Virginia View Curriculum

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<td>Summary</td>
<td>This activity examines the issue the availability and feasibility of mining coal in Montgomery County, Virginia. Students are asked to gather evidence for and against such a prospect by using maps and GIS skills. They will be asked to analyze the costs verses the benefits of such an endeavor and come to some conclusion regarding the issue of coal mining in Montgomery County, Virginia.</td>
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<td>Classroom Materials</td>
<td>This lesson is best completed with computers with ArcGIS and internet access. Under “Teacher Preparation”, variations for using the exercise with only internet access or without computers are also available.</td>
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<td>Submitted by</td>
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Teacher Guide

Applicable Virginia SOLs:

ES.2 The student will demonstrate scientific reasoning and logic

ES.3 The student will investigate and understand how to read and interpret maps, globes, models, charts, and imagery

ES.7 The student will investigate and understand the differences between renewable and nonrenewable resources.

Teacher Preparation:

- Review the background material on Coal Fields with students.
- If using ArcGIS, make sure students are familiar with Layout creation tools in ArcGIS (not for first-time users).
- If you do not have access to ArcGIS, you could complete the lesson using one of the following:
  - Internet access but no ArcGIS: Have students go to [www.virginiaview.net](http://www.virginiaview.net) and click on the Digital Atlas link. Scroll down to “Digital Atlas Layers” and click on “Coal Fields in and Around Virginia” (they are listed alphabetically). Under “Access Options” click on the link for the Interactive Web mapper. This should work for Questions 1-6. For the Group Project, have students do additional research using Google Earth or other online mapping program.
  - No computer access: Before class, print out the map located at [http://gep.frec.vt.edu/Digital_Atlas_PDFs/coalfields.pdf](http://gep.frec.vt.edu/Digital_Atlas_PDFs/coalfields.pdf) and locate Montgomery County on the map. This should work for questions 1-6. For the group project, have students do research at home using Google Earth or other online mapping program, or supply students with a Montgomery County road map or (best option) a USGS topographic quad of an area in Montgomery County.
- Print the Student Worksheet.
- A key is attached.

Background Information:

As the supply of fossil fuels diminish, and demands for energy increase, the question as to whether we should sacrifice our natural environment to procure more fossil fuel becomes a dominant concern in today's society.

Recently our Congress has debated such questions such as; "Should we go after the oil in Alaska's Arctic National Wildlife Refuge?, "Should more offshore oil rigs be built off the east
coast of Virginia and North Carolina?" "Should we build more nuclear power plants?" No one wants to destroy our land in pursuit of natural resources, however, how can we keep up the supply needed to provide the energy resources for the standard of living we have grown accustomed to in the United States? These are important questions that both the citizens and government of the United States are greatly concerned about.
Procedure: (For Teacher and Students)

1. Make sure your CPS are loaded with ArcEditor or ArcMap.
2. Open up ArcMap with an empty map.
3. Click on (+) or go under File; add data
4. In the pop up window "Look in", click on the drop down arrow/menu and choose "GIS Servers" * it may be down at the bottom of the list, so keep looking, then Click Add
   *If using ArcGIS 10, in catalog click on drop down menu to "GIS Servers". In window in catalog expand folder GIS Servers, double click Add ArcGIS Server. On the first window of the wizard, select “Use GIS Services.” Follow the directions in the wizard (see steps 7-9 below)
5. In the next window, select: "Add ArcGIS Server", Click add, a new pop up window "Add ArcGIS Server" appears.
6. Select "use GIS services", click next
7. A new pop up window "General" appears
   Select "internet" and type or paste URL in window: http://arc.gis.vt.edu/arcgis/services
8. Leave Authentication (optional) info blank, click "finish"
9. You will see the name arcgis on arc.gis.vt.edu as a listing/choice in the "Add Data" pop up window
10. Close the "General" window
11. In the "Add Data window, click on arcgis on arc.gis.vt.edu and make sure in the name field it says "arcgis on arc.gis.vt.edu", and the Show of type says "Datasets and layers (.lyr). In the new "Add Data window", click/select the folder "VA View", then ADD
13. Click on the layer name so it is highlighted : "Coal.Fields" and then right click and ZOOM TO LAYER. You may have to keep zooming until you see the state of Virginia full screen on your map. Use the (+) magnifier, click and drag a box around the state of Virginia. Wait for the map to reload.
14. Expand all the data layers (click on the + box next to each name). You should get the following:
16. Be sure to name (no spaces between names, use _, if you need to space out words) and save your map frequently on your C drive in a designated folder. Under File-Click on Map Document Properties- Under the General Tab, make sure that the box near "Pathnames" is checked to "Store Relative pathnames to data sources" is selected.

