. (Use a "click-hold-drag diagonally" method to zoom to a specific area.) If you mess up, use the "Pan" tool to slide around, or the "Zoom to Full Extent" tool to start again. Return to a 48-state view when you're done.
14. Click one time on the name of the "states" layer, to highlight the name. Click the "Find" tool. Since you highlighted the "states" layer, that layer is highlighted in the list of features you can find, but you may choose other features. For now, keep "states" highlighted and type "Iowa" (with a capital "I") in the "Value" box at the top. Click the "Find" button, and AEJEE will find Iowa and highlight it in yellow. Click "Zoom To" and AEJEE will move Iowa into the center of the map and zoom in.
15. We want to find which county in Iowa has the most cropland, but if you turn on the "counties: CropAcres97" layer, they look pretty similar. First, we need to select the counties of Iowa, which we can do with a query - asking the computer to highlight counties which meet a particular set of criteria.
16. In the TOC, click one time on the name of the layer "counties: CropAcres97" to highlight it. Click the "Query Builder" tool. Up comes the "Query Builder" window. This is where you can carefully build a set of criteria for AEJEE to apply. In the upper left corner, under "Select a Field", double-click "STATE_NAME", and notice that "STATE_NAME" is used to begin a statement, just above the "EXECUTE" button. In the upper center function pallet, click "=", and notice it gets added to the growing query statement above the "EXECUTE" button. In the upper right "Values" area, scroll down and double-click "Iowa". Now your statement should read "(STATE_NAME = 'Iowa')". Click "EXECUTE". In a couple of seconds, all the counties with a state name of Iowa will be highlighted ("selected") in the map of Iowa, and their attributes will appear at the bottom of the Query window. (How many counties are there in Iowa?)

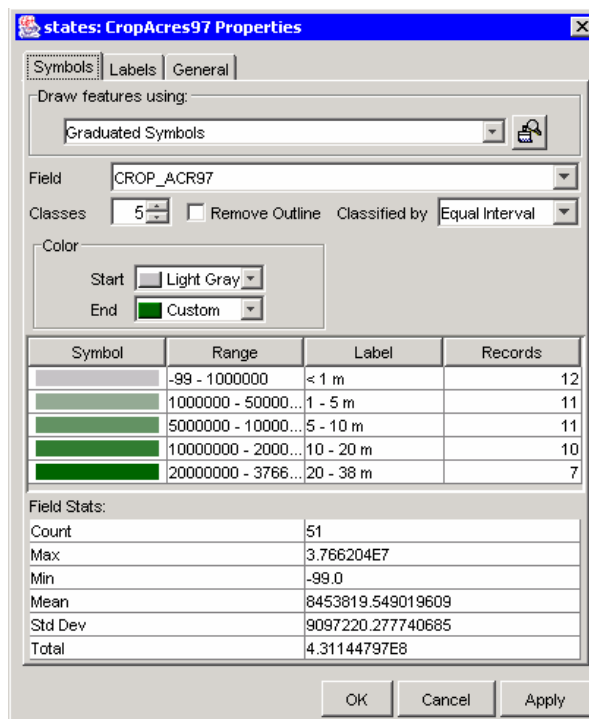


17. Using the query, we can't immediately tell which is the one county in Iowa with the highest amount of crop acreage. Close the "Query Builder" window. Back in the TOC, right-click on the layer "counties: CropAcres97". In the context-menu that appears, scroll down to highlight "Attribute Table" and click it. The attributes for all counties (Iowa plus all the others) appears, noting at the bottom that 99 counties are selected. Scroll to the far right, so the "Crop_Acr97" field is visible. Right-click on the field name, scroll to "Sort Descending", and click it to sort the counties from highest to lowest. It will only take a few seconds to sort the more than 3000 counties. Then, scroll down to find the first county highlighted in blue - the county in Iowa with the highest crop acreage. Click it one time in the table, then notice how many counties are selected in the table, and look back at the map to find the selected county. Close the "Attributes Table" window. Turn off the "counties: CropAcres97" layer and zoom back to see all 50 states.

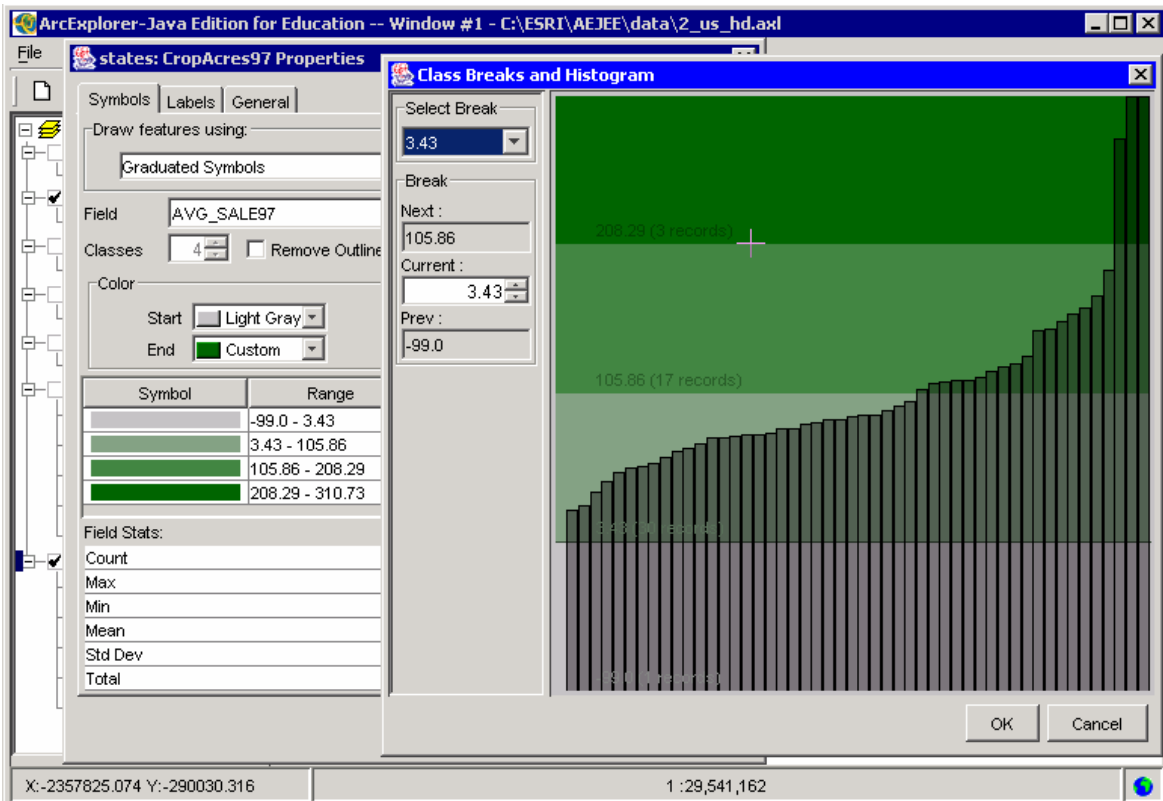


18. Set only the "states: CropAcres97" on. Now it's time to change what we're mapping here. Right-click on "states: CropAcres97" and scroll down to choose "Properties". Notice that all the elements of the current window are focused on classification and symbolization. This is because the "Symbols" tab at the top is clicked. If you click the "Labels" or "General" tab, you can change other aspects of the layer. Click again on "Symbols" to return to the classification and symbology area.

19. Looking from the top down, notice that the layer is currently using "graduated symbols" - symbols that change in size or color to indicate a change in amount of something. We want to stay with graduated symbols but want to change the field being mapped. Instead of "CROP_ACR97", click the "Field" item's pull-down menu and choose "AVG_SALE97" (value of total sales per farm, by thousands of dollars, in 1997). Look just below the Field pull-down handle and notice that the method of classification is by "Equal Interval". If you look below at the column called "Records", you'll see how many states (50 states plus DC) fall into each class. This doesn't show what we want, so we need to change the classification scheme.



