



Exploring Great Falls: Site Guide and Lesson Plan Secondary Education



Spanning the state of Maryland and bordering the Potomac River, the Chesapeake and Ohio Canal National Historical Park has an estimated 1,000,000 school-aged children within a 45-minute drive. The C&O Canal Classrooms Education Program encourages students to explore natural and historical resources in a setting that provokes thought, inspires wonder and ignites understanding.

Table of Contents

Exploring Great Falls: At a Glance	1
A Letter to Students	2
Map	3
Planning a Successful Visit	4
Safety Considerations	6
Additional On-line Resources about the C&O Canal and the National Park Service.....	8

Need to reach us? Call 301- 714-2213 (the park’s education line) or email cocanaleducation@nps.gov

Go digital. Find teacher resources including field trip reservations and pre- and post-visit classroom activities at www.nps.gov/choh/forteachers

Like us. Find us on Facebook at Chesapeake and Ohio Canal National Historical Park, on Twitter @candocanal, or on Instagram at chesapeakeandohiocanal.

Exploring Great Falls: At a Glance

Students will explore the history, life on Canal, and engineering of the C&O Canal, while uncovering manmade and natural changes to the environment. Students will differentiate between man-made and human features and how they affect the environment, compare the past and present to understand what life was like for people on the C&O Canal, and explore the function and design of technology from the past using primary sources.

As a result of visiting Great Falls, students will be able to:

1. Define the relevancy of national parks with a focus on preserving the C&O Canal as a place to learn and explore our history.
2. Describe the many challenges faced by those who lived and worked on the canal, particularly Lock tenders and Canallers/boat crew
3. Examine the role of flooding as a major challenge in both canal history and present day
4. Describe George Washington's Dream/Vision for a water-transportation route West
5. Understand the process and operations of a lock
6. Describe the process and operations of locking a boat through
7. Identify various plant and animals species in the floodplains of the Potomac

The park partnered with Montgomery County (Maryland) Public Schools to develop this field trip day along with pre- and post-visit activities for your classroom. Completing the classroom activities will enhance student learning. The lessons include a mapping project, a critical thinking activity, a reader's theater, and several math and estimation activities. See Appendix A or our website for the materials:

<http://www.nps.gov/choh/forteachers/classrooms/greatfallsfieldtrips.htm>

Duration	Up to 160 minutes
Arrival Time	10:00 AM (or call us for another start time)
Best Time to Plan Trip	Spring or Fall
Group size	Up to 120 students, may be divided into smaller groups <i>Please note: you may be scheduled the same day as another school</i>
Grade	Middle and High School
Chaperone to Student Ratio	1 to 5 (maximum); 1 to 15 (minimum)

A Letter to Students

Teachers, please distribute and read with your students and provide as a take home to parents.

Dear Students,

We rangers, teachers, and volunteers in the Canal Classroom Corps look forward to meeting you and spending a few hours exploring Great Falls together.

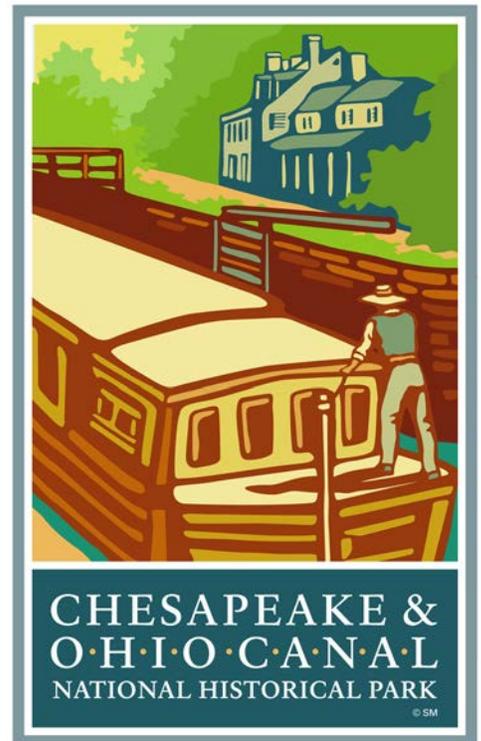
The 184.5 mile long Chesapeake & Ohio Canal is a special place that was important in American history. For nearly 100 years, the canal was a water highway, bringing Western Maryland's natural resources like coal, lumber, and agricultural products to the markets in Georgetown, near Washington, D.C. Today it is a pathway for discovering historical, natural, and recreational treasures.