17. Zoom into the state of Virginia so it fills your map page! (hint: use the (+) magnifier and click and drag a box around the state of Virginia! You might need to do this more than once. Remember if the globe/world is spinning the program is redrawing the map. PLEASE be patient and let it redraw before you zoom in again! Also, you can use the pan tool (hand) to move the screen around.
Student Worksheet

Coal Resources in Virginia

Name __________________________________ Partner's Name ______________________

1. What areas of Virginia have coal? (Ex: Western Virginia, Coastal Region, Northern VA, etc)
_________________________________________________________________________

2. Make sure you have expanded the menu in "Coal_Fields" so you can see the various colors and types and qualities of coal resources. (Ex: Anthracite[best quality coal], potentially minable is pinkish purple and Bituminous-Medium and High Volatile is green) What do you notice about the distribution of these resources in Virginia?
_________________________________________________________________________

3. Use the zoom (+ magnifier) button to zoom into the pink area where the Anthracite-potentially minable coal resources are found in Virginia.

4. Select the Identify tool (i). Click on an area. In the dialog box, Use the drop-down menu next to “Identify From:” and choose the “Counties” sub-layer. Now you can click on a county and identify it using this tool. What counties in Virginia the best possible coal resources according to the map? ______________________________

5. Zoom into Montgomery County, Virginia. This is the location of Virginia Tech in the town of Blacksburg. In ArcMap go under File; "Add Data from ArcGis online". Add Topo Maps to your map. In ArcGIS 10, Go to File, Add Data, Add Basemap, add Topo Maps Click and drag Topo Maps to the top of all the other layers in the list. (hint: ArcGIS 10-make sure you are in the "List by Drawing Order" menu in the table of contents or it won't let you move the layers!) Right click " Topo Maps" and click on properties. Click on the display tab and set the transparency to 50%.

6. Where do you notice that the coal deposits are located in Montgomery County?
_________________________________________________________________________ What roads or other man-made structures are located near these
7. Now we are going to add another layer called "World Imagery" from the ESRI site. In ArcMap go under File; "**Add Data from ArcGis online**". Add Imagery to your map. In ArcGIS 10, Go to File, Add Data, Add Basemap, add "Imagery". You will get a warning message about coordinate systems, but just click “Close.” It should be at the bottom of your table of contents list (move it there if not) and you may not see it yet on the map.

8. Right click on the layer "**Coal_Fields**" and select properties. Look under the Advanced tab in ArcGIS 10. Change the Layer transparency to 50%. You should now be able to see the coal deposits as a thin layer on top of the image!

**Group Activity**

You will now be divided into two teams by your teacher.

Team 1 : Coal Company= pro-mining

Team 2: Environmentalists =against coal mining

**Objective:** Using the maps provided and ArcMap tools produce a map showing the logic of your position. Your maps should represent the "EVIDENCE" to support your argument. Don't forget to include: Map Title, North Arrow, Legend with appropriate symbols, Scale bar, Group Name (Ex: AHS Coal Mining Company, or AHS Environmental Consultants Inc.)

You will be presenting your map (argument) to the class and will be graded on how well your map illustrates your points.

**Conclusion:** (after viewing presentations)

1. What are the arguments for coal mining in Montgomery County, VA?
2. What are the arguments against coal mining in Montgomery County, VA?
Student Worksheet (Key)

Coal Resources in Virginia

Name _____________________________  Partner's Name _____________________

1. What areas of Virginia have coal? (Ex: Western Virginia, Coastal Region, Northern VA, etc)

Southwestern Virginia (Anthracite[best quality] ) and Bituminous coal in some counties in central VA, north western Virginia

2. Make sure you have expanded the menu in "Coal_Fields" so you can see the various colors and types and qualities of coal resources. (Ex: Anthracite[best quality coal], potentially minable is pinkish purple and Bituminous-Medium and High Volatile is green ) What do you notice about the distribution of these resources in Virginia? They are not evenly located throughout the state. The southwestern part of the state has the best coal resources.

