Mine Over Matter

Understanding the Past to Shape the Future of Prince William Forest Park

Student Booklet

Bridging the Watershed

An outreach program of the Alice Ferguson Foundation in partnership with the National Park Service and area schools

Welcome to Bridging the Watershed, *a partnership among public schools, national parks, the Alice Ferguson Foundation and other nonprofit organizations. Your participation in this program will help you understand one of the issues that affects the ecological balance in the Potomac River basin.*

You will engage in some activities in your classroom and others in a nearby national park. A national park is land protected by the federal government. It is chosen for its scenic, recreational, scientific, or historical value. In the park, a ranger will guide your learning about how personal choices affect water quality, habitat, and other factors that affect the natural balance.

Learning to care for national parks is one step toward resolving worldwide environmental concerns. Taking responsibility for the environment by acting on what you learn gives you the power of stewardship.

You can find out more about the program on the Bridging the Watershed *web site at www.fergusonfoundation.org. The web site contains interactive activities that will help you better understand the watershed in which you live. Other good resources that you may want to explore are the National Park Service web site at www.nps.gov and the Alice Ferguson Foundation web site at www.fergusonfoundation.org.*

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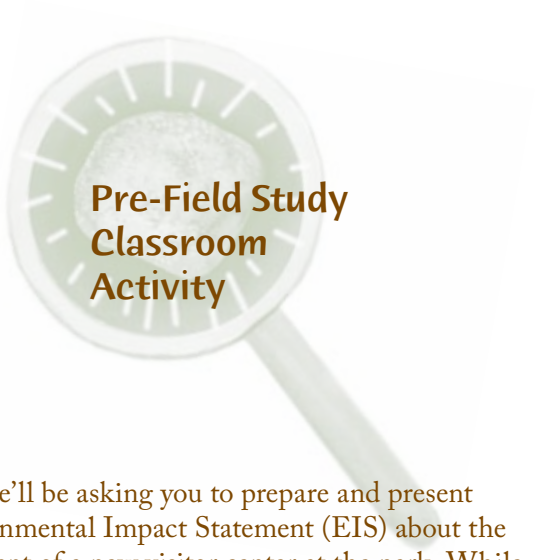


Pre-Field Study Classroom Activity

We don't usually think of science and storytelling as having anything in common. So *Mine Over Matter* might come as some surprise.

Over the next few weeks, you'll be learning about the history of Prince William Forest Park's Cabin Branch Mine. It's an amazing story that involves racial integration, spies-in-training, the recovery efforts following the Great Depression and historic environmental legislation.

Oh, and it involves you.

While all these little historical plotlines are mentioned in the first activity, what we want you to appreciate, in *Mine Over Matter*, is the impact that the closing of the Cabin Branch Pyrite Mine in 1920 continues to have today. That particular time in the park's history gives us a chance to explore the relationship between minerals and human wealth; it allows us to see how freshwater resources are influenced by geologic processes and human activity; and it gives us a chance to see how decisions made nearly 100 years ago continue to impact our quality of life today.

Of course, in order to understand land use issues, we'll learn a bit about reading different kinds of maps and will visit the mine site with a park ranger to do some soil and water tests.

Finally, we'll be asking you to prepare and present an Environmental Impact Statement (EIS) about the development of a new visitor center at the park. While a new visitor center isn't in the works, the rigorous EIS process is one that national parks go through whenever they create new permanent structures within their boundaries.

As we said earlier, you'll be collecting and analyzing soil and water samples from Prince William Forest Park. Your test results won't just be useful for your classroom presentations. The results will be provided to the biologists at Prince William Forest Park to assist them in monitoring the ongoing reclamation efforts along Quantico Creek.

All That Glitters:
Mining the Story of Prince William Forest Park ... featuring Thaxton

Pre-Field Study Classroom Activity

Goal:
To understand the cultural history and geology of Prince William Forest Park

Background Information:

Depending on how it's written, the story of Prince William Forest Park could be about fair pay for a day's work or a business owner's right to fire everyone, lock the doors and walk away. It could be about racial integration in the workplace and segregation at quitting time. It could even be about soil and water ecology or recreation and tourism. It could focus on government regulations or using natural resources for building wealth.

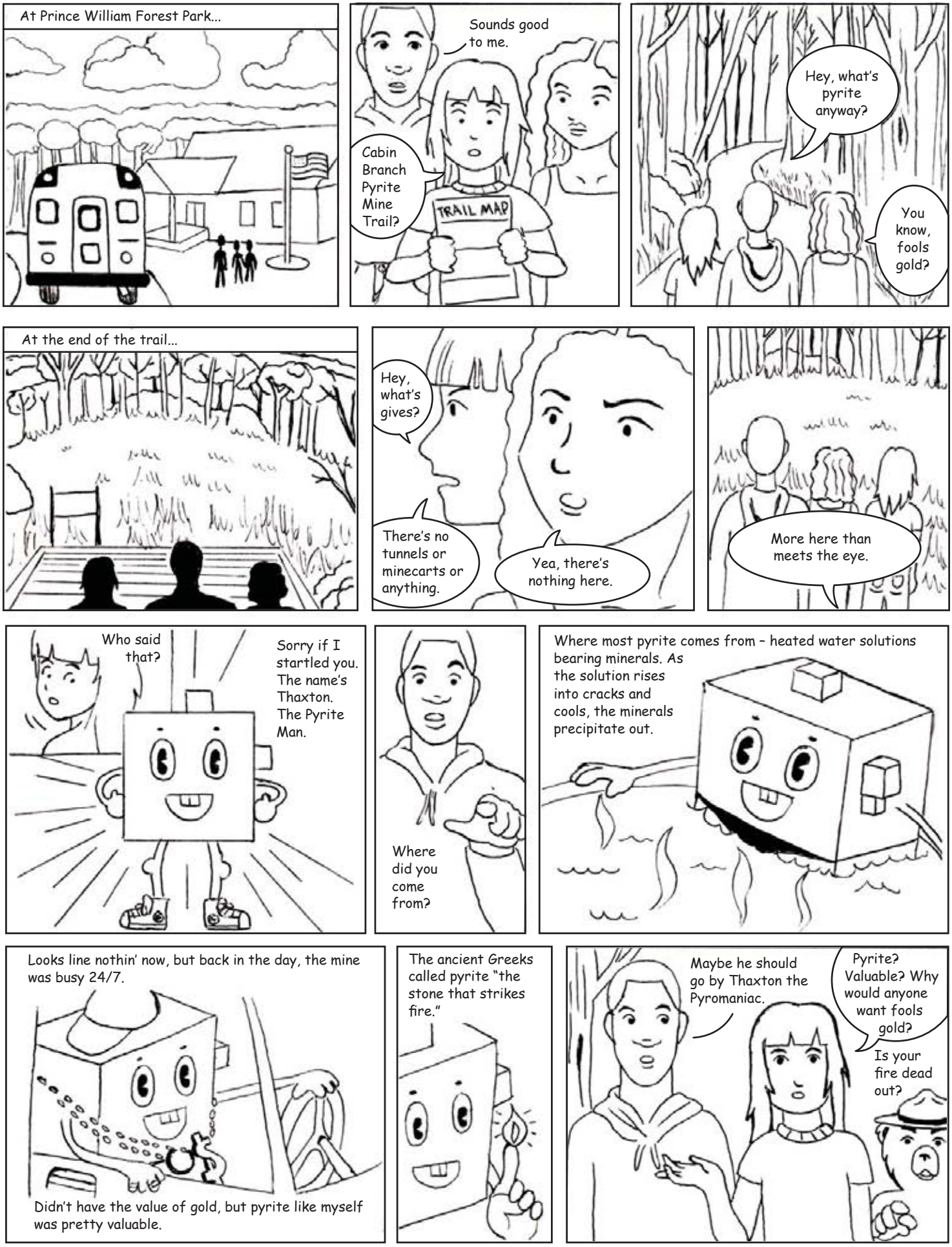
Prince William Forest Park is a remarkable little gem within a stone's throw of one of the world's most famous cities. It's remarkable not only for its beautiful scenery and vastness, but because of its rich history which mirrors human events over a long period of time.

As the saying goes, "A picture's worth a thousand words." So we asked graphic designer, and Prince William Forest Park summer intern, Jesse Miller to help us tell this story in a compelling way. She, in turn, summoned up help from Thaxton, a rather animated cube of pyrite who has witnessed a lot of the events in the park.

We hope you will find this graphic novel a, well, novel way to learn about Prince William Forest Park. Keep your eyes peeled for some wonderful little touches that

Jesse's added to make this history/chemistry/biology/ecology/business/civics lesson a little more memorable.

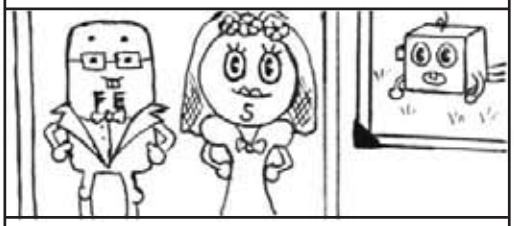
Be forewarned: there is a surprise ending. It's so surprising, we don't even know what it is.


At Prince William Forest Park...
Sounds good to me.
Cabin Branch Pyrite Mine Trail?
TRAIL MAP
Hey, what's pyrite anyway?
You know, fools gold?
At the end of the trail...
Hey, what's gives?
There's no tunnels or minecarts or anything.
Yea, there's nothing here.
More here than meets the eye.
Who said that?
Sorry if I startled you. The name's Thaxton. The Pyrite Man.
Where did you come from?
Where most pyrite comes from – heated water solutions bearing minerals. As the solution rises into cracks and cools, the minerals precipitate out.
Looks line nothin' now, but back in the day, the mine was busy 24/7.
Didn't have the value of gold, but pyrite like myself was pretty valuable.
The ancient Greeks called pyrite "the stone that strikes fire."
Maybe he should go by Thaxton the Pyromaniac.
Pyrite? Valuable? Why would anyone want fools gold?
Is your fire dead out?