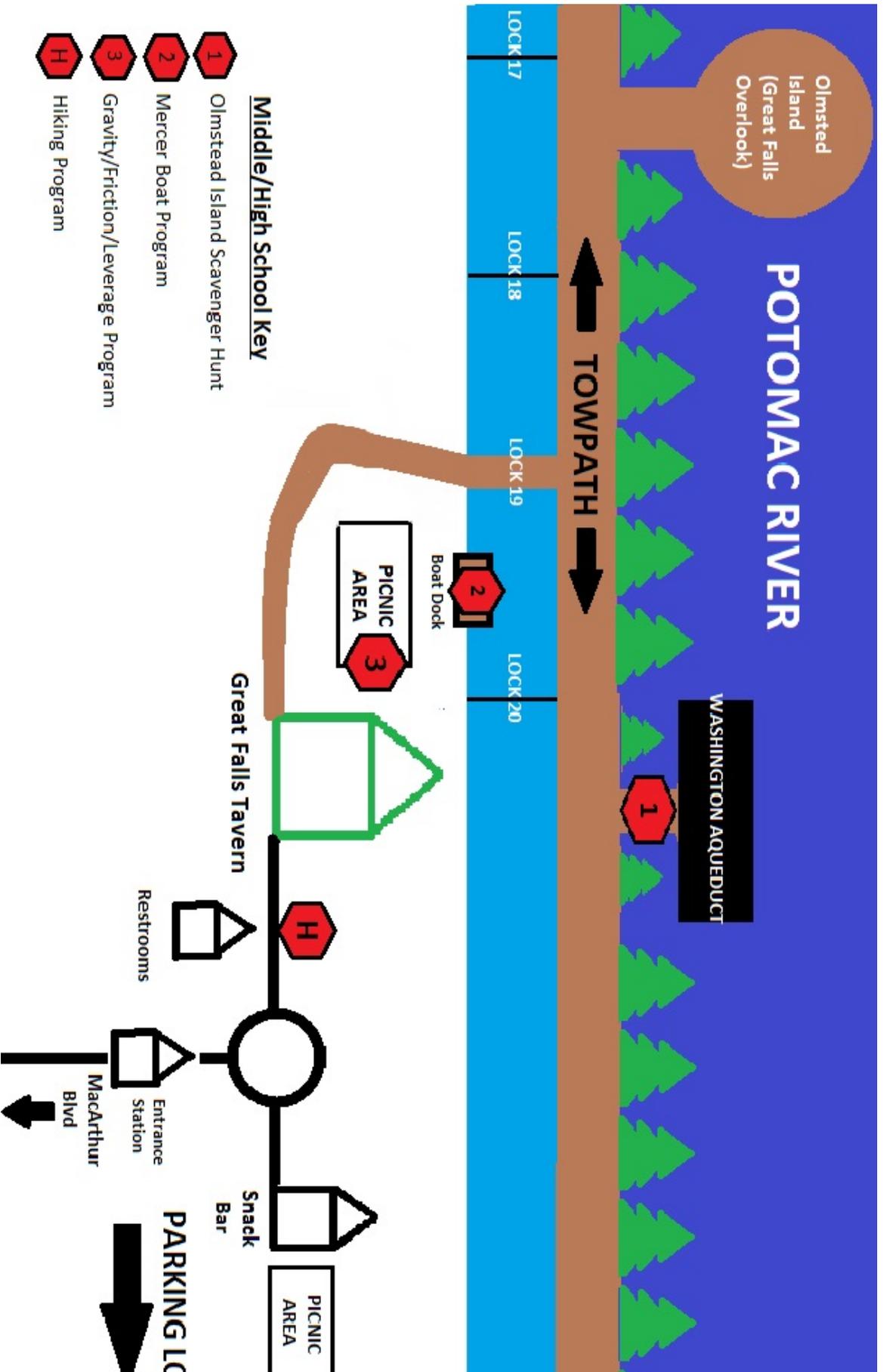
We will be outside for much of the day, so please dress appropriately. Check the weather forecast for the day, and remember to bring a coat for rain or cool morning temperatures. We will be walking on the towpath, which is covered with small rocks, so remember to wear sneakers or boots. Feel free to wear a hat and bring a water bottle. Finally, we do not have garbage cans in the park, so please pack your lunch in reusable containers and/or your teacher will collect your trash and take back to school to dispose.