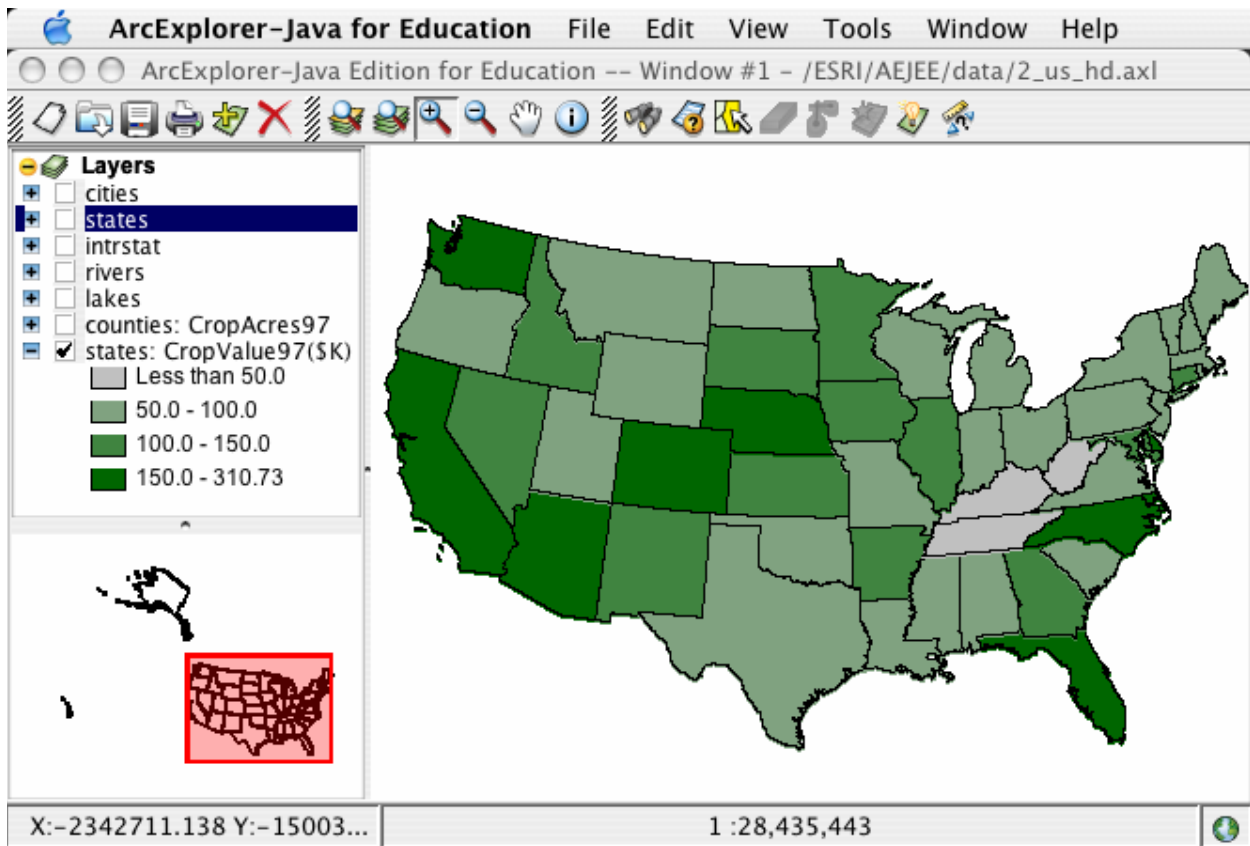
20. First, change the number of classes from 5 to 4, using the "Classes" pull-down menu, just below the "Field" menu. Notice that the number of records in each class has changed, since the divisions changed. But even this doesn't give the best picture. Instead of "Equal Interval" classification, let's use "Manual". Click the "Classified By" and select "Manual".
21. When you choose "Manual", a "Class Breaks and Histogram" window appears. The four colors show the range of values and the number of states within each value. The vertical bars represent the states. Move the mouse on top of the line separating color bands in the histogram, and notice that there is a point where the mouse arrow becomes a crosshair. By carefully clicking on the line separating color bands when the mouse arrow has become a crosshair, you can drag the "breakpoint" up or down to a new spot. As you drag, the break number will show the change. This method, however, can leave you with some breakpoints that are hard to use. Instead, let's use the number boxes to the left of the histogram window to type in the breaks.



22. Click in the "Select Break" window and choose "-99.0". This is the lowest value of the 51, and you cannot change it. Neither can you change the highest value, "310.73". You can only change the intermediate breakpoints - the numbers at which you want to see a color change. Click in the "Select Break" window and choose the number closest to "310.73"; this is the number for which we will define a new breakpoint. Click in the "Current" window, erase the numbers visible, and type in "150.0" and press the Return key on your keyboard. Notice that the breakpoint changes in the histogram. Click in the "Select Break" window again and choose the number closest to "-99.0". Click in

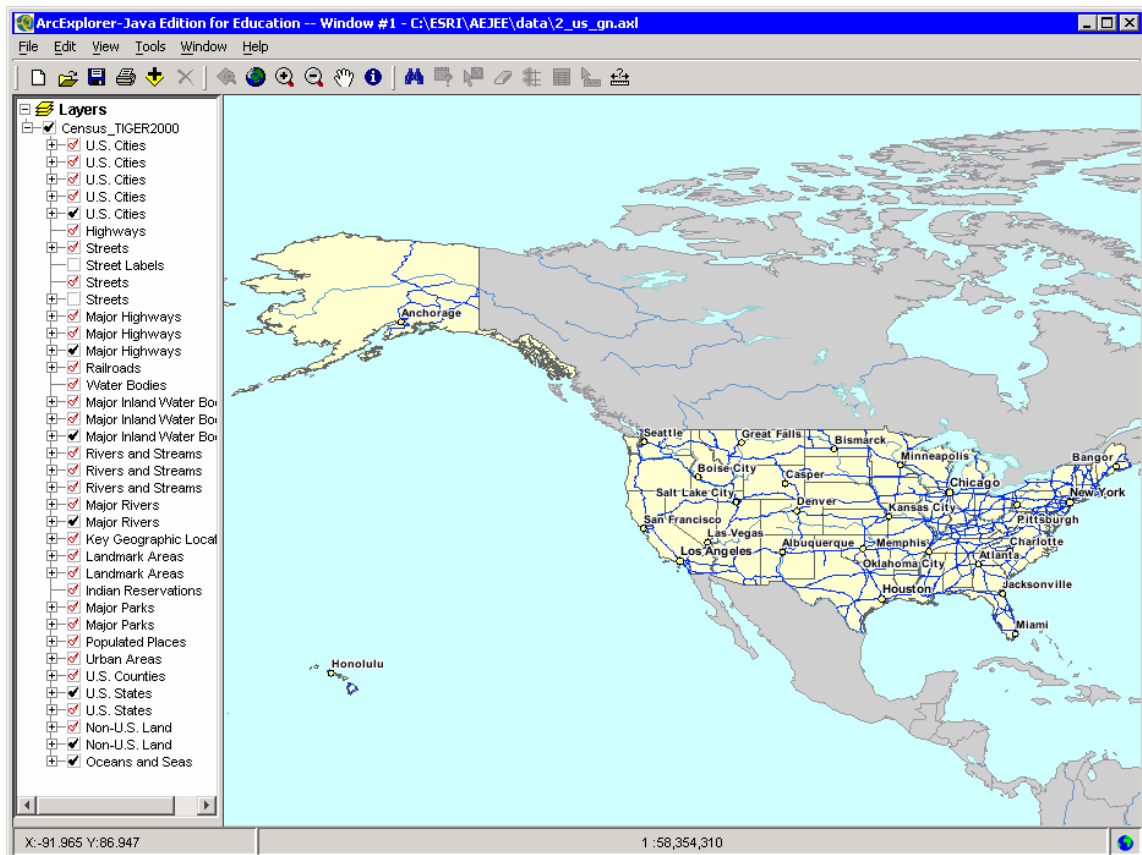
the "Current" window, erase the numbers visible, and type in "50.0" and hit Return. Notice the lowest category jumps. Last, click in the "Select Break" window again and choose the number between 50 and 150. Click in the "Current" window, erase the numbers visible, and type in "100.0" and hit Return. At the bottom of the Histogram window, click the "OK" button.