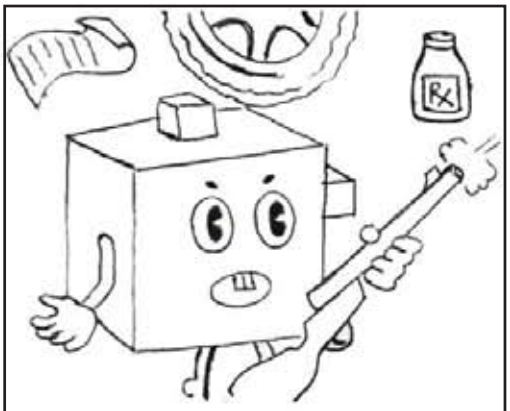
Well after the civil war farmers were scraping by.

Fed their families, but not much more.

With industry growing, and the pyrite discovery here on Quantico Creek, things changed fast.



Pyrite is sulfur and iron. Mining pyrite to extract sulfur allowed people to make a living.

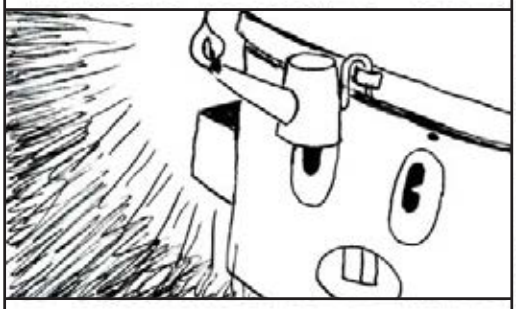


Why, without sulfur paper, tires, gunpowder, and some medicines couldn't be made. Back then, pyrite was the cheapest way to get sulfur.

But it was by no means the easiest. Mining pyrite was dark, dank and dangerous. Miners had to blast it out.

Men and teenage boys spent 10 hours underground, 6 days a week. They came to work in the dark, ate lunch in the dark, went home in the dark.

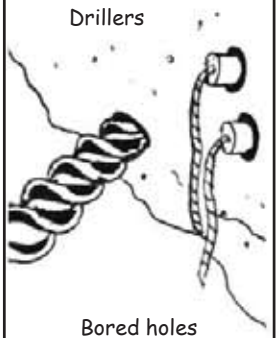
In the early days miners had a small oil lamps.



Which didn't hold a candle to the sun in the sky.

Everyone was assigned a crew...

Drillers

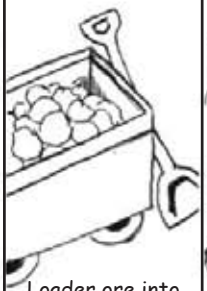


Bored holes for dynamite.

Powdermen

Carried and set the dynamite.

Muckers

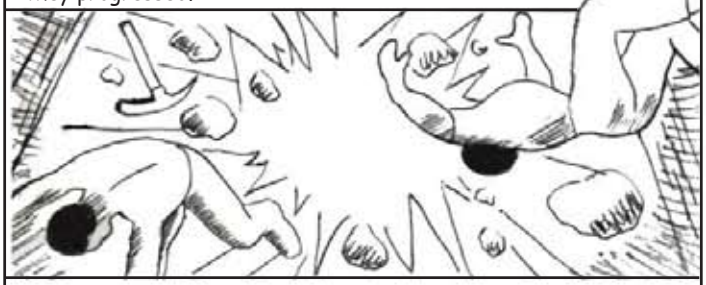


Loader ore into wagons.

Timbermen

Built wooden supports.

Blaster supervised the process and were paid by the distance they progressed.

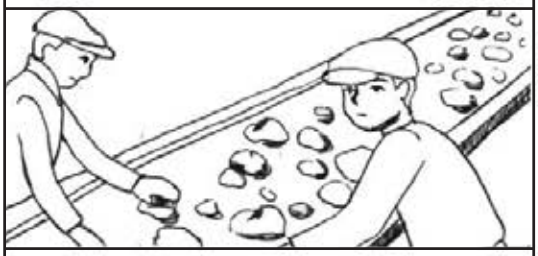


Three shifts a day, for $4 a day. Just shy of $7.50 in today's money. And men always knew a cave-in, gas leak, or explosion could kill you quick.

This was the only place to work. Everyone – Italians, Irish, freed slaves all worked here.

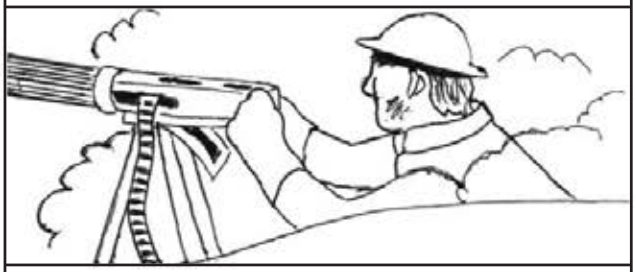
And the Cabin Branch Mining Co. had ways of keeping them here. Namely, debt bondage. Miners were paid mostly script-money only good at stores owned by the mine. The mine also owned the houses so they collected rent.

As for the miner's children...



They went to school over in Batesville, a town of mostly freed slaves, and Hickory Ridge. But this was a poor mining community. School didn't pay so even kids sorted ore for 50¢ a day.

Eventually, they did. America entered World War I in 1917. Cabin Branch produced 1/3 of this country's pyrite used mostly for gunpowder. After the war, the price dropped.

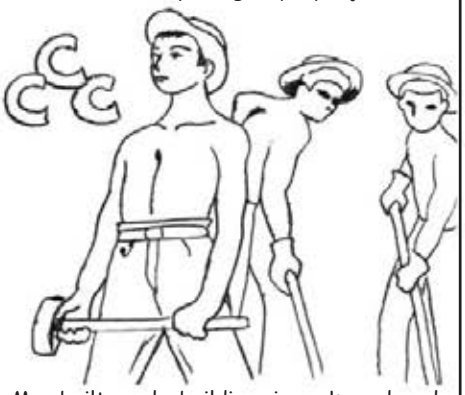


The miners went on strike for a 50¢ raise.

The mine decided that, since pyrite was becoming less valuable, they would shut the mine down instead of giving the miners a raise.

The mine superintendant is reputed to have said: I'll let the shafts fill with water and frogs jump in before I reopen the mine.

Things here were quiet 'till after the Great Depression of '29. FDR formed the Civilian Conservation Corps to give people jobs.



Men built roads, buildings in parks and made other improvements on public lands.

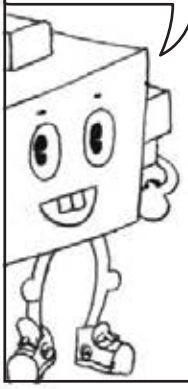
This was Chopawamsic Recreation Demonstration Area. Area farmers were paid for their land and were able to move to less depressed areas.

Over 2,000 men with the CCC were paid to build cabin camps, roads, lakes and dams. In the end it was summer camps for under-priviledge city kids.

Things here for the kids were good. But the land and creek near the site of the mine were dying.

The mine left behind piles of tailings – waste from the refining process.

Remember I said that pyrite is rich in sulfur? Well, when pyrite is exposed to air and water, it starts to change.



First the sulfur oxidizes:

$2\ FeS_2 + 7O_2 + 2H_2O \rightarrow 2Fe^{2+} + 4SO_4^{2-} + 4H^+$

(pyrite) (air) (water) (iron) (sulfate)

Then the iron oxidizes to ferric iron:

$4Fe^{2+} + O_2 + 4H^+ \rightarrow 4Fe^{3+} + 2H_2O$

(iron) (air) (ferric iron) (water)

Then, rain reacts with ferric iron to make ferric hydroxide:

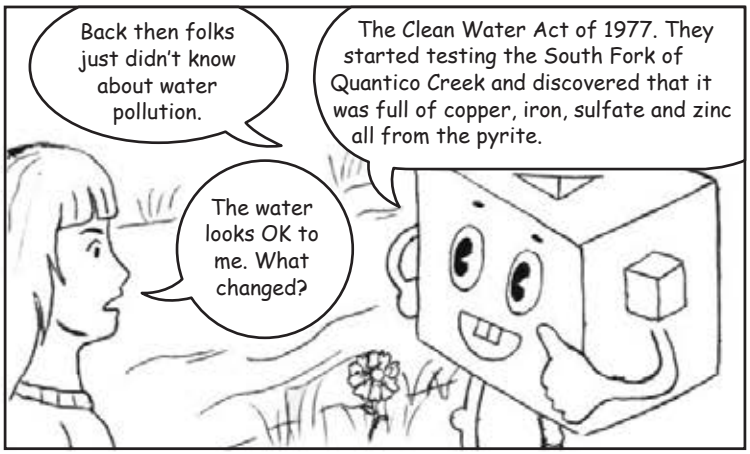
$Fe^{3+} + 3H_2O \rightarrow Fe(OH)_3 + 3H^+$

(iron) (water) (ferric hydroxide)

Finally, it turns to sulfuric acid.

Sulfuric acid lowered stream pH levels to that of vinegar. What's worse, some seeped into the water table underground and polluted the area surrounding the mine.

Runoff of iron hydroxide blocked out sunlight and covered the streambed with a nasty, thick, red blanket.



So, what did they do?

Ever heard of **RECLAMATION?**

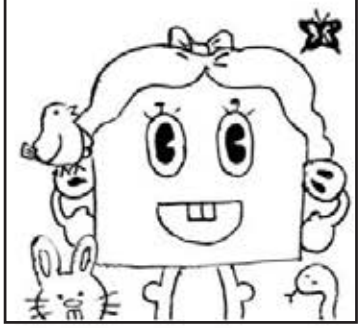
Like finding a balance between nature and human use?

Yeah, like keeping things the same?

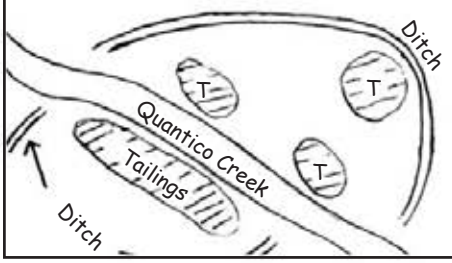
That's conservation.

Nope. That's preservation.

Reclamation is like making it habitable again. In the early '80s there was no good wildlife.



First off they tried a storm water conveyance. They carved ditches that curved around tailing piles to divert water from the polluted part of the mine so chemicals wouldn't leach into the water.



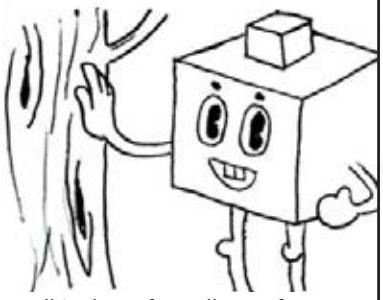
Next thing they did was to cover the tailings with dirt, lime and sanitized sewage to keep heavy metals from washing into the creek.