We know it will be a fun day of learning, and we can't wait for your visit. It will be an adventure.

Happy Trails,

Ranger Hollie





Planning a Successful Visit

What to Wear

- Remind students to wear appropriate footwear for this extended outdoor experience. Flip flops, slip-on shoes, or sandals are not appropriate.
- We suggest wearing layers. Pants are the best precaution against cool temperatures, bee stings, ticks, and poison ivy.
- Students may wear hats for sun protection and/or warmth.
- Everyone should carry a reusable water bottle.
- Programs will go on in light rain or snow. Encourage everyone to have proper outer wear such as a rain or warm coat.

Planning for Lunch

- Lunch will be outside, at shady picnic tables next to the Tavern. If the weather is bad, students will eat lunch on their buses or in the Tavern, depending on group size.
- The Chesapeake & Ohio Canal National Historical Park is trash free. Bring a trash bag or two and plan to take all garbage with you. Encourage students to pack lunches in reusable containers.
- We want animals to eat only wild food sources, so we will provide an indoor (non-refrigerated) storage location for lunches and trash.

Communication

- Cell phone coverage is spotty at Great Falls. Please ask all students, teachers, and chaperones to silence their mobile devices upon arrival.
- For non-emergencies, call (301) 767-3716. For emergencies, call 911 or (866) 677-6677 (this is the National Park Service dispatch center).

Chaperones

- At minimum, please have one chaperone (teacher or other adult) for every 30 students. In order to keep programs manageable, do not exceed one chaperone for every 10 students.



Exploring Great Falls

Page 5

- Chaperones should be an active part of the lessons—keeping up with the group and actively listening. We will likely call on chaperones to assist (handing out materials, sub-dividing groups, crowd control, etc.).
- During programs, refrain from holding conversations with other chaperones or using a cellular phone.
- No smoking during the trip.

Directions

The Great Falls Tavern is located at 11710 MacArthur Blvd, Potomac, MD, 20854. We are in Maryland, NOT Virginia!

Arrival

- Please arrive on time at 10:00 AM.
- The Canal Classroom Corps staff will be waiting for your bus to drop students off at the circle. Buses may park at the far end of the parking lot, where there is designated parking for them.
- The Great Falls area is equipped with restrooms near the Tavern.

Great Expectations

The Chesapeake & Ohio Canal National Historical Park is a federally-protected public use area. Please be good stewards during your visit. Do not pick the plants or take anything from the park.

Special Needs

Let us know if any of your students have special needs.

Cancellations

Field trips may be cancelled in very cold weather or heavy downpours or storms. If flooding or severe inclement weather is predicted, a Canal Classroom Corps member will call to reschedule your field trip. If you need to cancel, let us know as soon as possible by calling (301) 714-2213.



Safety Considerations

Lock 20

Exploring Great Falls

Page 6

Students may have the opportunity to operate Lock 20. They must follow all instructions from the park staff about how to approach, operate, and leave the lock area.

Great Falls Overlook

Students will have the opportunity to view the Great Falls Overlook at Olmsted Island if they participate in the Scavenger Hunt Activity. The overlook is completely fenced in, but please do not sit on the railings or try to climb over the barriers in place.

