

“WaterPower” Curriculum Design

Title	Lesson 1	Lesson 2	Lesson 3	Field Study	Lesson 4
	Pre-Industrial WaterPower In Europe	Catherine’s Cotton Factory	Human Impact on River Environments	Harpers Ferry National Historical Park	Contemporary River Use Conflicts
Time and Materials Needed	90 minutes Copies of “Your Village” Crayons, Markers, or Pencils: Blue, Brown, Red, Black, Orange, Yellow, Green	45 minutes without optional homework assignment Copy of “Locating a New Mill” map	45 minutes, unless students need additional time for composition. Copies of graphic organizers (see teacher guide for explanation)	30 minutes in the classroom, 2-3 hours in the park. Harpers Ferry Map, Student Field Study Guide, clipboards. Supplied by park: oranges, compass, timer, 10 m tape, turbidity kits, permeability kits, 3 m measuring rod.	45 – 135 minutes Access to research tools. Lined paper for writing. Art supplies if alternative assessments such as posters are allowed.
Unit Summary	Introduces the idea and effects of waterpower use by humans, setting the stage for the following lessons and the field study at Virginius Island.	Introduces students to the workings of a 19 th -century cotton mill and teaches them, in depth, how the turbines power all of the machines used to weave cloth.	Introduces students to the behavior of a naturally- flowing river during both normal conditions, and flood conditions, and contrasts that river with one that has been used to generate power for human use.	Students perform experiments to determine what happened to the industries on Virginius Island.	Requires students to research and evaluate a 21 st -century river use conflict.
Enduring Understandings	Human use of resources, in this case a creek, impacts both human life and the resource itself.	Rivers possess an enormous amount of energy that can be harnessed relatively easily.	Under normal conditions, rivers undergo a natural cycle of sedimentation and scouring, but that process can be interrupted by humans.	Choices have consequences; our relationship with nature is two-way, decisions that were appropriate for one time may not be appropriate for another time.	There will always be conflict related to the use of rivers, every option has both costs and benefits, and different solutions are appropriate for different circumstances.
Essential Questions	How does the environment shape human experience? In what ways does human use of natural resources alter those resources? When humans use resources, are conflicts inevitable? Why?	How much power do rivers really possess? How much of a river’s power can be harnessed for human use?	How do rivers behave under normal or “natural” conditions? How do rivers behave when they have been modified to provide power for human use?	What are the consequences of using rivers as power sources? How do humans place value on natural resources? Has human ability to manage nature improved over time? Is attempting to manage nature a reasonable goal?	What happens as we run low on resources? Is cooperation always the best solution? How much are our rivers worth? Should we go to war over them?

<p>Key Knowledge & Skills</p>	<p>Describe how waterpower was used in pre-industrial Europe.</p> <p>Demonstrate changes in settlement patterns as the use of waterpower intensified.</p> <p>Predict pollution and other negative consequences of intense over-use of a water resource.</p>	<p>Water wheels are inefficient because they fight gravity and waste head; in addition, they only use a small percentage of their surface area at any time.</p> <p>Turbines eliminate all of those weaknesses and produce much more power.</p> <p>Power can be utilized by many hundreds of machines simultaneously.</p>	<p>Run-off from forests is vital to the life of a river.</p> <p>Floods are good for rivers and the environments around them.</p> <p>Human use of rivers as a power source can interrupt a river's distribution of nutrients and its behavior during flooding.</p>	<p>Background of Harpers Ferry</p> <p>Experimental procedures will be learned in the field -- turbidity, permeability, soil type</p>	<p>Varies depending on the river conflict chosen by individual students.</p>
<p>Performance Tasks</p> <p>Students will:</p>	<p>Predict how life could change when the people in a village move to a site near the creek.</p> <p>Describe how waterpower changed several trades in pre-industrial Europe and predict how increased waterpower use could result in future conflicts.</p> <p>Design a village that uses water power from a local creek to drive several trades, label point sources of pollution and what the consequences of these might be.</p> <p>Optional: Demonstrate an ability to integrate recent learning into a scientifically valid narrative of how their imaginary village would be affected by its creek.</p>	<p>Compose a letter to the 19th-century girl explaining in detail how the turbines at her mill operate.</p> <p>Describe the best place to build a new factory in a hypothetical setting and the rationale for placement.</p>	<p>Complete map/graphic organizers that describe river behavior and write two short essays using the information contained on their map/organizers.</p> <p>Assert and defend a position related to human use of river power.</p>	<p>Perform experiments to assess the Shenandoah River's impact on Virginius Island and reflect on the location as a future industrial site.</p>	<p>Discuss and evaluate contemporary river use conflicts.</p> <p>Research and present a 21st-century river use conflict.</p>