Finally, they capped the shafts with huge blocks of concrete. Those pipes with chains through them are a warning system. If the chain is pulled tight, the shaft has caved.

So, is the creek clean now? Safe for wildlife?

It's getting there. Rangers keep an eye on things. They test the soil and water, plant trees to slow the rain water from running off the hillside and into the creek. A lot of reclamation is trial and error and because we're talking about nature, results don't show up right away.

When you plant trees you have to wait to see if they take root. When you add soil you have to wait to see if it makes a difference downstream.



I'll be here for millions of years more so I'll be able to see what works and what doesn't.

I wonder, what would've happened had the Clean Water Act happened earlier or later or not at all? How long would it have taken to discover that things were a mess?

What happens now?

Good question! I was hoping that **YOU** had some answers.

Prince William Forest Park Map: Let's Get Oriented

Pre-Field Study Classroom Activity

Map Activity #1

One way to understand the changes that have taken place at Prince William Forest Park, as a result of the pyrite mine, is to actually see the changes. Maps are perfect for this. They are an important source of primary information for historic investigation.[5]

Procedure:

1. Locate the following on your map:
   - Visitor Center
   - Pyrite Mine Road
   - South Fork of Quantico Creek
   - Quantico Creek
   - Boundaries for the Quantico watershed.

2. Following the field study at Prince William Forest Park, if we have time we'll be walking back to the Visitor Center. The two choices are the Birch Bluff Trail and the Laurel Loop Trail. The legend indicates how long the trails are. However, if you didn't have that information, how could you determine how long the walk would be?

3. Later on, we will look at how activities in the park impact residents outside the park. Take a moment to identify towns that would be impacted by any development or hazardous runoff from within the park. Make a list of those.

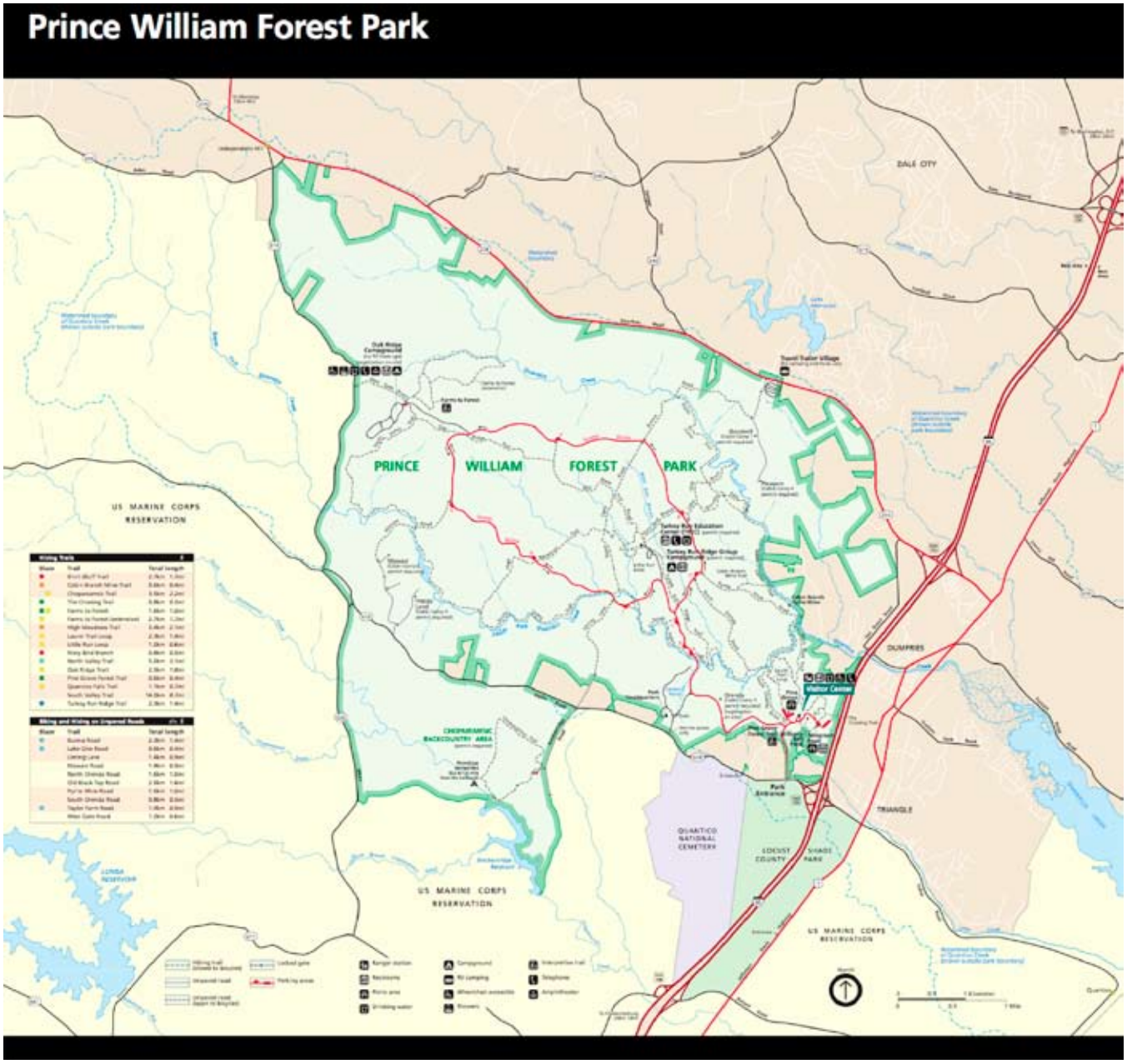
4. Any sediment or contaminants that get introduced into a creek will, eventually, make their way into the larger bodies of water. Take a moment to look at the map of Prince William Forest Park and trace the path that contamination will take if it starts in Quantico Creek. This, by the way, is called a "watershed address." You first list the smallest body of water and then continue to the larger bodies to which that water drains.

5. Is there any information missing from this map that you think would be helpful for park visitors?

Goal:
To interpret information on a political map.

Materials for each student:
- One copy of the National Park Service's Prince William Forest Park map
- Two small pieces of string for trail activity
- Pencil and science notebook or paper.

[5] Rosenberg, Matt. "Map Projections." About.Com Geography. 28 Apr. 2008 http://geography.about.com/library/weekly/aa031599.htm.


Prince William Forest Park
PRINCE
WILLIAM
FOREST
PARK
US MARINE CORPS RESERVATION
DALE CITY
DUMFRIES
TRIANGLE
QUANTICO NATIONAL CEMETERY
LOCUST SHADE PARK
CHOPAWAMSIC BACKCOUNTRY AREA
LUNGA RESERVOIR

How Topography Tells The Story

Pre-Field Study Classroom Activity

Map Activity #2

We provide two methods for model making.

Option #1: Corrugated Cardboard Topography Map

Purpose:

To make paper models that portray, in three dimensions, features represented by contour lines on a topographic map.

Materials:

- Corrugated cardboard
- Photocopy of the topographic map of the Powells Creek area of Prince William Forest Park. This area was selected because the contours are well defined and far enough apart for this particular exercise.
- Pencil
- Adhesive (tape or glue)
- Scissors or exacto knife

Procedure:

1. Place the photocopy on top of a piece of corrugated cardboard.
2. Carefully cut along the thick contour line representing the 250' elevation. To make this project a bit easier, just use the one long curving section of the 250' elevation and ignore the shorter 250' line segment. Label the center of the cardboard with a "1." This is the first — or lowest level of the model that you will build.
3. Set aside that cardboard shape.
4. Place the photocopy of the map on top of another piece of cardboard and carefully cut around the next contour line. Label the center of the construction paper with a "2." This is the second level of your model.

Goal:

Topographic maps provide information about the shape of the land. You're not alone, if you think it's difficult to see how a bunch of squiggly lines on a map represent a mountain. This activity turns a 2-dimensional map into a 3-dimensional object.

5. Repeat this procedure until you have cut out all of the contour lines. Don't forget to label the layer with the appropriate number.
6. Now you are ready to build your 3-D model. Take layer number 2 and glue it onto the top of the first layer. If you'd like, you can also separate the layers with small squares of the cardboard. This gives the model dimension.
7. Repeat Step 6 with the rest of your layers until you have built your model.

Option #2: Plastic Food Container Topography Map[6]

Purpose:

To make paper models that portray, in three dimensions, features represented by contour lines on a topographic map.

Materials:

- Clear hinged 8 in x 8 in x 2 in plastic clamshell salad containers. Make sure they are clean, have smooth (untextured) bottoms and are stackable. Your group will need 8 containers.
- One marker for each group. If you don't use permanent markers, the containers are reusable.
- Photocopy of the topographic map of Powells Creek area of Prince William Forest Park.

Procedure:

1. Take one of the plastic containers. Position it on the topographic map so that the largest area is in the center of the container's bottom. Using a fine point marker, trace the contour of the lowest level, in this case the 250' contour.
2. Take another container and place it inside the first. This time, trace the contour line that shows the next highest elevation.
3. Take a third container and add it to the stack. Remove the bottom container and set it aside. (If you have too many containers together, it becomes difficult to see the contour lines on the map.) On this third container, trace the next highest elevation.
4. Nest a new container on the stack and remove the one on the bottom. (This one will become the top container on the other stack.) Trace the elevation. Continue on in this way, adding a container to the top and removing the one on the bottom, until you've completed all the elevations.
5. When you're done, stack all the containers in order, with the lowest elevation as the bottom of the stack and the highest elevation on top. Now you have a three-dimensional model showing the topography of the area around the mine.

Do the following:

1. Identify the landforms on your topographic maps (hills, valleys, basins).
2. Using the information on your topo map, guess how water would flow down the hill, in a major rainstorm.
3. Looking at the spacing of the contour lines, would you say that the slope is pretty even, from top to bottom? What distance, in elevation, does each contour line represent?