The Mercer Boat

During the Boat Program, students will ride our own historic replica packet boat. Students must follow all safety precautions when riding the boat, and keep arms and legs inside the boat at all times. In addition, there is no restroom on the boat. Please use restrooms before embarking on the boat ride.

Bikers

The towpath is an active recreation corridor. Please ask students to remain in single file or gather in short, grassy areas off the towpath.

Ticks

You will be in areas where ticks are found. Remind students to take precautions such as wearing insect repellent, staying on the towpath, and checking frequently and thoroughly for ticks.

Snakes

Two species of poisonous snakes are found in the park: the Northern Copperhead and the Timber Rattlesnake. Students should be cautious where they place their hands and feet.

Stinging insects

You will be in areas with hornets, wasps, and bees, which can cause severe allergic reactions in sensitive individuals. Chaperones should carry epinephrine pens with them.



Rabies

All animals in the park are wild and their behaviors are unpredictable. Treat all animals with caution.

Poisonous plants

You will be visiting an area with poison ivy and other noxious plants. Stay alert and stay on the towpath or in mowed areas.

Sun and Heat Exposure

Remind students to wear sunscreen and a hat to avoid exposure to sun. Students are invited to carry water (preferably from a refillable water bottle) and stay in the shade to avoid heat exposure.

Wind and Inclement Weather

Because of falling tree hazards, we will not go on the towpath if wind gusts are more than 30 m.p.h. If the predicted high temperature is less than 40°, we will stay inside the trolley barn. If there is lightning at any distance, programming will continue in the trolley barn.

Additional On-line Resources about the C&O Canal and the National Park Service

Description		Website URL
C&O Canal NHP	The park's website for teachers hosts classroom materials and on-line resources	http://www.nps.gov/choh/learn/education/index.htm
C&O Canal Trust	The park's partner in education provides 50 short stories about places along the C&O Canal for students to read	www.canaltrust.org
National Park Service	Learn more about the NPS mission, history, and organization	www.nps.gov/aboutus/index.htm
National Park Service America's Best Idea	More facts about the NPS, including an excellent timeline and movies	http://www.nps.gov/americasbestidea/

Field Trip Scheduling

The following is a template for a suggested trip to the C&O Canal. When scheduling programs, please keep in mind the following:

- A. We are located in MARYLAND, not Virginia
- B. Traffic in morning commute to Great Falls
- C. Size of group*
- D. Timing of programs**
- E. Allow time to stop at Park Entrance Station

*Group sizes can be a factor on our Ride the Mercer Boat Program. The boat can accommodate a maximum of 60 PEOPLE per boat ride, however, for best program purposes, we ask that the group size be about 30 PEOPLE per ride. When the group size is smaller, students get a better, more personal experience from our educators.

**Our park is open from 9 am – 4:30 pm. Most school groups arrive around 10 am and leave the park in the early afternoon. We ask that groups to stick to the 10 am arrival time. Below is a suggested itinerary; however, we can try to accommodate different timing requirements that your group requests.

Suggested Program Schedule

10:00 am – Students arrive at Great Falls

10:05 am – Students are greeted by park staff

10:15 am - Separate into programs

10:30-11:30 am – Program 1

11:30-12:15 pm – Lunch

12:15-1:15 pm – Program 2

1:15-1:30 pm - Wrap Up

1:30 – School buses depart Great Falls

Optional: Late afternoon program 1:30-3:00; Programs available at this time are dependent upon staffing. However, a teacher-led program, such as a hike, is always an option.



Ride the Mercer Canal Boat Program

C&O Canal – Great Falls – Secondary

Ride the Mercer Canal Boat Program

Students will explore the history, life on Canal, and engineering of the C&O Canal, while uncovering manmade and natural changes to the environment. Students will differentiate between man-made and human features and how they affect the environment, compare the past and present to understand what life was like for people on the C&O Canal, and explore the function and design of technology from the past using primary sources.

Students will ride along the historic C&O Canal in a mule-drawn canal boat. They will experience rising 8 feet in a lock. They will be able to describe what life was like for the families that lived and worked on the canal through the analysis of primary sources.