23. We're almost done with the map changes. Before we can apply the changes, we need to change the title of our layer. Click on the "General" tab at the top of the "states: CropAcres97 Properties" window. In the "Layer Name" box, change it to "states:CropValue97(\$K)". Then click "OK". Now, your map is different, showing the value produced per farm in thousands of dollars in 1997.
24. If you can't quite see the title of each layer and you want to widen the TOC, move the mouse onto the middle of the line separating the TOC from the map. Click-hold-drag the line to the right a little bit, then let go. The map will redraw and the TOC will show more info.
25. To finish up, we want to clean up the display. Click on the "-" icons to collapse the legends for all layers except "states:CropValues97(\$K)" and make sure they are all off. With lots of space in the TOC, turn on the overview map by clicking "VIEW/Overview Map". Put a layer in the overview map by right-clicking "states" and choosing "Use in Overview Map". The shaded area shows the region in the main map.



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

1. ArcExplorer Java Edition for Education (or "AEJEE") is able to work with data coming from local sources such as your LAN or hard drive and also from websites that serve geographic data through ArcIMS. Lesson 1 used only data installed with AEJEE on the hard drive. Lesson 2 will use data coming from the Geography Network. The difference in the source of the data is indicated by "hd" or "gn" letters in the project name.
2. Engage AEJEE and make sure you are connected live to the Internet. Navigate to the folder /ESRI/AEJEE/data and open the project "2_us_gn.axl".
3. The project opens with a set of data coming from the Geography Network (<http://www.geographynetwork.com>). At the top of the TOC, you'll see "Census_TIGER2000", and the box with the black check mark will pulse in a green color while data are loading. The data can be used for free much like data from your hard drive, with a few key exceptions. You must be connected to the Internet to use it, and you don't have as much opportunity to change the classification or symbolization, or do as much analytical work, but it often comes in as a pretty rich data set.



4. You'll see a series of layers, all of which have a check-mark by the name, but some have a dark black check and others have a pale red check. Looking closely, you might even decide that some layers were duplicates. If you could inspect each layer, you'd find that each one

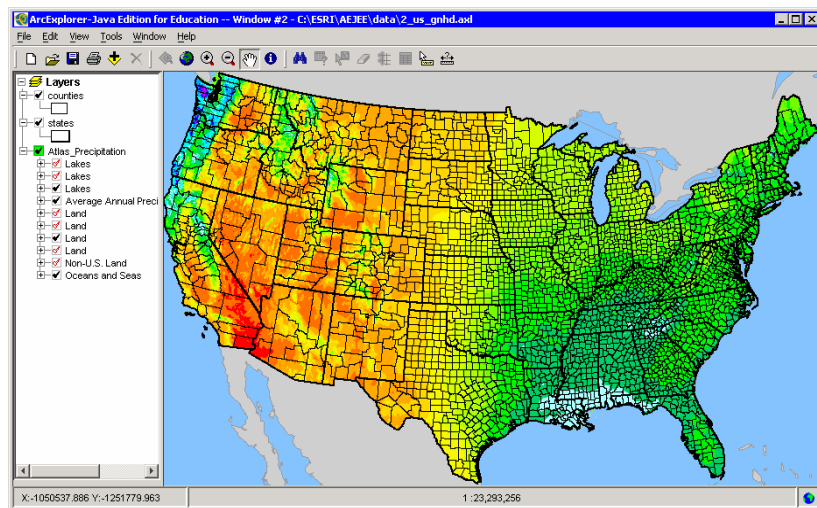
is in fact turned on, but each is set to display only when the map is zoomed to a certain scale. The reason for having multiple layers is to set it up so that different data are visible at different times. These are "scale-sensitive data layers."

5. You can see the scale sensitivity by zooming from 50 states to your multi-state region, then to your state, then inside the state, then down to your neighborhood. At different scales, different layers become visible and usable; this is controlled within the properties for each individual layer. Each time you zoom in or out, the software reaches across the internet to re-access the data. Zoom to your state so you can see the full state but set it to be as large as possible in your map. How many layers have black check marks?

6. Zoom in to your neighborhood and notice that features magically appear as you get closer. The scale of the map (such as 1:100,000) shows as a ratio below the map. When you are at a scale closer than 1:50,000 (such as 1:40,000), click in the TOC one time right on the name of the "Streets" layer with a black check mark, thus highlighting that layer. Click on the "Identify" tool, then, with the tip of the mouse arrow, click on a street. The software should reach back across the Internet, find information about the street, and in a few seconds present it to you in an "Identify Results" window. It may be hard to read everything, so make the window about an inch wider so you can see the full names in the "Field" column. Look down the list for "TGR.TGR_ROADS_FENAME", which will give the "feature name". All the other fields carry additional info about the particular road segment on which you clicked.

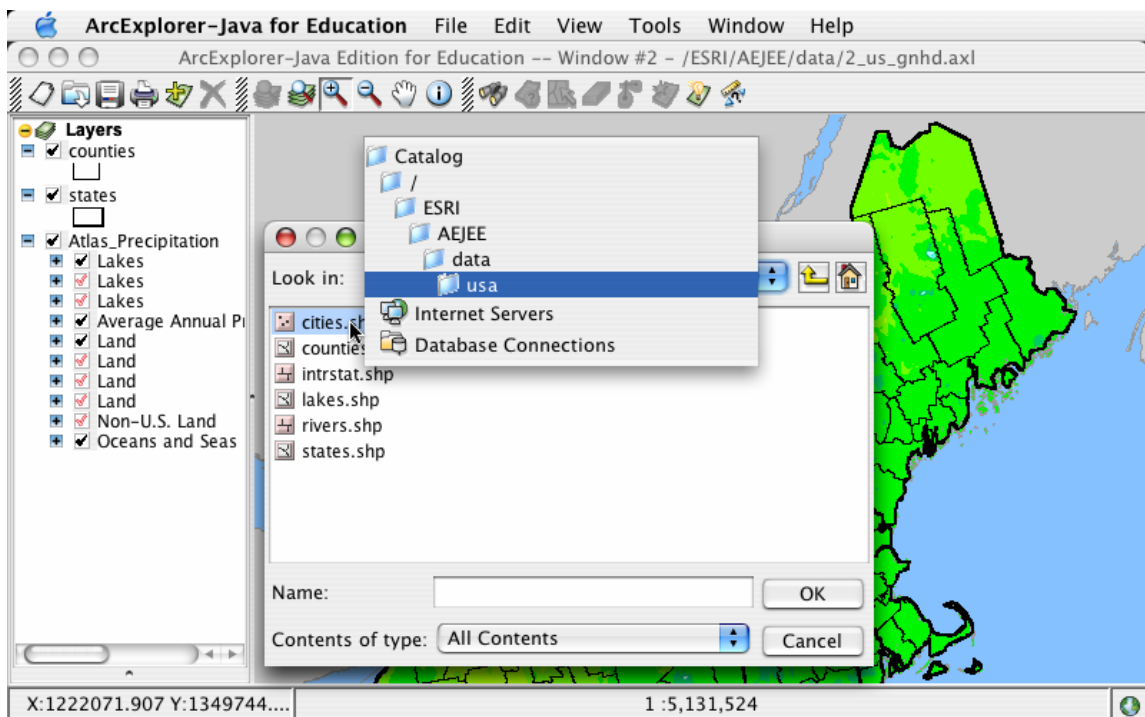
7. Try zooming in to a scale closer than 1:15,000 (such as 1:14,000). What happens this close that did not happen when zoomed farther out?

8. You can also integrate geographic data from the Internet with data from your own hard drive. Let's open a new AEJEE window and open a new project, by first going to the AEJEE menu bar, choosing the "WINDOW" menu item, and choosing "New Window". In your new AEJEE window, choose "FILE/Open", navigate into the /ESRI/AEJEE/data folder and select the project "2_us_gnhd.axl". This project will access data from both the hard drive and the Internet, at the same time. It's an elaborate project, so give it a few seconds to bring in the data from the Internet. Wait for the green pulsing in the "Atlas Precipitation" layer to stop. What you'll see when the map finishes loading is a display of average annual precipitation in inches. (This data only covers the 48 conterminous states.)