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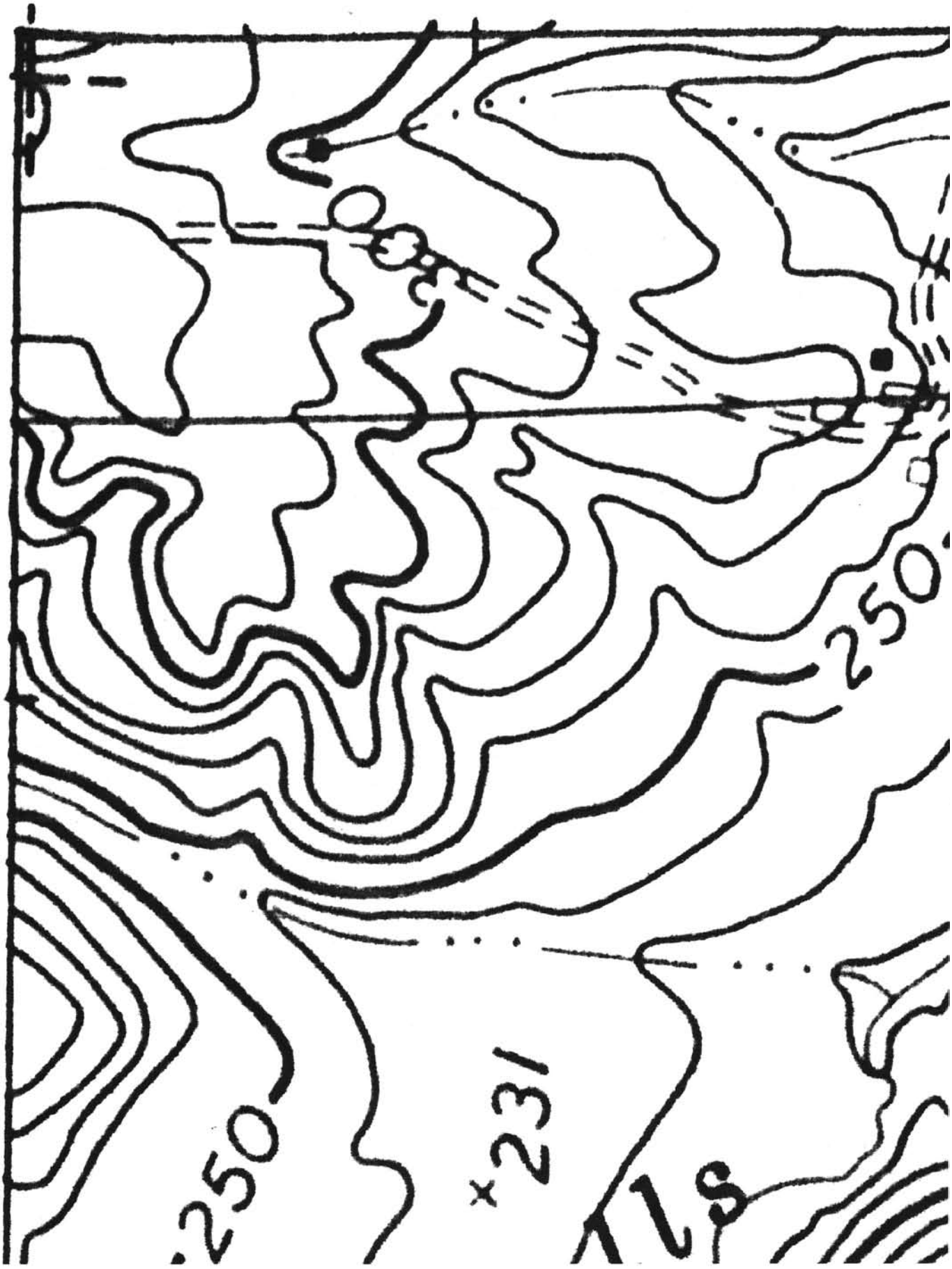
[6] Decoste, Kim, ed. *It's Our Water: a Water Quality Curriculum for Earth/Environmental Science Classes in North Carolina*. Raleigh: The Environmental Education Fund, 2004. 43-45.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250
231

Eye In The Sky:
A Bird's Eye View of the History of Prince William Forest Park

Pre-Field Study Classroom Activity

Map Activity #3

Aerial Imagery

Goal:
To understand how to extract and interpret information from an aerial photo

If you are lucky enough to get a window seat on a plane flight, highways all look pretty much the same, farms look like squares on a quilt, forests are dark patches, and rivers look like snakes.

If you've ever flown into Dulles Airport, you've probably tried to locate landmarks when you've started the long descent. You look out the window. "That's I-66. No. Wait. It's the toll road." From high up above, everything below looks pretty much the same from your window seat. Without a reference point, such as Dulles Airport itself, it's hard to sort out the freeways.

Conversely, if you type in your address on Google Earth, once it hones in on your house it's relatively easy to know which direction to look to locate schools, parks, ponds and other familiar features of your neighborhood.

This concept of looking at the world from a bird's eye view brings us to another tool we'll be using to determine the pyrite mine's impact in Prince William Forest Park. Aerial photography, pictures from satellites or airplanes, records all visible features on the Earth's surface from an overhead perspective.

It's amazing is to see a photo of the same area taken over a period of months, years or even decades. Pictures taken over a period of time can help you see how the landscape has changed and, in some instances, what has changed it.

These images aren't maps and don't provide the written clues or keys available in topographic maps or road maps. Instead, understanding them relies on your observational skills and the ability to identify features through photo interpretation. That's not to say that there aren't any guidelines for interpreting aerial photography. There is a set of guidelines for "reading" the photos. If you need to know more, a guide for aerial photography is in the resource section of this guide. Your teacher can reproduce this information for you.

Materials:

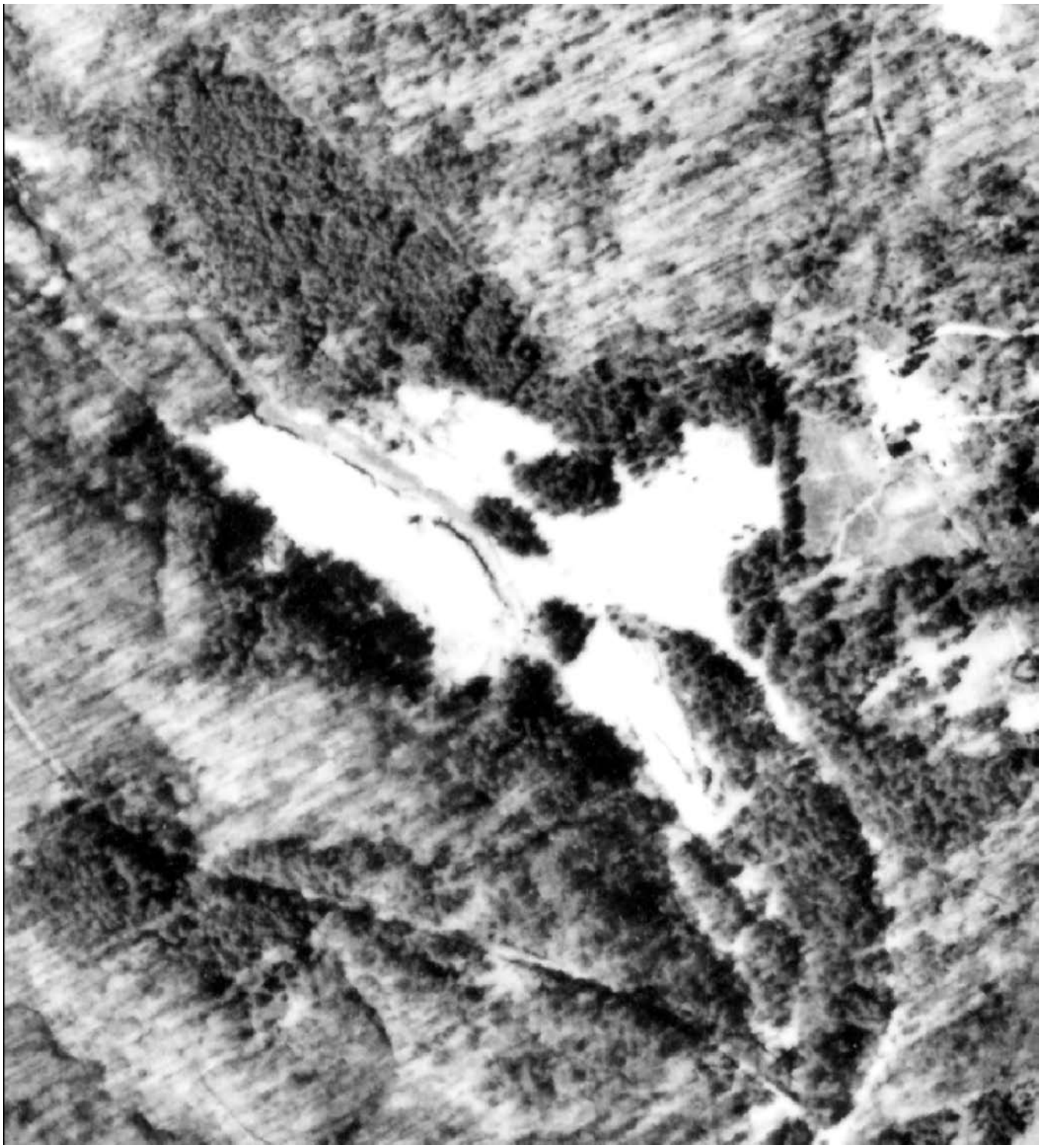
Set of 6 photos from Cabin Branch pyrite mine, dating back to 1937 and concluding with a photo taken in the past year.

Procedure:

You have six different pictures of the Cabin Branch Pyrite Mine, spanning from 1937 (when the Civilian Conservation Corps was building cabins and facilities for the Chopawamsic Recreational Demonstration Area) to a photo of the site today.

- Lay these out, side by side, and using the information provided above about aerial photography interpretation, determine a logical order for the photos — earliest to most recent.
- How does the tone change from photo to photo?
- What does the texture tell you about the effectiveness of the reclamation efforts?

- On one of the photos, you can see some straight lines fanning out across an open area, ends pointed toward the creek. Any guesses about what these are? Why are they here?
- What observations can you make about how Quantico Creek's path has changed over time?
- Make an estimate the percent of land cover from each photo?
- In which image would runoff pose the biggest problem (in terms of adding sediment to the creek, leaching contaminants from the soil into the creek and eroding the hillside)?



You're in Charge of the Clean-Up

In a couple of days, you'll be headed out to Prince William Forest Park to conduct a series of field studies. You'll be asked to take water samples from several places along Quanitco Creek, and soil samples from various areas around the site of the former Cabin Branch Mine.