At the end of the activity, students should be able to...

1. Describe social and economic life on the canal in the 1800s.
2. Analyze the challenges of traveling along the canal using primary sources.

Duration	1-1.5 hours
Best Time to Plan Trip	Spring or Fall
Group size	Approximately 30-60 students; for some activities, we will break out into groups of 5-6 students each
Grade	Middle and High School
Chaperone to Student Ratio	Chaperones: 1 to 10 (maximum); 1 to 30 (minimum)

Standards

<p>Middle School Standards: <i>English Language Arts-History/Social Studies: CCSS.ELA-Literacy.RH.6-8.1; CCSS.ELA-Literacy.RH.6-8.2; CCSS.ELA-Literacy.RH.6-8.6; CCSS.ELA-Literacy.RH.6-8.7; CCSS.ELA-Literacy.RH.6-8.8</i> <i>Social Studies State Standards: 5. B.3.a; 5.C.3.a; 6.A.1.a; 6.A.3.e; 6.A.3.f; ESS3.C</i></p>	<p>High School Standards: <i>English Language Arts-History/Social Studies: CCSS.ELA-Literacy.RH.9-10.1; CCSS.ELA-Literacy.RH.9-10.2; CCSS.ELA-Literacy.RH.9-10.3</i> <i>US History State Standards: 1.A.1.d; 1.A.2.a; 1.A.4.b; ESS3.C</i></p>
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Ride the Mercer Canal Boat Program

C&O Canal – Great Falls – Secondary

Pre Visit Activity: Meet the C&O Canal

Option A

1. Read through newspaper accounts from the 1800's. Determine the use and the specific type of resources transported by the canal. What were the hazards associated with the canal?

Source: <http://candocanal.org/histdocs/Newspapers-1864.pdf>

COMPILATION OF CANAL TRADE ARTICLES FROM THE ALLEGANIAN A CUMBERLAND NEWSPAPER 1864 ALLEGANY COUNTY, MD Compiled by William Bauman C & O Canal Association Volunteer, August 2012.

2. Watch the 3 minute video “Locking Through” of how the canal locks operate.

Source: <http://www.nps.gov/choh/photosmultimedia/multimedia.htm>

3. Watch the 5 minute video “Mule Power” to learn more about the importance of mules on the canal.

Source: <http://www.nps.gov/choh/photosmultimedia/multimedia.htm>

Option B

Look at a physiographic map of the C&O National Park. Study the map - what advantages and obstacles did early settlers face traveling west?

Source: http://www.cr.nps.gov/history/online_books/grfa/images/fig5.jpg

Post Visit Activity: Up and Down the Canal

Option A

Have students design a lift lock using materials from home or in the classroom. Ask them to include the important STEM elements in their design.

Option B

Have students choose one of the demonstrations or activities from the field trip and make a claim about why that science, technology, engineering or mathematical feat/information is critical to the function of the canal.

Option C

For middle school life sciences students: Have the students create and draw a hybrid animal, like the mules, and explain why they combined two particular animals. For high school students: reflect on what you know about biology (or do some research about different hybrid plants and animals) in order to create your own hybrid plant or animal. Next, write a paragraph that includes a claim of whether or not their hybrid organism could occur in nature citing supporting evidence or research.

Option D

Students design a canal boat using the real life canal boat dimensions – 90 ft length, 14.5 ft wide and drawing 4.5 ft when loaded. Students will include the following areas in their design: Captain's Cabin, Mule Shed, Hay House, and two large Cargo Holds. This activity can be done on graph paper or using real materials such as wood, cardboard, Styrofoam, etc. When complete, ask students to write an opinion piece on the viability of the canal boat as a transportation method today.



