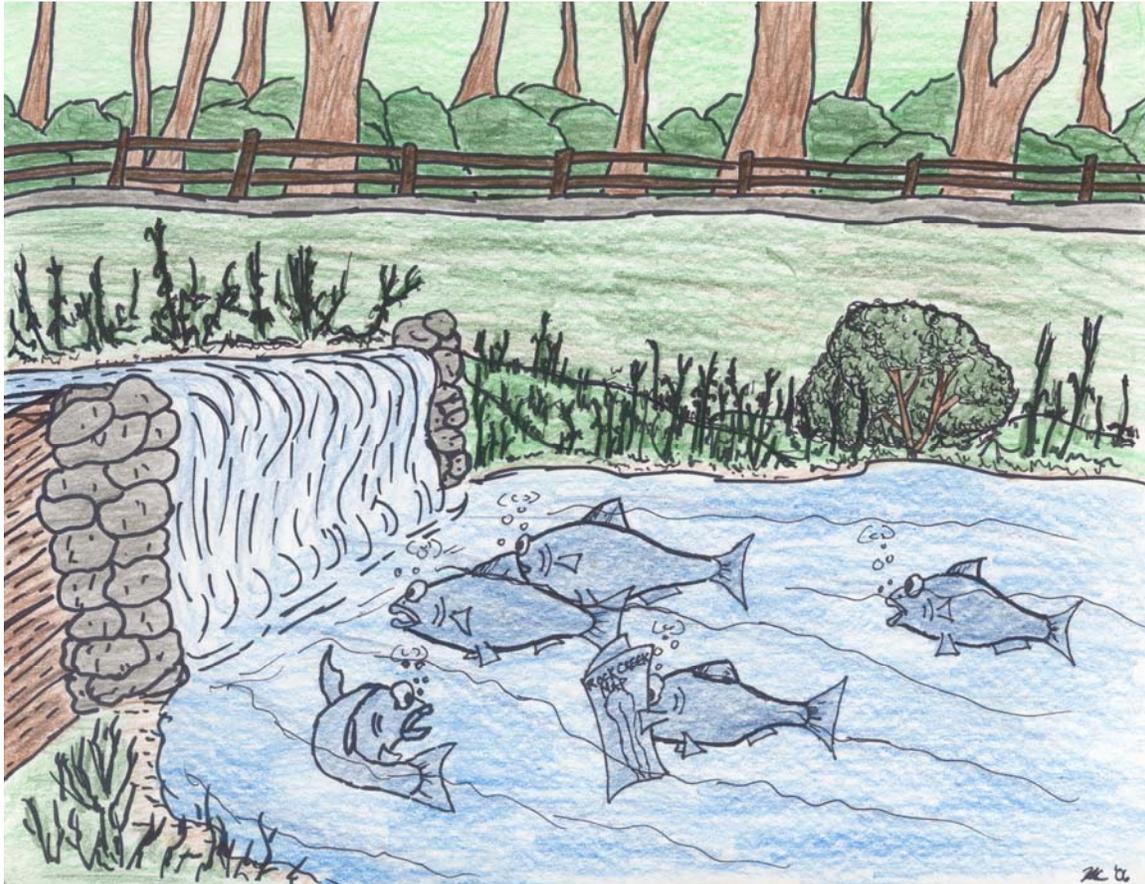


Herring Highway

A Study of a New Fish Passage for River Herring
at Rock Creek National Park



Ranger Field Study Guide

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SOP for Herring Highway Field Studies

1 -2 Weeks Before Field Study

- BTW staff will email confirmation of the field study. Phone or email teacher about any students' special needs. Review travel directions to the park, meeting place, time, date, and equipment/ material needs for the field-study. (i.e., lunch, beverages, appropriate attire, etc.)
 - If a pre-trip visit is planned, speak with the teacher about the curriculum material to be covered in class, equipment and materials needed, and the schedule. (BTW educators routinely conduct classroom presentations.)
 - If a classroom visit prior to the field study was not possible (i.e., by ranger or BTW educator), ask the teacher what lessons were covered in class and how well students are prepared for field study.
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Day Before Field Study