We'd like you to think like contractors responsible for assessing the current conditions at the site and then communicating the results, in the form of a status report, to the community and the National Park Service.

Of course, based on what you've learned from Thaxton, and what you've seen in the mapping lesson, you might be able to make some guesses about the status of the reclamation process before you get to the park.

- Is the reclamation process having positive results? What information suggests that? If you don't think so, on what do you base your opinion?

- Can you see areas where the ground contamination might still be at elevated levels?

- What other information would you need to have to be able to scientifically determine the status of Quantico Creek and the surrounding mine area?

- Since most of the Quantico Creek Watershed is located within Prince William Forest Park, where will most of the stream impact be created? Does development have much of an impact on the creek?

- Other than soil and water tests, can you think of another way the park rangers might be able to determine the health of Prince William Forest Park? (Think food chains and food webs.)

Testing … Testing …

When you get to the mine site, you'll divide into teams and conduct soil and water tests in several areas. What's exciting is that you'll be doing work as citizen scientists. Your data won't just be a grade, but will be added to all the soil and water data that's been gathered by the National Park Service and its partners over the course of many decades.

Soil: You'll be testing the soil at six places around the mine site conducting tests for: pH, to determine the acidity of the soil; iron (Fe), since this is a major component of pyrite; and sulfates, which form when pyrite is exposed to air or *oxidizes*. Your results will help us answer questions about why, in some areas, the forest is returning and why, in others, only grasses seem to be able to take root.

Water: You'll be testing water at six points along Quantico Creek as well. You'll be conducting tests for: pH, again because we want to know the acidity of the water; Nitrogen (N), which is critical for growth in plants and animals; and phosphorus (P), which is critical for energy production in animals.

Visit the Parks

Plan Wisely for Your Field Study in the Park

In the field study activity you will apply your knowledge of plant identification and sampling techniques in a local national park. You will work in assigned groups to identify plant species in a given habitat to determine the relative percentages of native versus alien plants in that area. For the best experience, read these guidelines carefully.

Wear Appropriate Clothing

- Wear comfortable clothing that allows you to easily move, hike, bend, and climb. You may gather data in a wet and muddy environment, so choose clothes you don't mind getting wet and dirty.
- Dress for the weather. In cool weather, wear layers of clothing to keep you warm in the early morning that you can remove later in the day or while working. If the forecast calls for possible rain, wear a waterproof jacket, hat, and shoes, and bring a plastic bag for your materials.
- Even in warm weather, wear long pants and a long-sleeved shirt as protection from poison ivy and briars. You may be in a wooded area or walk through tall grass.

Park Stewardship

- While you're in the park consider how parks can educate, inspire, and provoke thought.
- Remember, no collecting of any type is permitted.
- Take only photographs. Leave only footprints.

A Rewarding Experience

- Now that you know the materials to bring, remember to also bring a positive attitude to the experience. Be willing to participate in new adventures.

Things to Bring

- There will be no place to buy food. You must bring a bag lunch and plenty to drink, preferably water. The hotter the weather, the more you should bring to drink. Pack your lunch and drinks in a backpack or bag that you can easily carry into and out of your park work site.
- Keeping in the ecology-minded spirit, make your lunch as trash free as possible. Some areas and parks have no trashcans. What you pack in, you must pack out. Remember, there is nothing beautiful about trash.
- Bring sunscreen and insect repellant.

Prince William Forest Park
Soil and Water Data Collection

Background:

In this activity, you will collect water samples from various places along Quantico Creek, and you'll be taking soil samples inside and outside the runoff area below the former pyrite mine. This information will be used in a later exercise to prepare a report using the data collected in the park

Procedure:

1. Work in assigned groups to complete your data collection in the park. One person will record for the group.
2. Complete the Park Observation Sheet. Sketch the study site. Include any features of the landscape that may affect your findings.
3. Use the Pyrite Mine Reclamation Field Study Student Data Sheet to assess the stream and soil quality. Your Educator and Ranger in the field will give you the directions and assistance you need to complete this activity.

Prince William Forest Park
Pyrite Mine Reclamation Field Study
Student Data Sheet

Park Observation Data Sheet

National Park	Date
Field Study Site in Park	
BTW Educators/NPS Rangers	
Group Members:	
Latitude _____ degrees NORTH	Longitude _____ degrees WEST
Why is it important to know the exact location of your field study?	

Weather

Yesterday	Today
Air Temperature _____ ° C or ° F	Air Temperature _____ ° C or ° F
Cloud Cover clear _____ partly cloudy _____ cloudy _____	Cloud Cover clear _____ partly cloudy _____ cloudy _____
Precipitation _____ Type _____ Inches _____ None _____	Precipitation _____ Type _____ Inches _____ None _____
How could the weather affect your data collection?	

Sketch of Study Area

Water Quality Assessment – upstream of mine site		
Parameter	**Results (be sure to note units)**	**Notes**
pH		
Nitrate Nitrogen		
Phosphates		
Iron		
Sulfates		

Water Quality Assessment – downstream of mine site		
Parameter	**Results (be sure to note units)**	**Notes**
pH		
Nitrate Nitrogen		
Phosphates		
Iron		
Sulfates		

Soil Quality Assessment – hotspot		
Parameter	**Results (be sure to note units)**	**Notes**
pH		
Nitrates		
Phosphates		
Iron		
Sulfates		

Soil Type: Using the soil type diagram, determine soil type:

Soil Quality Assessment – reclaimed		
Parameter	**Results (be sure to note units)**	**Notes**
pH		
Nitrates		
Phosphates		
Iron		
Sulfates		

Soil Profile:

Draw a sketch and describe the soil that you found in the augur. Show the various layers and their qualities.

What evidences are there of success or failure of the reclamation? What else should be done?

Pyrite Mine Data Analysis

Post-Field Study Classroom Activity

You have been to the Cabin Branch Mine site and collected information about the soil and water. Field scientists that work for the National Park Service keep an eye on these parameters as part of their assessment of the mine site and its reclamation.

The goals of the reclamation do not include specific levels of nutrients or metals for the soils. Instead, the focus is on improving water quality. The Environmental Protection Agency (EPA) sets levels for each parameter in the Clean Water Act. These levels are noted in the chart below. The 'acceptable' soil levels are based on what is commonly found in soils in this region, as well as what will be tolerated by plants.

Questions for class discussion:

Compare your findings to the 'acceptable' range for that parameter: did you find higher or lower levels?

Why do you think your water quality findings upstream of the mine site might be different than the results from the downstream site?

Compare your finding for the soil to your finding for the water. Which is higher? Are both either higher or lower relative to their acceptable range?

Based on what you have found, and your comparisons to acceptable ranges, what do you think of the quality of the water and soil?

What did you notice about plants growing in the mine reclamation area? What does this suggest to you about the soil quality and/or the levels of the various parameters in the soil? Does this make sense, based on your findings?

Overall, how successful would you say the reclamation has been?

Upstream Water Quality Assessment			
Parameter	**Acceptable Range**	**Recorded Range**	**Notes**
pH	6.5 – 8.5		
Nitrates	Less than 4.4 mg/L		
Phosphates	Less than 1.0 mg/L		
Iron	Less than 0.3 mg/L[7]		
Sulfates	Less than 250 mg/L		

Downstream Water Quality Assessment			
Parameter	**Acceptable Range**	**Recorded Range**	**Notes**
pH	6.5 – 8.5		
Nitrates	Less than 4.4 mg/L		
Phosphates	Less than 1.0 mg/L		
Iron	Less than 0.3 mg/L		
Sulfates	Less than 250 mg/L		

[7] The iron and sulfate levels are for drinking water (they are EPA's Secondary Maximum Contaminant Levels – see http://www.epa.gov/OGWDW/consumer/2ndstandards.html for more information).

Soil Quality Assessment			
Parameter	**Acceptable Range**	**Recorded Range**	**Notes**
pH	6 – 8.5 (levels at which plants can uptake most nutrients)		
Nitrates	200 – 5,000 mg/L		
Phosphates	100 – 2,000 mg/L		
Iron	19 – 190 lb/acre		
Sulfates	100 – 2,000 ppm		

Prince William Forest Park
New Visitor Center Environmental Impact Statement

Post-Field Study Classroom Activity

Goals:

- Analyze and interpret information using a variety of maps;
- Understand the environmental and human impact of different land use decisions; and
- Develop and present the case for a land use decision.

Materials:

Your teacher will give you a packet with the following materials:

- Cover sheet detailing the assignment
- A topographic map of Prince William Forest Park
- Political map of Prince William Forest Park
- Profiles of the various stakeholders
- Most recent aerial/satellite image of the park
- Large drawing paper
- Background information (provided below)
- Soil and water data from field study

Internet access:

The National Park Service has some fabulous cultural and natural history resources on the Prince William Forest Park website. These can be accessed at http://www.nps.gov/prwi/. The narratives are well-written and are accompanied by great photographs. Some students may choose to use these in their presentations. Of course, they might also need to research additional data, from the number of parking places needed for a new venue to restrictions on archeologically sensitive area.

Scenario:

The increasing popularity of Prince William Forest National Park is placing a strain on the park's small visitor center. While the exhibits provide basic information about the park's cultural history, surveys indicate that visitors want to know more about the Cabin Branch Mine and the company towns of Batestown and Hickory Ridge, the park's history as a top secret military installation where the Office of Strategic Services operated training schools in World War II, its development for the Chopawamsic Recreation Demonstration Area, as well as the rich natural history of the park.

The National Park Service (NPS) is considering building a new visitor center. Ideally, it would be built on the hillside where the operations for the Cabin Branch mine were located. The new Prince William Forest Park Visitor Center and Museum would include displays for all of its artifacts, a research lab for ongoing archeological studies, a theater for multimedia presentations showing films about the park's history, offices for park staff, and a bookstore.

But the first choice may not be the best. Before the NPS gets to put a shovel in the ground, it must prepare an environmental impact statement or EIS. An EIS is a document that provides information about the reason and justification for a project, the proposed plans, and potential environmental effects that construction, increased traffic, and noise (to name a few) will have on water and soil quality, wildlife and vegetation. An EIS analyzes not just the agency's first choice of action (in this case, a specific design and location of the new visitor center), but also a few alternatives to the project including "no action," which is, as it suggests, an option not to build a center.