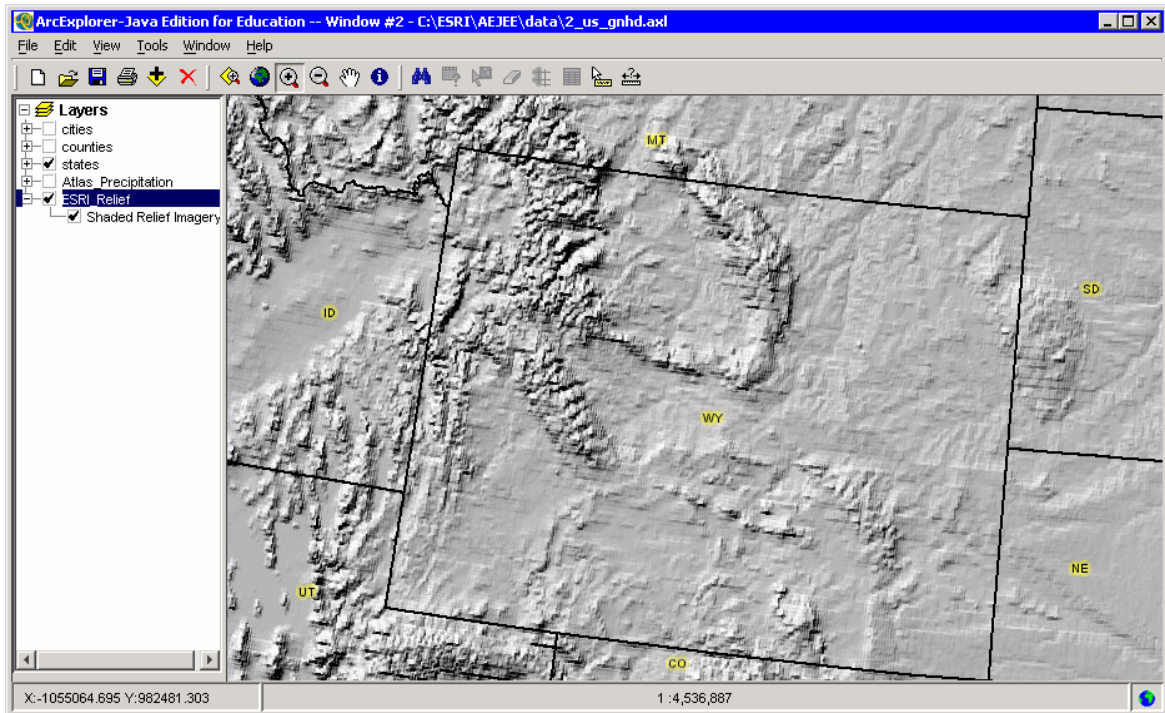
9. Remember that you can open (or close) the legend for layers of data by clicking the "+" (or "-") checkbox next to a layer in the TOC. Find the layer "Average Annual Precipitation" and click the "+" checkbox to open its legend. About how much water content (rain plus water from snow) falls in Maine during a year? How much falls in southern Louisiana at the mouth of the Mississippi? How much falls in the borderlands between southern California and southern Arizona? Zoom in to your state. What is the range of precipitation across your state, from the driest part to the wettest part?

10. It would be ideal if our precipitation map included US cities, as we saw in the project "2_us_hd.axl". The cities are available on your hard drive, and can be added into this project. On the AEJEE button bar, click the "Add Data" button. In the "Content Chooser" window, navigate to /ESRI/AEJEE/data/usa, and look for the layer "cities.shp". You'll see an icon with a box and some dots, telling you this is a geographic dataset in shapefile format named "cities", and they will appear on your map as a set of points. Click the name, and then "OK". A "cities" layer will be added to the top of your TOC, it will have a default symbol, and it will be turned on.



11. In order to get a good sense of the map, let's have the cities display name labels. You can set this in the properties of the layer. In the TOC, right-click on the name "cities" and choose "Properties". At the top of the "cities Properties" window, click the "Labels" tab. In the window for "Label features using", you will see a list of the fields in the table for cities. We could label the cities by any of these pieces of information, but "AREANAME" will be the most helpful one to start with. Choose "AREANAME". For now, leave the font, size, and color at the default settings (Arial, 10, Black), but click the "Effects" button and select "Glow". Click "OK" to close the "Effects" window and "OK"

of data options available from the Geography Network. Scroll to find "ESRI_Relief" and choose it, then click "OK." Inside, you'll find another icon labeled "ESRI_Relief". Choose this one and click "OK". A new layer called "ESRI_Relief" will be added to the bottom of your map. When it appears, you'll see a grey-shaded display, showing mountains, hills, and plains. Was your answer to the Yellowstone question correct? Turn the "Atlas_Precipitation" layer back on to see. (You can turn the layers off and on pretty quickly if you don't change the scale.)

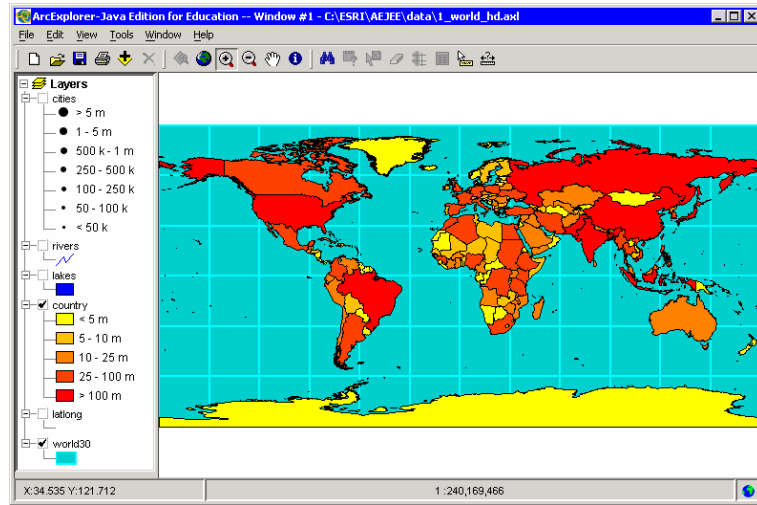


15. Are you ready to save this project? Let's save the project under a new name, but in the same place as the other projects. In the AEJEE menu bar, choose "FILE/SaveAs". Navigate to /ESRI/AEJEE/data and name this project "2_us_gnhd_plus.axl", then click "Save". Just like in your other software packages, you can come back later and re-open this project. It doesn't save the data with the project, it only saves a "recipe" for where to find each data set, how they are classified and symbolized, and the area to be displayed in the map.

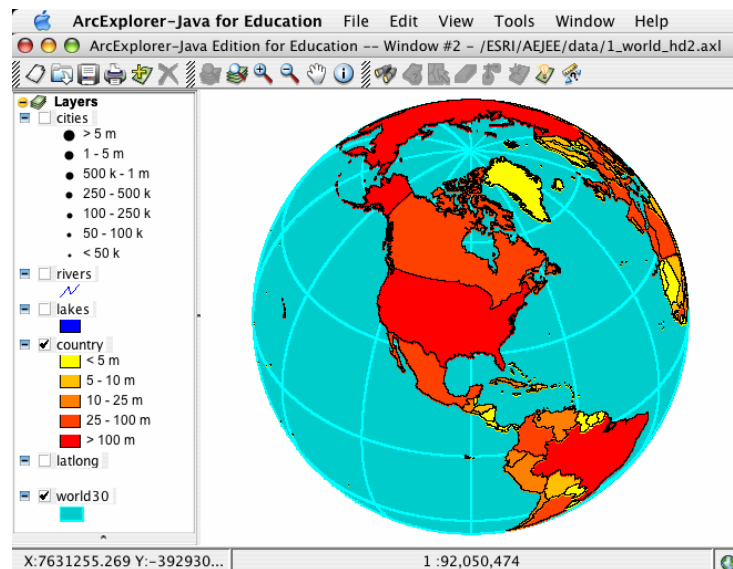
Getting Started with ArcExplorer™ Java™ Edition for Education – Lesson 3

1. ArcExplorer Java Edition for Education (or "AEJEE") is able to work with data coming from local sources such as your LAN or hard drive and also from websites that serve geographic data through ArcIMS. Lesson 1 used only data installed with AEJEE on the hard drive. Lesson 2 used data coming from both the hard drive and the Geography Network. Both lessons used data about the US in map windows that presented the data in a "projected" format. Lesson 3 will focus on map projections within AEJEE.