- Organize all the needed equipment: (#s change based on group size)
 - ___ Student Guides (BTW or Ranger)
 - ___ Big Dam Map and Photographs
 - ___ Clip boards
 - ___ Large seine net
 - ___ Chest waders,
 - ___ Large buckets
 - ___ Small dip nets
 - ___ Rubber gloves
 - ___ Hand lenses
 - ___ Small plastic fish tanks
 - ___ Rulers (12")
 - ___ Meter tape measure (25 meter spool)
 - ___ Meter sticks
 - ___ Stopwatches
 - ___ GPS meters
 - ___ Flow meter
 - ___ Dissolved oxygen kits
 - ___ pH kits
 - ___ Thermometers (for air & water temps)
 - ___ Wash bottles full of clean (distilled not necessary) water
 - ___ Empty waste bottles
 - ___ Binoculars ** **For spring visual census
 - ___ Polarized sunglasses**
 - ___ First aid kit
 - ___ Cell phone
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SOP for Herring Highway Field Study *(continued)*

Day Before Field Study *(continued)*

- Determine how to transport all equipment to field study site
- Communicate with your co-workers and USPP about your program and whereabouts during the field study.

Morning of Field-study

- Check to ensure all necessary equipment is ready and loaded, including a cell phone and first-aid kit.
 - Be prepared and await the groups' arrival.
-

Introduction & Logistics

- Meet and greet the bus and students at the Nature Center. Discuss the day's schedule, pick-up location, and departure time with the bus driver and teacher. **Don't let the bus driver leave until you have verified transportation in the park and the trip back to school!**
 - Welcome the class to Rock Creek National Park, the capital city's forest. Introduce yourself, the BTW staff, the BTW program and module. Answer the question, "Why are we here today?"
 - Invite the students to explore the Nature Center to see examples of the plants and animals that live in Rock Creek National Park, to use the restroom, or to stretch a bit before meeting to focus ourselves for the field study. Set a time (i.e., approximately 15 minutes) and meeting location to regroup.
 - Describe the day's schedule and expectations. Explain what the students will be doing when and where. Indicate the restroom location, approximate lunchtime, and any safety messages.
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Field Study

- Proceed to the study site—Picnic Grove 1 or 6
 - Divide the students into groups.
 - Distribute equipment/ supplies. Please be careful with the equipment.
 - Safety issues, instructions, demonstrations
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SOP for Herring Highway Field Studies *(continued)*

Field Study *continued*

- Many of the students will be unfamiliar and unprepared for field activities. Remind them to use sunscreen and bug spray (if needed). Warn them to be on the look-out for poison ivy and stinging nettles. Point these out at the study site or along the trail.
 - Gather and record data.
 - Review data
 - Lunch
 - Collect equipment
 - Reflect on field experience
-

Closing

- Get immediate feedback from the students.
 - Invite the students and teacher to visit the park again as a group or on their own
 - Wrap up the lesson, leaving time for a question-and-answer session, and complete the exit slips/ reflections.
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After the Field Study

- Send exit slips/ reflections to the BTW Program Coordinator.

Herring Highway Ranger Program for Field Study

Essential Field Study Components

1. Introduction at Nature Center
2. Barriers to Fish Migration (Big Dam Map)
3. Unblocking Fish Passages
4. Field Study
5. Data discussion
6. Ranger Interpretation
7. Reflection