4. What counties in Virginia the best possible coal resources according to the map ? Botetourt County, Roanoke County, Montgomery County, Pulaski County, Wythe County

6. Where do you notice that the coal deposits are located in Montgomery County? along the valley in front of Brush Mountain and Price Mountain. What roads or other man-made structures are located near these deposits? Rt 114 on Price Mountain, Rt 314, Rt 460, Virginia Tech, Virginia Tech Airport, other small roads in front of Brush Mountain

7. Now we are going to add another layer called "World Imagery" from the ESRI site. In ArcMap go under File; "Add Data from ArcGis online". Add Imagery to your map. In ArcGIS 10, Go to File, Add Data, Add Basemap, add "Imagery". It should be at the bottom of your table of contents list (move it there if you need to) and you may not see it yet on the map.

8. Turn OFF the Topo Map Layer. (hint: uncheck the box next to its name!) Right click on the layer "Coal_Fields" and select properties. Change the transparency to 50%. You should now be able to see the coal deposits as a thin layer on top of the image!

Group Activity
You will now be divided into two teams by your teacher.

Team 1: Coal Company = pro-mining

Team 2: Environmentalists = against coal mining

**Objective:** Using the maps provided and ArcMap tools produce a map showing logic of your position. Your maps should represent the "EVIDENCE" to support your argument. Don’t forget to include: Map Title, North Arrow, Legend with appropriate symbols, Scale bar, Group Name (Ex: AHS Coal Mining Company, or AHS Environmental Consultants Inc.)

You will be presenting your map (argument) to the class and will be graded on how well your map illustrates your points! **GOOD LUCK!**

**Notes to teacher:**

- Have students "brain-storm" first about a possible plan of action before they use ArcMap to make their maps
- Have them make a list of their argument(s) and what evidence would be necessary to support them
- ***Let the students explore with the various tools in ArcMap and have them learn to use the "help menu" to learn how to use various tools!***

**Pro-Mining**

- Students that are "pro-mining" might want to use the distance tool and show how much area in Montgomery County there is that has the possibility of high quality coal. They could research the current cost of coal and show that a profit could be made from mining coal in Montgomery County. They could research how many jobs a coal mine would provide and use that as an argument for their position.

**Anti-mining**
• Students that are "anti-mining" might want to use the distance tool to determine how many houses and structures already lay on top of the coal deposits. This would greatly reduce the area of deposits available for mining! They also might want to look at the slope (and measure it) and the water resources (streams, ponds, etc) that would be affected by possible pollution from the mine.

These are just a few suggestions, I'm sure your students can come up with others as well.
Appendix: Images of Maps

Map 1 = Pro-Mining (using topo map base map)

Anthracite Coal Deposits in Montgomery County, VA

September 1, 2011

AHS Coal Mining Company

Circumference of Montgomery Co = approx. 160 miles
Circumference of Coal Deposits = approx 63 miles
Percentage of Montgomery County Coal Deposits = approx 39%
Map 2: Pro-Mining (Coal Field layer on top of Imagery Layer)

Anthracite Coal Deposits in Montgomery County, VA

September 1, 2011

AHS Coal Mining Company

Circumference of Montgomery Co = approx. 160 miles
Circumference of Coal Deposits = approx 63 miles
Percentage of Montgomery County Coal Deposits = approx 39%
Map 3: Con-Mining (Coal Field 60% transparent over Image Layer)- Multiple Data Frames

Anthracite Coal Deposits in Montgomery County, VA

Price Mountain Anthracite Deposit

Base of Brush Mountain Anthracite Deposit

90% of Land Developed Already

80% of Land Developed Already

AHS Environmental Consulting Inc.
Resources


A map-based resource designed for Virginia teachers. The Digital Atlas contains many different maps pertinent to Virginia in several accessible formats.


A Federal source of national-scale maps and geographic data of many different themes, including base maps.