2. Engage AEJEE and navigate to the folder
/ESRI/AEJEE/data,
then open the project
"1_world_hd.axl".
AEJEE will display
the world in a
rectangular fashion,
centered on the Prime
Meridian (0 degrees
longitude), with all
the world visible at
once. Each of the
blue boxes in the
background,
representing ocean
regions 30 degrees on
a side, is the same
size.



3. Let's open a new window with a different display. In the AEJEE menu bar, choose "WINDOW/NewWindow". A new, empty display appears on top of your first window. Slide the new window just a little bit so that you can see there are two different AEJEE windows. In this second window, open the project "1_world_hd2.axl".



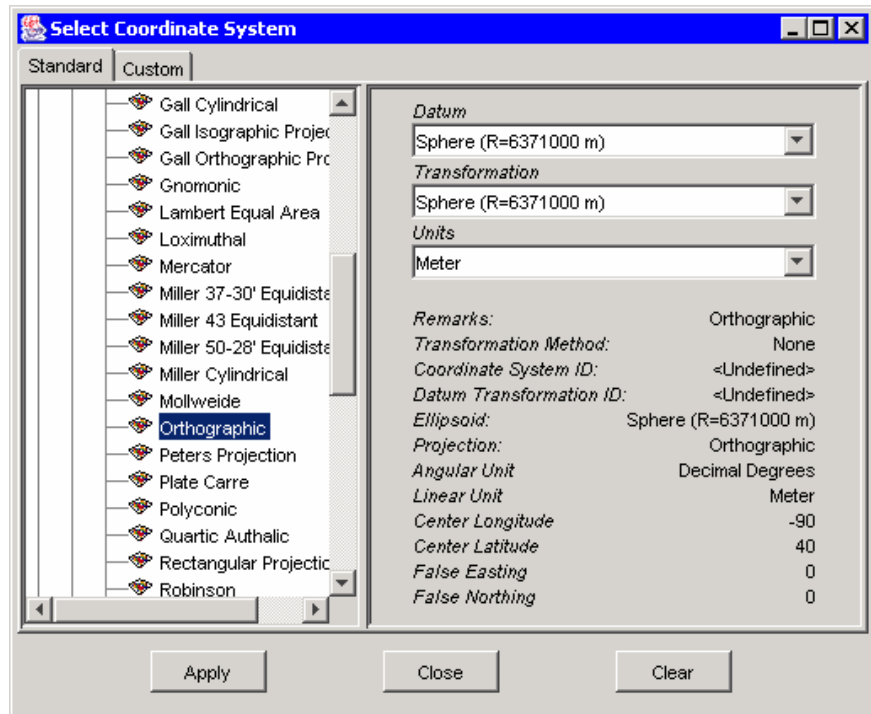
4. The two maps use exactly the same data, but different projections. The second window shows the world as a sphere, or rather a flat representation of a sphere. The data in the TOC are stored in a "decimal degree coordinate system" and the map space has been "projected" to look like what we know as a globe. Projections, coordinate systems, and datums are somewhat complicated, but they are

extremely important parts of GIS; they are like mathematical languages which allow people to work accurately with flat maps that represent a curved surface. In simple terms here, AEJEE is able to "spin" (or "twist" or "project") geographic data that is stored in one standard coordinate system: decimal degree. AEJEE can do this "on the fly", without needing data that has been physically created and stored in a different coordinate system.

5. Let's examine the projection of the second window. In the menu bar for the second map, choose "TOOLS/Projection". In the right side of the "Select Coordinate System" window, you can see that the current projection is "Orthographic" and the center longitude has been set at "-90" (that is, 90 degrees west of the Prime Meridian), with the center longitude set at 40 (i.e. 40 degrees north of the Equator). Close the "Select Coordinate System" window for the second map.

6. Let's use the first map ("1_world_hd") as our playground and try to match the spherical display of the second map ("1_world_hd2"). Bring the first AEJEE window forward. Choose "TOOLS/Projection" and note the current choice: "Geographic", which some folks call "Decimal Degree" or "Latitude/Longitude". We want to change this to match the display of the second map. In the left-hand column, click "World Projections" and then "World Projections (Sphere)".

Scroll down to choose "Orthographic". Immediately, a set of parameters appears on the right. Use the defaults, click "Apply", and then click "Close." Back in the button bar for our first map, click the "Zoom to Full Extent" button. The world map changes to match what is in our second window.



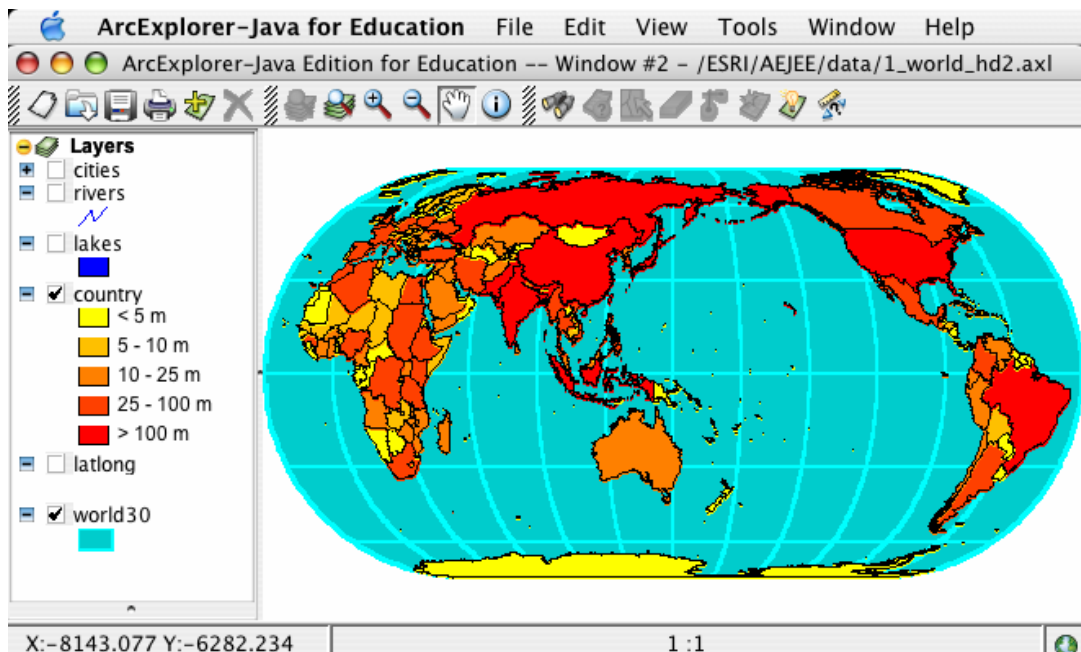
7. But suppose we're not happy with a map centered here at 90 west and 40 north. Suppose we'd rather see a map centered on Australia, perhaps 135 east and 25 south. Open "TOOLS/Projection" again and in the very top, click "Custom". Now you get to change all aspects of the map, as follows:

- a. Projection: Orthographic
- b. Datum: WGS84
- c. Angular Unit: Decimal Degrees
- d. Linear Unit: This means how you want to measure distances, so let's choose "Int.Mile"
- e. Center Longitude: 135.0
- f. Center Latitude: -25.0
- g. False Easting: 0.0
- h. False Northing: 0.0

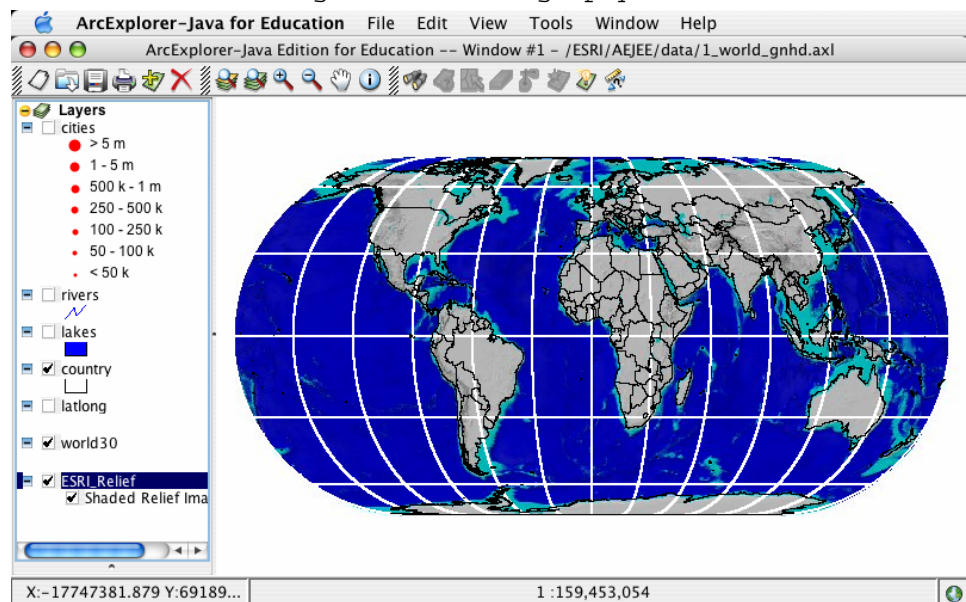
Then click "Apply" and "Close", and "Zoom to Full Extent"