Creating an EIS is required as part of the National Environmental Policy Act (NEPA). Before an EIS can

become final, it must be shared with communities for a public comment period. Any interested member of the public can share feedback with NPS on the project, and have that input considered in the final EIS.[8]

The park supervisor and the regional director for the National Capital Area region of the National Park Service will make the final decision. You may want to assign students to these roles, or bring in other faculty — or members of the community — to perform this function.

Considerations for the Cabin Branch Mine Visitor Center

Proposal:

The National Park Service (NPS) would like to locate the new visitor center on the hill where Cabin Branch Pyrite Mine operations were originally located. The advantage of this location is that it allows visitors to experience the story of the mine while looking directly down at the site.

Facilities:

In addition to the new exhibits, the new building(s) must also include offices and storage space for the interpretation and education staff, restrooms & drinking fountains, parking areas for cars and school buses, and new trails to allow visitors to safely walk to places where they will be able to see the remnants of the Cabin Branch Mine community. The building, which will be about 4,000 square feet, must also be handicapped accessible.

Concerns:

Since you've done soil and water studies at Prince William Forest Park, you know that building on the hillside, atop the old pyrite mine, poses some potential problems, including:

- **Erosion:** The minute you start digging, you create the potential for erosion. Containing this sedimentation is challenging enough under the best of circumstances; however, the old mine site has the additional potential for acid mine drainage if any of the contaminated soil is exposed;
- **Aesthetics:** The visitor center will need to be sited high enough so that once the Virginia pines reforest the hillside, people can still see down to Quantico Creek, but not so high that it dominates the skyline;
- **Water quality:** You can't talk about soil and erosion without considering water quality. Disrupting the soil will lead to increased sedimentation in the stream. As you know, the sediments in the mine area, also include particles of heavy metals, like the pyrite in the mine tailings.
- **Cultural preservation issues:** The remains of the mine aren't the only important cultural resources that NPS must protect. Throughout the park are Native American artifacts dating back to the archaic period (10,000 – 3000 b.c.e.).

Park Purpose:

Parks were created under the National Park Service Organic Act, which was enacted by Congress on August 16, 1916. In essence it states, "The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purposes of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."[9]

Proposal:

Your class will be divided into four groups. Each group is a team of consultants for the company preparing the EIS for Prince William Forest Park. You will be asked to present your EIS at a hearing for public comment. The EIS should be a brief document that outlines the potential impacts of the construction project.

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[8] Council on Environmental Quality, Executive Office of the President. *A Citizen's Guide to the NEPA: Having Your Voice Heard*. http://www.nepa.gov/nepa/Citizens_Guide_Dec07.pdf.

[9] "The National Park Service Organic Act." The National Park Service. 26 Feb. 2008. U.S. Department of the Interior. Accessed 8 Sept. 2008 http://www.nps.gov/legacy/organic-act.htm.

One group will lobby for constructing the visitor center on the proposed hillside location. The second group will make a case for building the visitor center on a different location, which that group will need to identify. A third group will make the case for building a new visitor center where the current center now stands. The fourth group will argue that the best action is no action (i.e. leave the visitor center as it is, and do not build new structures).

In order to do this, you should consider the issue from the perspective of several specialists who would be called in to provide expert opinion on various aspects of the new visitor center project. These may include:

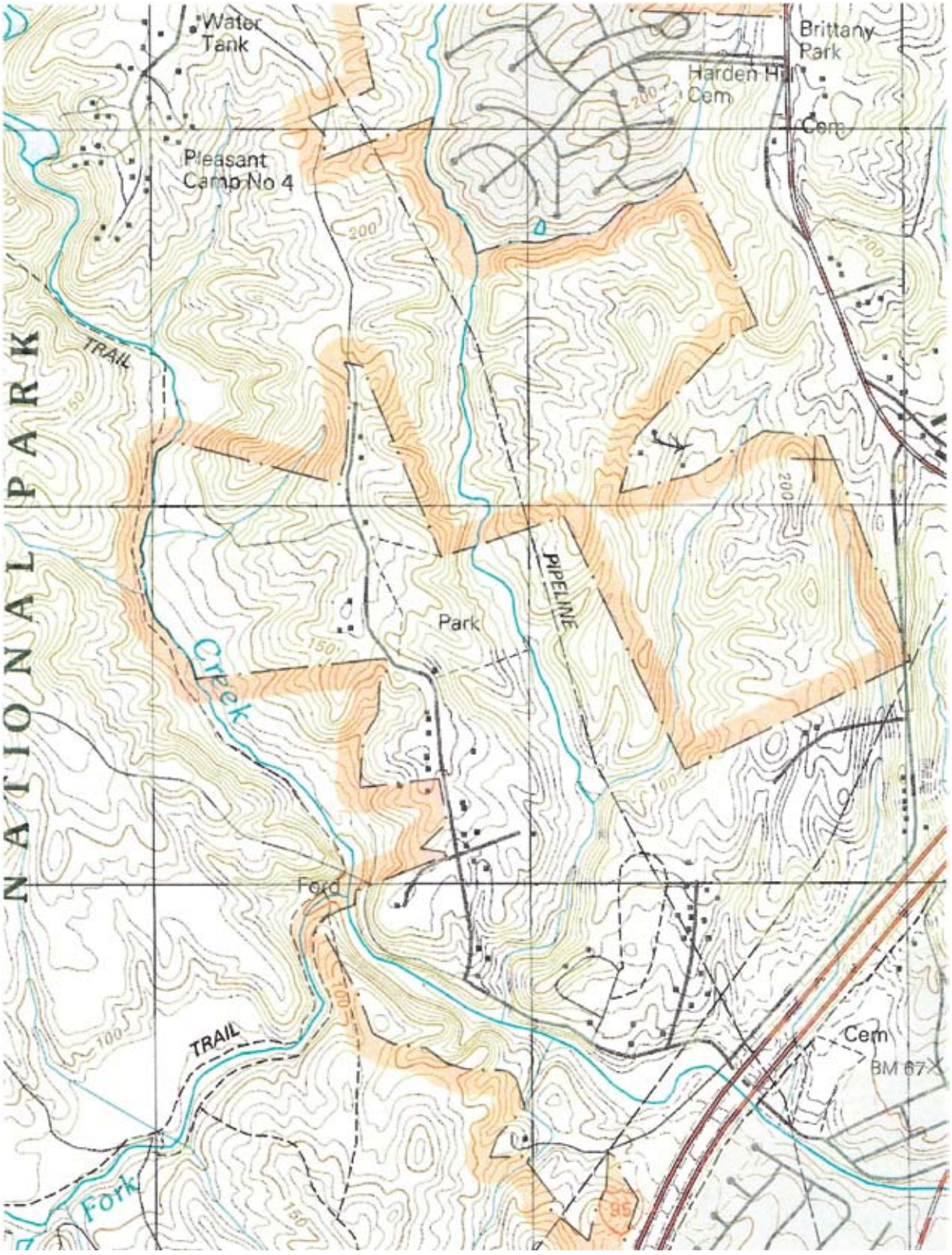
- A soil scientist, who can tell you a bit more about soils in and around the pyrite mine and make recommendations about the best way to position, or site, the project on the hill;
- A biologist, who can be a resource on forest health issues (including the impact to plants and animals), and who can provide you with ongoing water/soil quality data;
- A park interpreter, who knows the cultural history of the Cabin Branch Pyrite Mine in particular, and can give you insight into the overall cultural history of Prince William Forest Park;
- An Environmental Protection Agency (EPA) official who oversees abandoned mine sites, and who will want to be sure that you're adhering to laws and regulations such as the Clean Water Act, addressing potential acid mine drainage issues, and utilizing resources for making the project environmentally friendly.

Some of the members of the public who are likely to provide input during the public comment period are:

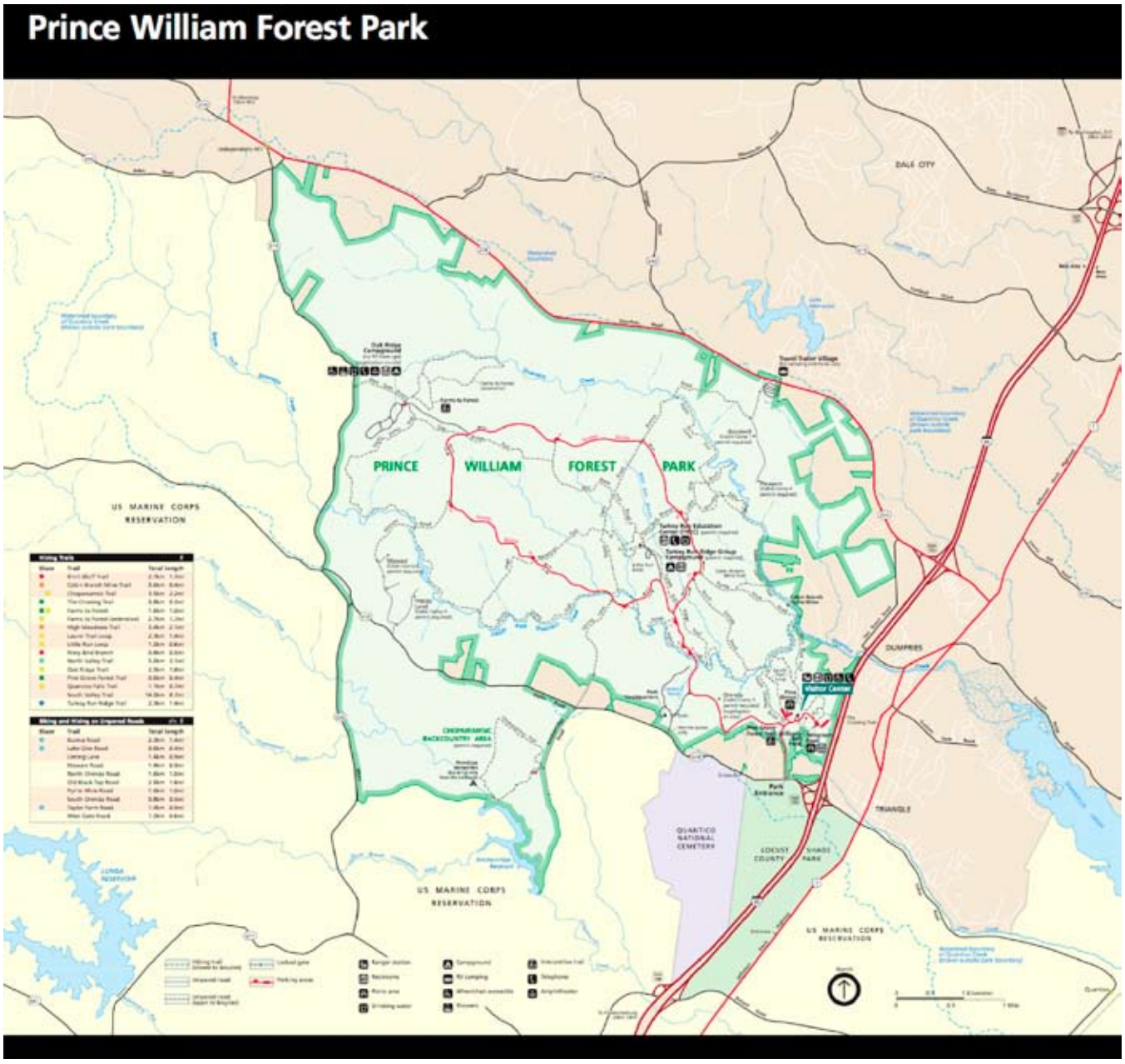
- A representative of a river advocacy organization. This individual will be able to talk with you about how your actions upstream will impact the ecology of Quantico Creek downstream;
- A resident (or group of residents) living downstream of the project. This individual will want to know how the visitor center project will impact the quality of their water; whether the construction will silt up the creek; and even how the increase in traffic into the park will impact their lives.