Olmsted Island Nature Scavenger Hunt

C&O Canal – Great Falls – Secondary

Olmsted Island Nature Scavenger Hunt

Students may not realize that there are clues around them in the natural world that can be used to determine what has happened in the past and predict what may happen in the future. During the activity, students will need to link what they are seeing to evidence of flooding. For example, they will see tree trunks on top of rocks above the current water level indicating that they were moved by flowing water at some point. They will find Asiatic clam shells on the ground near where they are walking indicating that the water was much higher at some point. They will see moss in some areas and lichens in some areas, etc.

Students will hike from the Washington Aqueduct, down the towpath and Olmsted Island Trail to the Great Falls Overlook and back while making observations, finding specific features and answering location-specific questions.

At the end of the activity, students should be able to...

1. Identify biotic and abiotic factors along the trail.
2. Use evidence observed to make predictions and draw conclusions.
3. Determine how the natural features of the area influenced human ingenuity and invention.

Duration	1-1.5 hours
Best Time to Plan Trip	Spring or Fall
Group size	Approximately 30 students; for some activities, we will break out into groups of 5-6 students each
Grade	Middle and High School
Chaperone to Student Ratio	Chaperones: 1 to 10 (maximum); 1 to 30 (minimum)

Standards

Anchor Standards for All Grades: <u>CCSS.ELA-Literacy CCRA Writing #1;</u> <u>CCSS.ELA-Literacy CCRA Writing #7;</u> <u>CCSS.ELA-Literacy CCRA Speaking</u> <u>Listening #2</u>	Middle School Standards: <i>Life Science 2.A Interdependent Relationships in Ecosystems 6-8;</i> <i>Life Science 4.D Biodiversity and Humans 6-8;</i> <i>Earth Science: MS-ESS2-2; MS-ESS2-3; MS-ESS3-2;</i> <u>CCSS.ELA-Literacy.RST.6-8.4;</u> <u>CCSS.ELA-Literacy.RH.6-8.7</u>	High School Standards: <i>Life Science 2.A Interdependent Relationships in Ecosystems 9-12;</i> <i>Life Science 4.D Biodiversity and Humans 9-12;</i> <i>Earth Science: HS-ESS2-2; HS-ESS2-7; HS-ESS3-1; HS-ETS1-1;</i> <u>CCSS.ELA-Literacy.RST.9-10.4;</u> <u>CCSS.ELA-Literacy.RST.11-12.4;</u> <u>CCSS.ELA-Literacy.RH.11-12.7</u>
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Olmsted Island Nature Scavenger Hunt

C&O Canal – Great Falls – Secondary

Pre Visit Activity: Meet the C&O Canal

Use at least one of these lessons as a pre-visit classroom activity.

Option A (Recommended)

Look at a physiographic map of the C&O National Park. Study the map - what advantages and obstacles did early settlers face traveling west? Source: http://www.cr.nps.gov/history/online_books/grfa/images/fig5.jpg

Option B

Check out information available on Potomac River water levels at Little Falls (between Great Falls and Washington DC) on the USGS National Water Information System website.

Source: http://waterdata.usgs.gov/usa/nwis/uv?site_no=01646500

Ask students to locate the river gauge on the map, by selecting from the drop down menu. What is the proximity to Great Falls? Washington DC? Ask students to use the other drop down features to search for what type of information is available on this website. Ask them to search data during a flood event, i.e. Hurricane Sandy, 2012, and make observations about the how an increase/decrease in water effects the other data sets. Ask students to think about why this information might be important for the public to know, access?

Post Visit Activity: Know Your Water

Option A (Recommended)

Where does your water come from? After learning about the Washington Aqueduct supplying water for Washington DC residents and businesses, ask students to research where their water comes from. "What kind of drinking water do you use at home?" Take a class poll by completing the questions on the following website and examine previous responses. What can you determine by examining previous responses? Are most of the countries listed considered modern societies? How do most people get their water? <http://water.usgs.gov/edu/sq2.html>

Where does the water go? After understanding where our water comes from, ask students to think about where water goes by completing the "Where does the water cycle begin?" activity found at <http://water.usgs.gov/edu/watercyclebegin.html>

Examine the processes at a Waste Water Treatment facility by viewing the activity at <http://water.usgs.gov/edu/wwvisit.html> - Ask students to explain how the wastewater treatment facility helps supply their water and/or clean the water they have used.