8. Using this method, you can set AEJEE to display the world centered on any coordinate, including the poles.
9. You can use the Projection window to select a wide assortment of standard projections, or customize the display infinitely. Are you looking for a nice equal area map of the world, showing the world's land masses at their proper size? Choose "Standard", "World Projections", "World Projections (Sphere)", and "Eckert IV". Apply the changes and close the Projections window, then click the "Zoom to Full Extent" button to adjust the map.
10. What if you want to see the same "Eckert IV" projection but showing the Pacific Ocean as an unbroken body? Again, go into the Custom settings, as follows:
 - a. Projection: Eckert IV
 - b. Datum: WGS84
 - c. Angular Unit: Decimal Degrees
 - d. Linear Unit: "Int.Mile"
 - e. Center Longitude: 150.0
 - f. False Easting: 0.0
 - g. False Northing: 0.0

Then click "Apply" and "Close", and "Zoom to Full Extent"

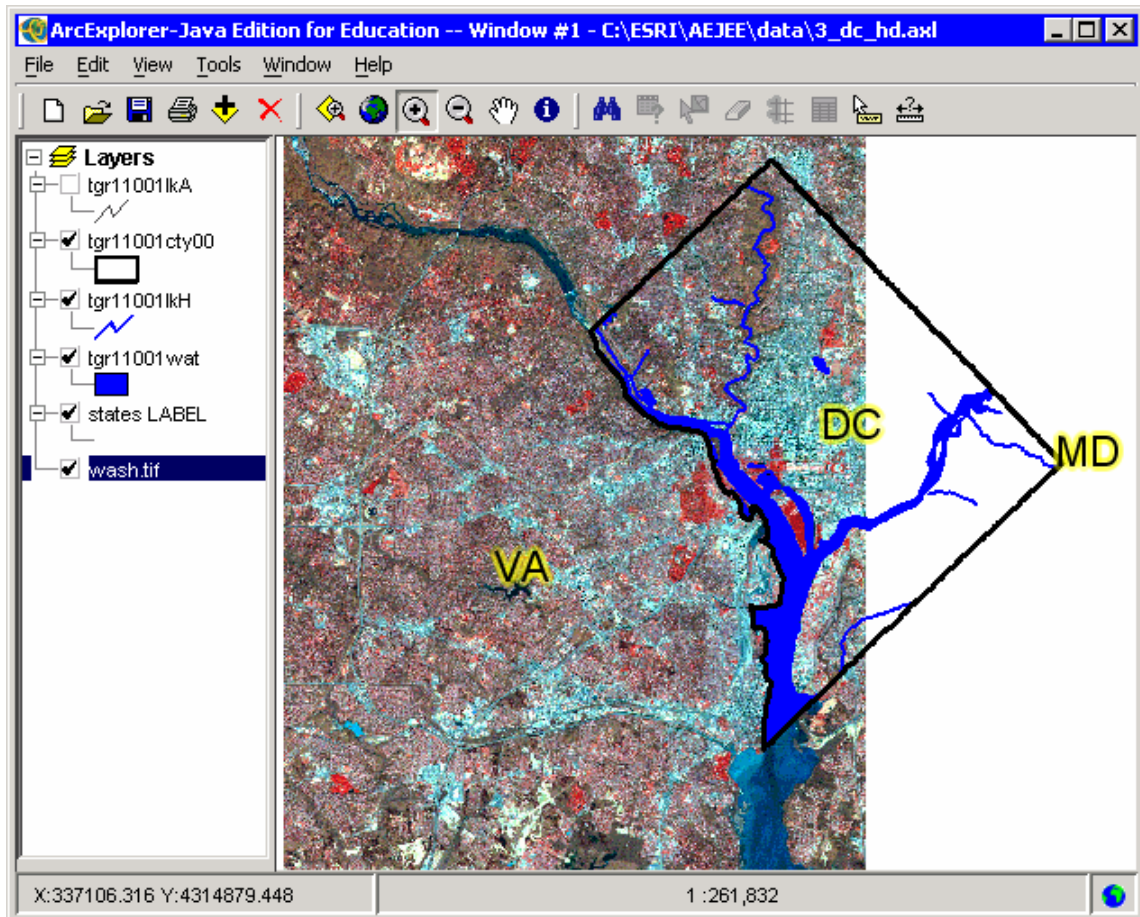


11. While we have a nice world map, let's try measuring some distances. Click on the "Measure" tool, then choose "Mile". The measure tool works by clicking at the starting point and holding and dragging to your finish point. Try first to measure from Maine in the northeast to southern California in the southwest. You'll see not one but three lines appear. These lines are "Total" (the straight line drawn on the map as projected), "Rhumb" (a line of constant angle from start to finish), and "Geodesic" (a line along a great circle route, the shortest distance between the two points).
12. It will be easier to see the differences in the lines with a more extreme example. First, clear the measurements by clicking the measure tool and choosing "Clear Measure Totals". Then, measure from Maine to the southern tip of India. Notice that, while the line you drew goes southwest, the rhumb line actually heads southeast, while the geodesic starts out northeast before heading south across India. Find a physical globe and try to match and compare the lines from AEJEE and the lines on your globe.
13. Also, let's try working with data from the Geography Network, to see how it handles projections. (Be sure you are connected live to the Internet for this step.) Create a new window ("Window/NewWindow") and choose to open the project "1_world_gn.axl". This opens up data from the Geography Network, showing a general data set in decimal degree. Try changing the projection for this one to a standard "Robinson" display. Does it work? It works here because much of the data on the Geography Network is stored in a decimal degree fashion, so it projects on the fly nicely. (However, orthographic - the "world from space" view -- does not work with data from the Geography Network.)
14. Last, let's look at a project which integrates data sources and is stored already projected on the fly by AEJEE.



Getting Started with ArcExplorer™ Java™ Edition for Education – Lesson 4

1. ArcExplorer Java Edition for Education (or "AEJEE") is able to work with data about specific geographic features coming from local sources such as your LAN or hard drive and also from websites that serve geographic data through ArcIMS. Lesson 1 used only data installed with AEJEE on the hard drive. Lesson 2 used data coming from both the hard drive and the Geography Network. Lesson 3 focused on map projections within AEJEE. Lesson 4 will add to the work on projections by integrating image data with shapefiles and adding point data from XY tables.
2. Engage AEJEE and navigate to the folder /ESRI/AEJEE/data, then open the project "3_dc_hd.axl". AEJEE will display the region around Washington DC using a satellite image. The image is a "false color" display, in which healthy vegetation shows up as red and human structures such as buildings or roads appear bluish. The image is stored in a format known as "Universal Transverse Mercator", using a datum of "North America 1983", and the specific zone is "18". These elements can be abbreviated as "UTM 18, NAD83".