1. Introduction Nature Center

- Welcome the class to Rock Creek National Park, the capital city's forest. Introduce yourself, the BTW staff, the BTW program and module, and explain why the class is here today. Tell the students that they'll participate a field study, see alterations to the creek that allow fish passage, have lunch, collect data, and discuss and reflect on their experience.
- Invite the students to explore the Nature Center exhibits to see examples of the plants and animals that live in Rock Creek Park, to use the restroom, or to stretch a bit before meeting to focus ourselves for the field study. Set a time (i.e., approximately 15 minutes) and meeting location to regroup.
- Ask students to share something they learned from the exhibits. Ask if they have any questions.
- State the NPS and Rock Creek mission statements: "Rock Creek National Park is home to a wide variety of plants and animals. It is the mission of the National Park Service to preserve and protect plants and animals, as well as cultural resources. During your field study today, it is important that you are careful not to harm the things we are to protect."
- This is a good opportunity to assess students' background knowledge and what they learned from the pre-field study lessons completed in the classroom.
- Ask students to define a watershed. "Where is the Rock Creek watershed, and what impacts the Rock Creek watershed?" Use the Big Dam Map.
- Ask students which river Rock Creek flows into and what body of water that river flow into, etc. (Lesson 2)
- Ask someone to describe why they are at Rock Creek today. Use their response(s) to discuss the migration of the river herring. (They were exposed to anadromous fish in Lesson 3.)

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Herring Highway Ranger Program for Field Study *(continued)*

2 & 3. Barriers to Fish Migration

Interactive Activity using the Big Dam Map



What's the Dam Problem?

Spread out the Big Dam Map and have the students gather around it. Pass around the laminated site photographs. Ask the class to look at these photographs. Tell the students to listen carefully for a clue as to which photograph is being identified by the ranger. Then the student holding that photograph will place the photograph at the appropriate location on the map.

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Herring Highway Ranger Program for Field Study *(continued)*

2 & 3. Barriers to Fish Migration *(continued)*

Rock Creek is 33 miles long, originating in western Montgomery County, Maryland. The southern end of the creek is managed by the National Park Service, Rock Creek National Park. As the nation's capital has developed and grown, this creek has been altered accidentally and deliberately. These changes made it impossible for herring and other fish to swim the entire length of the creek, thereby altering fish migration and spawning. A recently completed mitigation project has removed or altered those barriers, making it possible for fish to swim the length of Rock Creek.

- What were those barriers?
- Where were they?
- How was the problem solved/ corrected?

1. Sewer lines

(Inactive pipes were removed. Boulder step pools were built in front of active sewer lines to raise the water level to cover the pipe.)

2. Fords

(Concrete fords were removed. Milkhouse ford was lowered to increase water flow over the ford, allowing fish passage while keeping the historic landscape.)

3. Peirce Mill dam

(A Denil Fishway was installed so that fish can swim around the dam, rather than remove the historic 1904 structure.)

Review the removal or alteration of areas in the creek.

4. Field Study

- Organize into small groups and distribute the equipment.
- Reiterate any safety messages.
- Be sure the students rotate through each data-gathering activity:
 - Habitat assessment
 - Water Quality assessment
 - Fish Census

Important reminder: During the spring migration, only a visual census is conducted. There is no seining or handling of any fish. View the creek from the shore and bridges, aided by binoculars and polarized sunglasses.

5. Data discussion

Discuss the data with the students. Include such questions as, "What did we find today?" "What did you expect to find?" "How hospitable is the creek to fish today?" "Where are the herring?" Remember herring are anadromous. They are born in fresh water, mature in offshore schools along the Atlantic coast, then return to fresh water to breed/spawn.

Herring Highway Ranger Program for Field Study *(continued)*

6. Ranger Interpretation

A Fish Tale: Interdependence = Connections

(Use laminated copies of historic illustrations and photographs to aid the presentation. Show and tell, pass them around. At a mitigation site, relate some connections between the creek, local history and herring.)

Fish have been part of the human diet for a very long time. People have been harvesting fish from the Chesapeake Bay, the Potomac River, and associated tributaries since prehistoric times. Herring were abundant during spring migration along Rock Creek. Archeological evidence indicates that native people/ Algonquin-speaking Americans encamped in this area to gather stone for making tools while the spring herring migration made food plentiful and easy to catch. The forest surrounding Rock Creek was a place to gather many things essential to their lives. Plants for food, medicine, and fuel were present. Wild game was hunted providing meat, bone, sinew, and skins for tools and clothing.

The first European explores and settlers marveled at the abundance and variety of fishes present in the Chesapeake Bay watershed. During a 1585 expedition to this region and beyond, Englishman John White documented the fishing practices of the natives, who used spears, nets, and weirs.