Option B (Recommended)

Field Trip Debrief. After visiting the canal, ask students the following questions to create a dialogue about their experience and how it is relevant to their lives. At the time the canal was built, there was a great need to move goods and merchandise down the Potomac River towards Washington, DC.

1. How did the natural landscape of the area (rocks, river, etc.) affect human activity?
2. What evidence did you find that indicates that the water level of the river changes over time?
3. What would be a major problem with trying to travel by boat down the river?
4. How does the canal fix this problem?
5. Is it possible to move a boat uphill along the canal so that people and goods can be transported from Washington to the West?
6. How do the locks work to make this happen?
7. Do you think it would be profitable today to use canals for shipping goods? Explain.



Friction, Leverage, and Gravity: The Physics of the Canal

C&O Canal – Great Falls – Secondary

Friction, Leverage, and Gravity: The Physics of the Canal

In this activity, students will explore the history and engineering of the Chesapeake and Ohio Canal. Students will develop an understanding of the C&O Canal’s purpose and function. Students will differentiate between man-made and human features and how they affect the environment, compare the past and present to understand what life was like for a people on the C&O Canal, and explore the function and design of technology from the past.

Students will rotate through three stations exploring canal operations and canal life via STEM hands-on demonstrations of friction, leverage and gravity. Students will also ‘Meet the Mules’ and learn about how this invaluable hybrid animal supported C&O Canal operations.

At the end of the activity, students should be able to...

1. Understand the limitations to technology.
2. Explain the hardships of canal boat life.
3. Explain the use and function of the canal lock system.

Duration	1-1.5 hours
Best Time to Plan Trip	Spring or Fall
Group size	Approximately 30 students; for some activities, we will break out into groups of 5-6 students each
Grade	Middle and High School
Chaperone to Student Ratio	Chaperones: 1 to 10 (maximum); 1 to 30 (minimum)

Standards

<p>Middle School Standards: <i>CCSS.ELA-LITERACY.RH.6-8.7; CCSS.ELA-LITERACY.RH.6-8.2; Standard 4.0 Economics; MS- ETS1-1; MS-ETS1-1; MS-PS2-1; MS-PS2-2; MS-PS2-4; CCSS.MATH.CONTENT.2.MD.A.1; CCSS.MATH.CONTENT.2.MD.A.3</i></p>	<p>High School Standards: <i>HS-ETS1-1; HS- ETS1-3; HS-PS2-1; HS-PS2-2; HS-PS2-3; HS-PS2-4; CCSS.MATH.CONTENT.2.MD.A.1; CCSS.MATH.CONTENT.2.MD.A.3</i></p>
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Friction, Leverage, and Gravity: The Physics of the Canal

C&O Canal – Great Falls – Secondary

Pre Visit Activity: Meet the C&O Canal

Option A

1. Read through newspaper accounts from the 1800's. Determine the use and the specific type of resources transported by the canal. What were the hazards associated with the canal?

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3. Watch the 5 minute video “Mule Power” to learn more about the importance of mules on the canal

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Option B

Look at a physiographic map of the C&O National Park. Study the map - what advantages and obstacles did early settlers face traveling west?

Source: http://www.cr.nps.gov/history/online_books/grfa/images/fig5.jpg

Post Visit Activity: Locking Through

Option A

Have students design a lift lock using materials from home or in the classroom. Ask them to include the important STEM elements in their design.

Option B

Have students choose one of the demonstrations or activities and make a claim about why that science, technology, engineering or mathematical feat/information is critical to the function of the canal.

Option C

For middle school life sciences students: Have the students create and draw a hybrid animal, like the mules, and explain why they combined two particular animals. For high school students: reflect on what you know about biology (or do some research about different hybrid plants and animals) in order to create your own hybrid plant or animal. Next, write a paragraph that includes a claim of whether or not their hybrid organism could occur in nature citing supporting evidence or research.

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