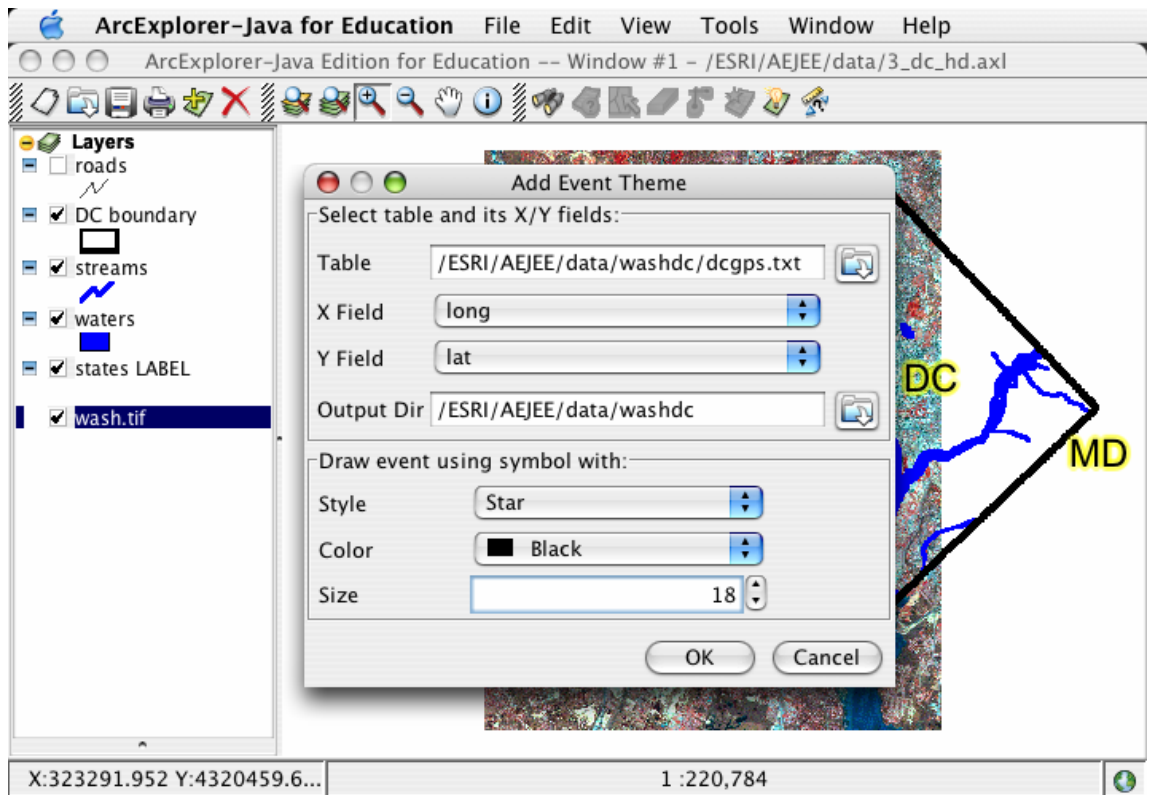
3. When you wander your mouse around the display, you'll see in the very bottom of the AEJEE window a pair of very large numbers. These numbers show the location in meters away from the standard beginning point of UTM 18 NAD83. (The size of the numbers is one indication that this is

not displayed in "decimal degree" space, since decimal degree numbers only go from a high of 180 to a low of -180.)

4. Draped on top of the image are some shapefiles that came from the ESRI TIGER Data website (www.esri.com/tiger), which is a place where GIS users can download data about any county in the U.S. The data comes 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 specific 5-digit code, and Washington DC is known as "11001". Let's start by giving those layers more understandable names.
5. Find the layer "tgr11001wat", which has a blue box symbol. Right-click on the name "tgr11001wat", choose "Rename", and change the name to "waters", then hit the "Return" or "Enter" key to complete the change. In the same manner, change the following layer names:
 - a. "tgr11001lkh" to "streams"
 - b. "tgr11001cty00" to "DC boundary"
 - c. "tgr11001lka" to "roads"
6. Save your project in the same space as the other projects, but give it a new name, like "3_dc_hd2.axl".
7. Back in AEJEE, zoom in to the bluish area that is the heart of Washington DC, just north of the junction of two main rivers - the Potomac and the Anacostia. (Can you remember how to identify the rivers?) Zoom to a scale of about 1:30,000.
8. The map is fascinating, but we would like 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). Create a document that looks exactly like this:

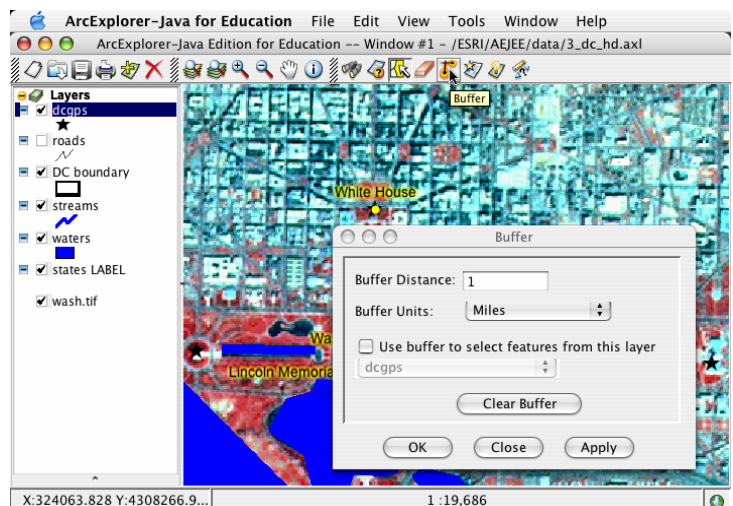
```
site,lat,long,name
1,38.889,-77.035,Washington Monument
2,38.889,-77.050,Lincoln Memorial
3,38.898,-77.036,White House
4,38.889,-77.009,Capitol
```

Make sure you have only these five lines, and no extra spaces or characters that are not shown above. (Notice the latitudes are identical except for the White House, and the longitudes are negative.) Save this as a simple text file called "d cgps.txt" in the folder /ESRI/AEJEE/data/washdc. Exit your text editor and return to AEJEE.
9. We want to see on the map the GPS points that we just created with the coordinates above. AEJEE cannot display simple text files, but it can read such text files and create a regular shapefile. Choose "VIEW/AddEventTheme". Navigate to where you stored the text file. Highlight "d cgps.txt" and click "Open". AEJEE will tell you to select the X and Y fields; the "X" should be "longitude" or "long", and the "Y" should be "latitude" or "lat". AEJEE is going to create a shapefile in the "storage directory", which should be /ESRI/AEJEE/data/washdc. You can also pre-select what symbol you want AEJEE to use in displaying these points on your map. Try a star colored black and sized 18 points. Click OK.

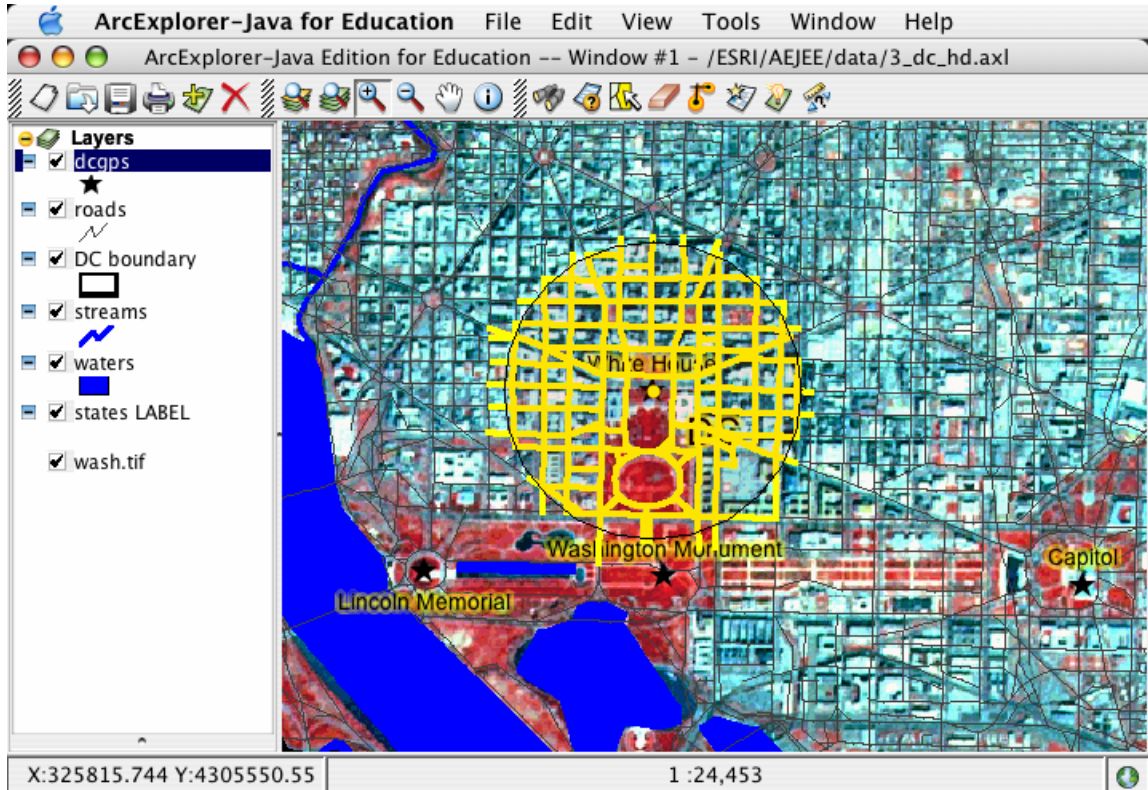


AEJEE will create three new files in your "washdc" folder called "dcgps.shp", "dcgps.dbf", and "dcgps.shx"; together, these files constitute a shapefile called "dcgps" - the one now added to your map display! Because the map window is already projected, and the other feature data (such as roads and streams) is in decimal degree, the GPS data can integrate well with these layers. Use the layer properties for "dcgps" to set the label as "Name"; it may also help to set the label placement at the "12 o'clock" position.