Explorer Captain John Smith wrote in 1608 that fish were so plentiful in the Potomac his men tried to catch them with a frying pan. According to Maryland Historian Robert Beverly, in 1705, springtime herring were so numerous in streams and creeks that “they stank of fish.” You could not ford through a stream or creek without stepping on them. Fish were an important food, as well as a source of oil used in many products from medicine to paint and fertilizer. The seasonal run of river herring fed local people and provided a protein rich food for sailors and traveling merchants once it was salted or pickled. Preserved herring made life and commerce better. No one lives well or for long on an empty stomach.

People settle wherever food and fresh water are readily available. The Chesapeake Bay region is just such a place, serving human needs from generation to generation for thousands of years. This is also true of Rock Creek and the surrounding land where building materials and foods were gathered leading to the establishment of farms, homes, grist mill and saw mill industries. The picturesque Rock Creek Valley was saved from further development by becoming a National Park in 1890, a playground for people and a haven for wildlife.

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Herring Highway Ranger Program for Field Study *(continued)*

6. Ranger Interpretation *(continued)*

It is now the 21st century. What became of the herring stocks that were once so plentiful? The people of this area are no longer dependent upon herring for survival as they were hundreds or thousands of years ago. Where are the herring? Think for a moment. What factors of modern times have affected these animals? Numerous factors have contributed to reduced numbers; over-fishing, water pollution, floods, drought, habitat loss, and barriers to spawning grounds. The environment has been greatly changed and continues to change. Careful management and habitat restoration using the best methods possible are known to bring species back, sometimes from the brink of disaster. River herring now depend on humans to preserve the resources they need to survive. Their habitat can be altered, and problems caused by human development can be corrected, if we so choose.

By removing barriers to migration and prohibiting fishing in Rock Creek to re-establish the “Herring Highway,” the way is clear for river herring and other migratory fish to make full use of this waterway again. Only time will tell if they will return in greater number and grow in population. The National Park Service, U.S. Fish and Wildlife Service, D.C. Fisheries and other agencies are crossing their fingers, hoping for the best.

7. Reflection

Give each student a pencil and a blank file card. Ask them write or draw something to convey something they learned or a connection they made to this place today. Indicate that they should do this on their own and in silence.

Gather the reflection cards and lead the class to the bus. Once aboard, thank the students for their cooperation and encourage them to follow up on their data analysis. Encourage them to return to Rock Creek National Park.

Timeline of Events in Rock Creek

Rock Creek History

Rock Creek is 33 miles long, originating from a spring in Montgomery County, Maryland. Numerous tributaries merge with the creek before it empties into the Potomac River.

1000 AD	Late Woodland period, native Algonquin people lived seasonally in the area that is now Rock Creek National Park. They would forage for plants and hunt animals that were readily available during each season. In late March and April, the annual run of herring into Rock Creek drew the hungry natives here to set up weirs to catch the fish while stone was gathered for tool making. (Archaeological evidence supports this story.) Springtime fishing parties continued though the 18 th century, possibly beyond.
1540 – 1603	European sailing ships and fishermen periodically deliberately or accidentally enter the Chesapeake Bay and its rivers.
1607	English colonists form the first European settlement in what is now Virginia at Jamestown
1608	Captain John Smith explores the Chesapeake Bay and its rivers. The English and European invasion has begun.
1700	Non-native settlement growth
1760 – 1900	Several mills are built along Rock Creek, creating barriers to fish migration.
1800 – 1970	As the Washington region develops, potable water and sanitary sewer lines (pipes) are laid under Rock Creek to provide water and waste deposal to the city
1820	The stone Peirce Mill is built, replacing a wooden structure.
1890	Rock Creek Park is established to preserve the lovely Rock Creek Valley and its natural and cultural artifacts for the enjoyment of the people.
1902	Peirce Mill Dam is built to slow the water, creating a picturesque waterfall for the enjoyment of park visitors.
1904	At Milkhouse ford, concrete is laid in the creek bed to support automobile traffic.
1979	The NPS Rock Creek Watershed Conservation Study identifies Peirce Mill Dam as a major fish migration barrier, making migration beyond it impossible.