You might also think of some additional players in this process: the mayor of Dumfries, the Prince William County Board of Supervisors, the Prince William Conservation Alliance (a nonprofit water-shed organization serving Prince William and surrounding communities), classmates who live — or have relatives who live — downstream of Prince William Forest Park. The list can go on. Feel free to be creative, and really think about whose opinions and expertise you'll need to create compelling and persuasive argument.

Include written comments from at least two members of the public in your report.



Map courtesy of U.S. Geological Survey, Department of the Interior/USGS


Prince William Forest Park
PRINCE
WILLIAM
FOREST
PARK
US MARINE CORPS RESERVATION
DALE CITY
DUMFRIES
TRIANGLE
QUANTICO NATIONAL CEMETERY
LOCUST SHADE PARK
Visitor Center

The following chart provides some the "pros" and "cons" posed by various stakeholders in real life land use issues. These considerations might prove helpful as your consulting group gathers research and information for the environmental impact statement.

Pro	Con
National Park Service:	
• Better presentation of park history	• Construction issues in the short term
• Increased park use	• Increased park use will impact wildlife & plant communities
• Better facilities	• Increased stormwater runoff
• Cross-market with National Museum of the Marine Corps Museum?	
Residents:	
• Potential to grow businesses in Dumfries/ Triangle area	• More traffic
• Better park services	• Construction mess
• Creates new jobs	• Changes the character of the park
River Advocates:	
• Watershed education opportunity	• Uncovering contaminated soils
• Can advocate for continued reclamation	• Creating more impervious surfaces
	• Traffic

Stakeholder Cards

Soil Scientist:

- If you're digging deep into the soil (to lay the foundation of a building, install sewer lines) how will you address erosion issues?
- Another concern for the soil scientist is run-off. If you will be exposing potentially contaminated soil to the elements (think air and rain) what can you do minimize the impact?
- How deep will you need to sample soil, in order to determine if it can safely support construction on the site you've been assigned?
- How will topography influence where you place the visitor center?

Park Interpreter:

- Where are the culturally sensitive areas in the park?
- How will you highlight the different uses of the park over time? For instance, if you're building a new center, or expanding the current center, how much space will you assign to providing background on the American Indian heritage, the story of the mine, the Chopawamsic Recreational Demonstration Area, the Office of Strategic Services and such?
- How do park visitors use a center? For instance, some might just want to stop in to use the restrooms before heading out to hike or camp. Others might want to know more about the flora and fauna of the park. Still others might want to know why Prince William Forest Park is a national park.
- How does the experience in the center enhance visitors' appreciation of the park's past?
- Will a bigger center mean that there will be more large-scale public events at the park?

Biologist:

- Are there communities of endangered or rare plant and animal species you need to take into consideration?
- Is there risk of introducing or further encouraging invasive plants through the construction?
- How will your reclamation efforts be impacted by the new visitor center?
- Is there a way to involve visitors to the new center in the reclamation efforts?

EPA Representative:

- How will you determine, in advance, the impact of your project on the environment?
- What additional soil & water tests will you need to conduct? (Perhaps select additional sites to perform tests similar to the ones you did at the park earlier.)
- How will you accommodate additional cars and foot traffic in the park?
- How will you minimize the noise that additional traffic will bring to the park?
- What additional services will you need to address the increase in visitors to the park?

River Activist:

- What impact will construction have on Quantico Creek?
- How will you monitor water quality during construction? How often will testing be done?
- What action will you take if you see that the construction is impacting the health of the creek? (All possibilities need to be considered.)

Resources:

Attached are profiles of people who actually do these jobs. You can read about their backgrounds and can learn what work they've done on the reclamation of the mine. This can give you a good idea of what they might be advocating for in a new visitor center.

Considerations:

- You've gathered soil and water data from the site. How can you use that to determine the environmental impact of a new visitor center?
- What else do you need to think about? Some possibilities include: noise during the construction phase; wildlife disturbance during and after the new center is constructed; impact of air pollution with additional cars coming into the park; and erosion and hillside stability.
- How will parking lots and the buildings rooftops (all considered impervious surfaces because water can't penetrate through to the ground as it would without buildings, but runs off) add to the stormwater runoff? What impact will this have on Quantico Creek? How can this be minimized?

- Is it a good idea to build on the hill or does it make sense to build further down the hill, near the foundations of the old buildings?
- How can the new visitor center continue to enhance reclamation efforts?

Presentation:

For the 'public comment' phase, choose at least two members of your group to present the EIS as consultants. The other members of your group should play the roles of members of the public (see examples above) who are giving input, using the written comments you have prepared as a starting point. One group member should play the role of park superintendent, who will present the rationale for the project to the public.

Your report should include:

- A list of the people or organizations who are interested in the proposed action;
- Three significant issues to be analyzed in the EIS and at least three issues that can be eliminated from detailed review. Provide a short paragraph for each issue to be eliminated that explains why it is not significant.
- A list of the roles and responsibilities of lead and cooperating agencies;
- A list of the data or other information needed to make the decision about what visitor center to build — provide as much of this data as possible, and indicate where you might be able to find the rest; and
- A brief explanation of how your plan addresses the mission of the park, as described in the Organic Act of 1916.

After each group presents its alternative, the review panel should ask questions of the group, including questions they feel the report did not address.

When all groups have presented their proposals, the panel should decide which alternative to use — and explain their rationale.

Evaluation:

The good news (or bad news, perhaps) is that there isn't an obvious right answer or a correct solution. That's often the case with land use issues. What is important is that you make your case based on the data you collected, reasonable assumptions about soil properties and water quality, and the needs of the park and the community.

As presentations are being made, students may want to keep a chart to compare the alternatives so that, as a class, they can take a vote on the best course of action:

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Location of Center				
Soil Impact				
Water Quality				
Cultural History				
Wildlife Impact				
Addresses Community Concerns				

Biographies of Stakeholders

Post-Field Study Classroom Activity

Paul Peterson
Park Biologist

What education do you need to be a park biologist?

I graduated from Utah State University in 1997 with a Bachelor of Science degree in Forestry. I started my career with the National Park Service, working on the Vegetation Crew in the Great Smoky Mountains National Park. While I was there, I did a lot of research into forest health issues, including the effects of the Balsam Wooly Adelgid (a small wingless insect) on Frasier Fir, American beech scale disease, and yellowwood canker disease.

In 2000, I helped develop the National Capital Regional Exotic Plant Management Team (EPMT), a swat team in the Washington DC area dedicated to invasive plant species removal from National Parks. Invasive, or alien, plants are any species, including its seeds, spores, or other biological material capable of propagating that species, which is not native to that ecosystem.

What do you specifically do at Prince William Forest Park?

In 2003, I began work for the Resource Management Division at Prince William Forest Park, where I conduct research on natural resource issues including invasive species, forest health, water quality, and geographic information systems (GIS).

What work do you do on the mine, now that a lot of the reclamation efforts are complete?

Although it might look like there's nothing to do, we're far from done. I actually work closely with other researchers on the reclamation of the Cabin Branch Pyrite Mine. I continue to collect soil samples, conduct geographic modeling, and monitor 750 trees (Virginia Pine (Pinus virginiana) we planted on the site. Until recently, the only species able to grow on the hill has been lespedeza, a nonnative invasive plant. We are beginning to see some natural succession of the pine trees, however. As they fill in the hillside, and create shade, the lespedeza is forced out. That's pretty exciting to see.

I also am responsible for the Park's long-term water quality monitoring of the Quantico Creek adjacent and to the mine site, where water quality has shown moderate improvement.

Andrew Fahlund, MS
American Rivers, Vice President for Conservation

What is your background?

I grew up next to the Fox River in Wisconsin, and learned to kayak and canoe at an early age. I loved being on the river and later paddled on many river trips including white water wilderness adventures. I love being in nature, and paddling is really fun. The Fox River, where I grew up, is a working river, so I saw natural, recreational, and industrial aspects of rivers and how people interact with them. As a teenager, I started volunteering to help clean up and save the rivers I loved so much. In college, I studied human ecology and anthropology, which investigates the way people relate to their environment. I decided I wanted to apply my knowledge in a useful way, and went on to earn a masters degree in natural resource policy and administration. In graduate school I did a project for the environmental activist organization, American Rivers. After it was finished I got a job there, and worked my way up to Vice President for Conservation.

What does American Rivers do?

We work to make sure that rivers are healthy, protected, restored and self-sustaining. To do this, we work to develop laws and policies that will help protect rivers, and we work with community and civic leaders to get those laws and policies in place and enforced. We also do conservation projects to show people the best ways to clean up and protect rivers, streams and floodplains. And, we try to inspire people to take action for rivers.

Here is an example of one of our successful projects.

There is a river named Fossil Creek. A power company had diverted the water out of Fossil Creek into a pipe, so that the stream was only a little trickle. We convinced the power company to surrender its power plant. Then we worked to restore the creek and the wildlife habitat it provided for plants and animals that live in and around rivers. Finally, we got Congress to permanently protect Fossil Creek from pollution and development by getting it designated as a Federal Wild and Scenic River. Using Fossil Creek as an example, we show community and civic activist how they can restore and protect the rivers in their own communities.

