Smithsonian Environmental Research Center

SERC Field Trip Activities

SERC field trips are customizable for your group. The activities that you can do are largely based on how much time you have to spend at our site. If you're unsure, or if you have a wide range of grades, then please contact Karen McDonald (McDonaldK@si.edu) for suggestions.

Maximum Group Size- 60 students

Groups of 15-30 students requires **at least** 2 hours to allocate to the day's program.
Groups of 31-49 students requires **at least 2.5** hours to allocate to the day's programs
50-60 students requires that you have **at least 4** hours to allocate to the day's programs.

Canoe Excursions require at **least 3 hours** and may have no more than 22 participants total per trip.

Amount of Time You Have For Your Trip	30 or fewer students (# stations)	31-49 students (# stations)	50-60 students (# stations)
4.5 Hours	4	4	4
4 Hours	4	4	4
3.5 Hours	4	3	X
3 Hours (no lunch)	4	3	X
2.5 Hours (no lunch)	3	3	X
3 Hours (with lunch)	3	X	X
2.5 Hours	3	X	X
2 Hours	2	X	X

Grades	Program	Rotation Station Name
Hands-on Programs		
K-2nd	**Exploring Nature Connections ($18/student, $300 minimum)**	Seining
		Blue Crabs
		Understanding Oysters
		Terrapins
		Sharks
3rd-Adult	**Shoreline Connections ($18/student, $300 minimum)**	Plankton/Microscopes
		Oysters Reef Sorting
		Seining
		Watershed Modeling
		Bay Sharks
		Blue Crabs

3RD-6th	**Food Web Shoreline Connections**	Producers: Plankton/Microscopes
		Primary Consumers: Oysters and Inverts
		Secondary Consumers: Fish/Seining
		Apex Predator: You choose from Blue Crabs, Bay Sharks or Otters
Engineering and Design (STEM) Programs		
5th-Adult	**Engineering a Blue Crab ($18/student, $300 minimum)** Need a minimum of 3 hours for this program. Only for groups 30 or less students, 2 stations required.	Introduction to Blue Crab Anatomy, Hydraulics, and Pneumatics
		Build a Blue Crab Hydraulic Arm
8th-Adult	**Remotely Operated Vehicle (ROV) Building and Prototype Testing on Water ($25/student, $350 minimum)** Only for groups of 25 students or under. Requires 4 hours min.	Introduction to ROVS: Design and Planning
		Phase 1: Building ROVs
		Phase 2: Testing on the Water
6th-Adult	**Movement of Life: Sharks and Shark Migration ($18/student, $300 minimum)** Need a minimum of 3 hours for this program. Only for groups 30 or less of students, 2 stations required.	Shark migration mapping
		Shark tag implantation and suturing practice
		Engineer, design, and build/test a shark tag in water
		Shark biology-mock shark necropsy (stomach content analysis), preserved shark, and shark tooth sorting and examination
Canoe Programs		
5th-Adult	**Canoe Expedition** ($20/student, $300 minimum)	Covers basic paddling but includes two hands-on stops (usually seining and oyster bar) and lunch out on the River. 3.5-4 hours required.
5th-Adult	**Canoe Excursion** ($18/student, $300 minimum) (Canoe and Shorelines, $27/student, $350 min)	Covers basic paddling instruction, students will look for wildlife, and talk about SERC research. 3.0 hours required.

SERC Field Trip Activities Descriptions

All of our "Connections" programs are designed to be hands-on and focused on the practices of science and how our SERC researchers conduct science. Each station will be led by a SERC staff person or trained volunteers.

Exploring Nature Connections (K-2nd Grades)

This field trip is based on children following the journey of Gary the Grass Shrimp. The number of stations you choose will depend on how much time you have. These stations are fine in any combination.