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Timeline of Events in Rock Creek *(continued)*

Rock Creek History *(continued)*

1993	The Rock Creek Fisheries Study final report identifies all the barriers to fish migration and suggests their removal. Money for the project will have to be found somewhere.
1998	Woodrow Wilson Bridge project planning begins. An Environmental Impact Study states that the Potomac's ecology will be disturbed. Federal law requires a mitigation project be conducted as compensation.
2003	Funded by the Woodrow Wilson Bridge Project, the Rock Creek Stream Restoration project begins in December of 2003.
2004-2006	Rock Creek Stream Restoration Goals: Restore upstream fish migration in Rock Creek by removing or modifying existing "in stream" fish barriers. Restoration will include the removal of 2 abandoned fords in the National Zoo, 3 abandoned sewer lines, a modification/ lowering of Milkhouse ford, creation of natural-looking pools to raise water over active sewer lines, and construction of a "fish-ladder" (Denil fishway) at Peirce Mill Dam
2006	The fish passage is restored, and construction is completed. Hopefully the fish will return to their ancestral spawning ground beyond the District of Columbia line, north into Montgomery County, Maryland. Only time will tell. The migratory species of concern are: Alewife, Blueback Herring, Striped Bass, Yellow Perch, White Perch, Hickory Shad, and American Eel.

Building Blocks:

Park Rangers Herring Highway Field Study

Theme Rock Creeks' fish inhabitants and human beings have been interdependent for thousands of years. Today, the survival of the fish is dependent upon human behavior more so than ever. Environments altered by humans can be altered again to accommodate wildlife.

Goals

- Provide a hands-on field study experience utilizing knowledge gained from pre-lesson preparation
- Gather authentic data via habitat assessment and a fish census for post-field study analysis
- Illustrate state-of-the-art natural resource restoration in a national park

Objectives By the end of the field-study the students will be able to:

- Explain the rationale for conducting a fish census in Rock Creek.
Answer: Barriers to fish migration have been removed from Rock Creek. The census/fish data may indicate whether or not the herring and other fish are using the fish ladder. The remediation has had the desired effect on fish behavior.
- Explain why Rock Creek Park, the NPS, and other agencies advocated the removal of barriers to fish migration in this creek.
Answer: Humans can correct alterations they have made to natural systems for the benefit of other species. Environmental mitigation helps the NPS and other agencies fulfill their mission to preserve and protect species and habitats, promoting the stewardship of public land and the restoration of ancient spawning ground. Conveniently, Woodrow Wilson Bridge Project money paid for the fish passage.
- Describe/ trace Rock Creek's connections to the greater Chesapeake Bay watershed.
Answer: Rock Creek flows into the Potomac River, which flows into the Chesapeake Bay. Fish migrate to and from Rock Creek via the river and bay. The land within the park and areas surrounding Rock Creek drain into the bay.

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Building Blocks

Park Rangers for HH Field Study *(continued)*

Building Blocks Woven into Interpretation	Tangibles	Intangibles	Universal Concepts
	River herring	Anadromous	Fish survival
	Eel	Catadromous	Fish survival
	Food	Migration	Fish to harvest
	Fish species	Species survival	Sex and death
	Rock Creek	Herring highway	Migration/ spawn
	Fresh water	Elixir of life	life and death
	Potomac River	Water is life, transportation	Survival, people, and places
	Chesapeake Bay	Estuary, brackish, commerce, recreation	Nursery, estuary, livelihood, nature's beauty
	Fishing	Subsistence	Full-belly, survival
	Baymen	Industry, feed the masses	Livelihood, full belly
	Mills	Industry	Livelihood
	Dams	Barrier	Route closed
	Ford, bridge	Crossing	Travel route
	Fresh water pipes	Water to the masses, necessity	Vital resource, health
	Sewer pipes	Sanitation	Health concern
	Storm sewers	Impervious surfaces, pollution, controls, physical barriers	Flood control, health concern, migration stopped
	Human beings, native peoples, settlers, enslaved people	Numerous needs	Alter world to suit needs and desires