Why are you interested in reclamation efforts such as Cabin Branch Mine?

Rivers are very important to the health and resilience of our environment. Just looking at a river flowing by is peaceful and beautiful, and playing on and around rivers if fun and refreshing. Those things are nice, but there are other really important reasons we need healthy rivers. We often get our drinking water from rivers, and food, too, such as freshwater fish. Rivers provide habitat for lots of plants, fish and wildlife that are part of the food chain and the web of life. Many species of birds depend of the river for nesting and food. Healthy rivers also protect us from bad flooding because the wetlands around them act as a sponge soaking up the excess water. Healthy river flooding will also keep local farmland rich and fertile.

Pollution such as acid mine tailings can drastically change the chemistry of the water, killing off plants, small organisms such as macro-invertebrates (river bugs), fish and subsequently other wildlife as well. Quantico Creek ultimately drains to the Chesapeake Bay and the Atlantic Ocean. Pollution from Quantico Creek will move through the watershed hurting the health of the bay and ocean as well. We are all connected. What we do in our neighborhood or on our stream, will affect the animals and plants in and around us, as well as everyone and everything down stream.

What are some good strategies for getting people to understand the value of rivers?

Talk about your personal feelings and your connection to rivers and streams. Explain why you care so much about healthy waterways and river systems. Know your facts. Be able to talk about the bad effects of acid mine drainage on the stream and local environment. Also, know the effects of this water pollution on people. Be honest, knowledgeable, and passionate, and people will listen.

Environmental Protection Agency

Profile

Why did the EPA focus on the reclamation of the Cabin Branch Mine?[10] Virginia's Nonpoint Source Pollution (NPS) Management Program has long recognized the need to improve surface and ground water quality by reducing nonpoint source pollution associated with abandoned and orphaned mineral mines.

(Nonpoint source pollution doesn't come from a specific company or industry but from an undefined source. One example is the fertilizer that washes off your lawn during a rainstorm and is swept into the storm drain where it enters creeks and rivers.)

Virginia's Department of Conservation and Recreation's Division of Soil and Water (VDCRSW), which administer the NPS program, partnered with the Virginia Department of Mining, Minerals and Energy's (VDMME) Orphaned Lands Program to support several innovative reclamation projects in order to achieve water quality goals.

What was the goal of the reclamation effort?

The primary goal of the Cabin Branch Mine Orphaned Land Project was to improve the water quality of the downstream reach of Quantico Creek, contaminated by acid drainage and heavy metals. Additional goals included making the site safer for park visitors, and restoring native vegetation. Reclamation plans included diverting storm waters away from the mine site to limit acidification of off-site storm waters, dredging spoil materials from Quantico Creek, sealing all shafts so surface water would not enter mine workings or groundwater, covering mine spoil materials with good soil medium, and revegetating all disturbed areas with tolerant grasses. All of these actions were designed to reduce acid mine drainage discharges, thereby reducing heavy metal concentrations in the surface waters.

And finally, as part of the research project on amphibian reproduction within the storm-water detention ponds at the reclamation site, a park wide amphibian monitoring program was initiated. This program includes a dynamic educational component consisting of a brochure, an intranet page, an interactive CD-ROM, and a detailed training manual. Interpretive staff is also developing additional amphibian programs.

What measurements did you use to determine if efforts were successful?

Water chemistry monitoring of Quantico Creek was conducted before and after reclamation of the Cabin Branch Mine site in order to quantify success of the reclamation project. Initial water sampling taken after reclamation activities were completed showed a marked decrease in the presence of heavy metal contamination in Quantico Creek. A two-year monitoring program conducted by George Mason University confirmed that levels of copper, zinc and iron in the stream have been appreciably reduced since project completion. Sulfate levels and conductance have also improved. In addition, remotely sensed images taken by the US Corp of Engineers pre- and post-reclamation visually illustrate the elimination of acid materials from the creek itself. The George Mason study also included fish and invertebrate sampling of the stream. The fish community in the downstream reach has increased in both number of taxa and number of individuals since the project was completed.

[10] "Cabin Branch Mine Orphaned Land Project:." Environmental Protection Agency. 13 May 2008 http://www.epa.gov/reg3wapd/nps/pdf/success/va/cabinbranch.pdf.

Delvin Fanning
Soil Scientist

What is your background?

I received my BS and MS degrees from Cornell University, and my Ph.D. from the University of Wisconsin. In 1964, I joined the faculty at the University of Maryland, where I am currently Emeritus Professor of Soil Science (which means that I've retired but I continue to do research). When I was a professor, I taught courses in Soil Morphology (how soil is arranged), Genesis and Classification and in Soil Mineralogy. In 1989, I published a textbook entitled *Soil: Morphology, Genesis, and Classification*. I was recognized as a Fellow of the American Society of Agronomy and of the Soil Science Society of America

What is soil science? How is it different than geology?

A geologist wants to know how the Earth was made and studies the planet's structure way below the soil. A soil scientist studies the upper few meters of the Earth in order to find out about what the soil is made of, how it's distributed and how it's chemical and biological elements are arranged

What was the focus of your work?

So my work deals with the management of residential, commercial, industrial, and agricultural lands and land development. Soil science information is used to make land development decisions by local and state governments and is used in planning and engineering land development projects.

Why is soil science important?

Everything in life depends on soil. So knowing as much as we can about soil will help in food production, reducing erosion, conserving natural resources and determining how to best use the land.

What do you consider to be your most important achievements?

Throughout my career, I've worked a lot in the area of Acid Sulfate Soils, like those at Prince William Forest Park. I've made an effort to get scientists, and decision makers, to understand the significance of acid sulfate soils in a variety of geomorphological settings. I've worked very hard to help people become aware of the potential environmental hazards associated with exposing sulfidic (potentially acid) materials.

I've also focused on disturbed or highly man-influenced soils. Two areas of research — sulfate weathering and disturbed soils — were part of my work on classifying soils formed in coal mine spoil in the Appalachian province and in studies on soils formed from materials dredged from estuarine harbors along the Atlantic Coast. I hope that the work that I've done has helped scientists and community leaders more effectively address soil problems caused by abandoned mines, like Cabin Branch Mine in Prince William Forest Park.

Laura Cohen

Prince William Forest Park

What does a park interpreter do? Do you have to speak different languages?

National Park Service interpretive rangers are the ambassadors for our parks to the American people. Like people who translate the languages, we translate the meanings of our park resources (trees, history, stories etc.) to people who may be unfamiliar with them. Visitors to national parks come from a variety of backgrounds and bring with them a variety of experiences and expectations. It is our goal to inspire an understanding of our park resources in each visitor. We do this through interpretation, understanding; through understanding, appreciation; through appreciation, preservation. It is also important to keep in mind that interpretive park rangers do not just give programs and presentation; they often collect entrance fees; they often issue back country camping permits; they often prepare and design the park website and other publications; they rove the park on foot, car or bike to ensure that visitor needs are met; they work with volunteers and partners to develop programs and project that benefit the public. An interpretive ranger wears many hats.

What job experience/education is necessary for this job?

A park ranger must possess a variety of skills to be successful at this job. At the introductory level, customer service and public speaking skills are the most important. As a ranger climbs the career ladder, skills such as project management, computer skills, negotiation and time management all come into play. Many interpreters start out as volunteers or interns to build these skill sets and get experiences in national parks before they are hired on.

How does your job interface with other onsite park personnel?

Interpretive park rangers interact with every other division in the park. We work with law enforcement by reporting visitor incidents, like vandalism, and by assisting in first aid or other emergencies. We work with maintenance to ensure that visitor needs are met and that safety concerns are quickly taken care of. We work with resource management to communicate important resource protection message and to ensure that the public is properly using our park resources. We work with management by communicating the priorities of management to the public in a way that builds support for the park. There is no division in a national park that can work independent of each other; like spokes of a wheel, it is all about teamwork.

If there were to be a new visitor center, what role would you play?

An interpretive park ranger would work with park management and the visitor center designers from the beginning. We would assist designers in determining the best placement of the visitor center based on visitor use and park meanings. An interpretive ranger might assist in the design by informing the designers of the main interpretive themes of the park that would inspire the architecture of the building. We would also assist park management by building support and excitement for the visitor center by supplying the public with information about the new building through press releases, the website, park newsletters and other means. Finally, once the visitor center was built, interpretive rangers would help designers construct the layout and design of the exhibits and visitor center desk. The visitor center is often the first stop for people that are new to your park. Its exhibits should create the connection between the visitor and the park's resources and stories so that they will come back again and again and protect the park for perpetuity.

Think Globally, Act Locally

"Think globally, act locally" is a common phrase among those who want to protect and restore the environment. It means that while we recognize that environmental problems are worldwide, we can help solve them where we live. Recognizing a problem is the first step toward a solution, but recognition by itself is not enough. The real solution must take place at a local level, and it begins with you. You've observed a stream habitat in a national park and thought about how your activities could impact runoff and sediment in the river. The next step is to take what you've learned and apply it at the local level in your community.

During your visit to the park, you investigated a local environment, your watershed—the basin that collects, transports, and holds the freshwater upon which your life depends. This module and the trip to the national park were designed to heighten your awareness and to help you understand the important role you play in the health of the Potomac River watershed. The everyday choices you make about how you interact with your environment make an important, long-term difference, not only to the area where you live, but also to the Earth as a whole.

Goals:

To increase awareness of the need for individual environmental action.

To "act locally" and get involved in a service project.

YOU CAN MAKE A DIFFERENCE. You have already made a difference by submitting your assessment of the health of a stream to the national park you visited. There are other things you can do to maintain and increase the health of your watershed. Here are a few possibilities:

- **Change personal choices** by modifying one or more behaviors in your daily activities.
- **Influence your peers** by holding a brainstorming session with your classmates to think of other ways to make a difference and improve the quality of life in your watershed. Make a poster of your ideas and hang it in a prominent place in your school.
- **Make a difference** to a specific site such as the park you visited or an area near where you live. Visit the *Bridging the Watershed* web site, where you will find links to organizations that offer opportunities to get involved in service projects in the Potomac River watershed.

www.fergusonfoundation.org

I am part of something much greater than myself.

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