10. Let's select the point that is the White House. Click one time on the name of the "dcgps" layer, to highlight the layer. Click on the "Select Features" tool and choose "Rectangle". Click and drag a box encompassing the star symbol for the White House. A new dot appears, yellow, indicating it is selected. Now, click on the "Buffer" tool. Choose as a distance 1 mile, and click "OK". Around the White House will appear a shaded circle with a radius of 1 mile. Which of the three other features is not within a mile of the White House?



11. 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 ask AEJEE to select features from the layer "Roads", then click "OK". Turn on the roads. The yellow road segments are all within a half-mile of the White House.



Getting Started with ArcExplorer™ Java™ Edition for Education – Lesson 5

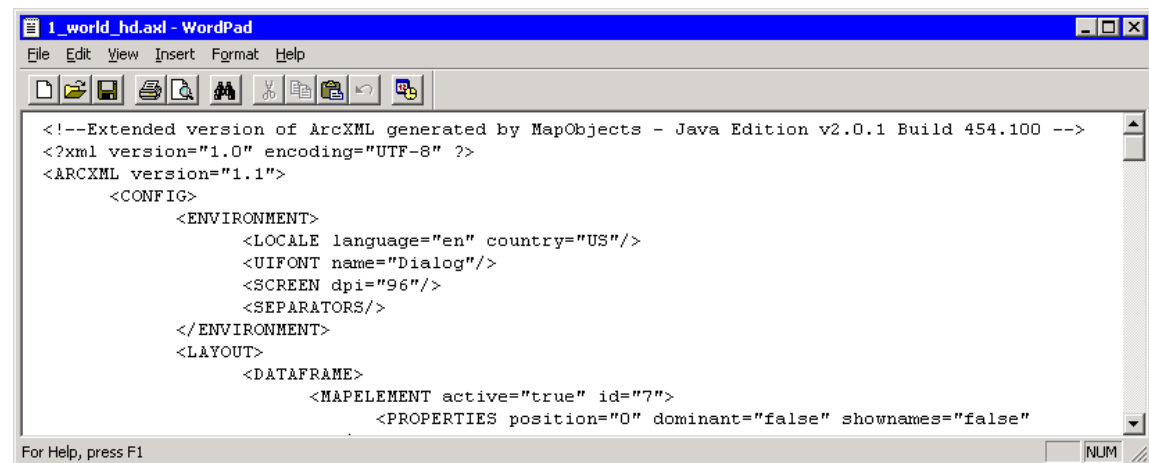
1. ArcExplorer Java Edition for Education (or "AEJEE") is able to work nicely with data from local sources and the Internet. Lessons 1-4 provided a basic introduction to these capacities. Lesson 5 focuses on sharing projects between computers and working with georegistration data for images.

Transportable Projects and AEJEE

2. 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 also to share them with others. But the project file (such as "3_dc_hd.axl") is simply an ASCII textfile recipe file, 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. Let's look at an example.
3. Open up either WordPad for Windows or TextEdit for Macintosh. Choose FILE/OPEN and navigate to the folder /ESRI/AEJEE/data, and select the file "1_world_hd.axl".



```
<!--Extended version of ArcXML generated by MapObjects - Java Edition v2.0.1 Build 454.100 -->
<?xml version="1.0" encoding="UTF-8" ?>
<ARCXML version="1.1">
  <CONFIG>
    <ENVIRONMENT>
      <LOCALE language="en" country="US"/>
      <UIFONT name="Dialog"/>
      <SCREEN dpi="96"/>
      <SEPARATORS/>
    </ENVIRONMENT>
    <LAYOUT>
      <DATAFRAME>
        <MAPELEMENT active="true" id="7">
          <PROPERTIES position="0" dominant="false" shownames="false">
```



```
<!--Extended version of ArcXML generated by MapObjects - Java Edition v2.0.1 Build 454.100 -->
<?xml version="1.0" encoding="UTF-8" ?>
<ARCXML version="1.1">
  <CONFIG>
    <ENVIRONMENT>
      <LOCALE language="en" country="US"/>
      <UIFONT name="Dialog"/>
      <SCREEN dpi="96"/>
      <SEPARATORS/>
    </ENVIRONMENT>
    <LAYOUT>
      <DATAFRAME>
        <MAPELEMENT active="true" id="7">
          <PROPERTIES position="0" dominant="false" shownames="false">
```

4. 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. Look after the big long paragraphs for the section from "<FOLDERS>" to "</FOLDERS>":

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

This shows that all the data in this project are stored in one folder, and shows the path starting from the root level of the hard drive. If you want to change the location of the folder, all you need to do is go in to the project and change this line, then re-save the project file.

5. When you save an AEJEE project on a Macintosh, this is how the data get stored. Both Macintosh and Windows versions of AEJEE can read this project just fine. However, if you re-save the above project on a Windows computer, it stores the data like this:

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

It may not look very different, but close inspection will reveal two key differences in the "value" portion. First, the hard drive has a drive letter and colon. Second, the PC saves with backslashes instead of forward slashes. These changes are enough to prevent Macintosh computers from reading the PC projects. But you can make them readable by both versions. Just open up the project, remove the "C:" references, and change the "\" characters to "/", then re-save.

GEO-REGISTERED IMAGES and AEJEE

6. The project "3_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 little 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 resides).
7. As you saw in the earlier lessons, AEJEE can project decimal degree features (points, lines, polygons) to match up with images. But it needs to have these two files in place in order to reference the image accurately. 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.

8. ArcView 3 and 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.
9. ArcView 3 does not pay significant attention to PRJ files for images. 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. Once again, you can use a text editor to change the data presented by ArcView 9 so that it is more useful for AEJEE.
 - a. In AV9, engage the "Define Projection" toolbox. Input the image, choose the coordinate system, and click "OK". The toolbox will create a ".XML" file. Exit AV9.
 - b. 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:

```

<?xml version="1.0"?>
<!--!DOCTYPE metadata SYSTEM
"http://www.esri.com/metadata/esriprof80.dtd"-->
<metadata
xml:lang="en"><Esri><MetaID>{44432D5F-4526-4554-8397-78F74DFF6376}</MetaID>
<CreaDate>20041004</CreaDate><CreaTime>15104300</CreaTime><SyncOnce>TRUE</SyncOnce>
<DataProperties><lineage><Process Name="DefineProjection_1"
ToolSource="C:\ESRI\arcgis\ArcToolbox\Toolboxes\Data Management
Tools.tbx\DefineProjection" Date="20041004"
Time="151043">DefineProjection C:\ESRI\AEJEE\data\washdc\test\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['Scale_Factor',0.9996],PARAMETER['Latitude_Of_Origin',0.0],
UNIT['Meter',1.0]]
C:\ESRI\AEJEE\data\washdc\test\wash.tif</Process></lineage></DataProperties></Esri></metadata>

```

- c. Omit all the text leading up to "PROJCS" and following the double bracket after "UNIT"

```

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["Scale_Factor",0.9996],PARAMETER["Latitude_Of_Origin",0.0],UNIT["Meter",1.0]]

```

- d. 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!