- **Seining-** Students will journey with Gary to explore the types of creatures that live in the nearshore zone of the Bay. They will then help gather fish and invertebrates from a seine net and sort them based on their adaptations for moving (swimming, hopping, crawling, floating, and sitting). Students will then count their organisms and discuss what they found. (K-ESS3-1)(K-LS1-1)(2-LS4-1)(2-LS4-1)

- **Blue Crabs-** We'll journey with Gary to meet another invertebrate that is similar but not exactly like Gary himself. They will learn the parts of a blue crab, relate our five sense to a blue crab's five senses, and learn the life cycle of a blue crab to see how baby crabs are alike but not exactly like their parents. They will then meet a

live blue crab and compare it to mud crabs (smaller crabs) that live in the Bay. Students will get to handle the mud crabs and afterwards play a relay game. (K-ESS3-1)(K-ESS3-3)(K-LS1-1)(1-LS1-2)(1-LS3-1)

- **Understanding Oysters**- Here we'll travel with Gary to meet his relatives Ginny and Gus Grass Shrimp that live on an oyster reef. He will explore the different types of creatures that rely on oysters (live oysters as well as their shells). Students will sort through a basket of oyster shells looking for fish and invertebrates that colonize a model reef. Children will sort and count their creatures and then try to explain what they found. (K-ESS3-1)(K-LS1-1) (1-LS1-2)(1-LS3-1)(K-ESS3-3) (2-LS4-1)

- **Terrapins-** In this station Gary will learn about the difference between land and water turtles, and specifically about the Chesapeake Bay's unique resident, the diamondbacked terrapin. You'll visit with a live terrapin and learn about his adaptations for living in the Bay. After that you'll go with Gary on a turtle shell scavenger hunt along one of our trails. (K-ESS3-1)(K-LS1-1) (1-LS1-2)(1-LS3-1)(K-ESS3-3) (2-LS4-1)(2-PS1-1)

- **Sharks**-Gary bravely visits with his shark friends to learn more about the types of sharks that live in the Bay. Students will help Gary figure out how big the sharks really are by learning about some of the commons sharks in the Bay. We'll discover what sharks eat by doing a mock necropsy too. Everyone will get to learn what shark skin feels like, see shark teeth and jaws, and even see a preserved shark. (K-ESS3-1)(K-LS1-1) (1-LS1-2)(1-LS3-1)(K-ESS3-3) (2-LS4-1)

Shoreline Connections (3rd-12th Grades)

This program can be adapted for a range of ages. The guiding question of the trip is, "We're all watershed neighbors so how do we affect and protect the water?" We focus on science as fact based, though hands-on inquiry at each station. At each station students will be given a key word to help them answer this question at the end of the Day. Perfect for MWEEs and watershed learning.

- **Plankton & Microscopes-**Students will learn the word balance, and how a little of a good thing is good, but too much of a good thing can be bad, such as algal blooms. Students will be given a plankton sample and filamentous algae from the Bay, and then be asked to sort phytoplankton and zooplankton. (3-LS4-3)(3-LS4-4)(4-LS1-1)(5-LS2-1)(5-ESS3-1)(MS-LS1-6)(MS-LS2-4)(MS-ESS2-1) (MS-ESS3-4)

- **Oysters and Model Oyster Reef Sorting-** Students will begin by exploring the different types of bivalves that live in the Bay, and then learn about how oysters live together and their biological function. They will attempt to build a model oyster reef to determine its habitat structure and then sort through a model reef that has been colonized by fish and invertebrates from the Bay. They will sort the organisms and learn about the role that oysters play in clean water and Bay habitat. (3-LS4-3)(3-LS4-4) (4-LS1-1) (5-ESS3-1) (MS-LS2-4)

- **Seining-** Students will begin by discussing how researchers might study nearshore organisms, and learn how SERC researchers use seining nets to catch fish and invertebrates. They will discuss the term "biodiversity" and how biodiversity might be an indicator of water's health. They will then collect data by donning waders and use seining nets to sample the populations. Students will conclude with a short discussion about their findings and what they might mean. (3-LS4-3)(3-LS2-2)(3-LS4-4)(4-LS1-1) (5-LS2-1) (5-ESS3-1) (MS-LS2-4)

- **Watersheds-** Students will explore how a watershed works through narrative and a 3D watershed model. They will demonstrate how material gets into and is carried through a watershed. Next they will discuss how their neighborhood is connected to all of the Bay's watershed, and what actions they can take locally to keep water clean. (3-LS4-3)(3-LS4-4) (4-LS1-1) (5-ESS3-1) (MS-LS2-4)(MS-LS2-4) (MS-ESS3-4)

Food Web Shoreline Connections (3RD-6th Grades)

- **PRODUCERS: Plankton & Microscopes-**Here students will learn about aquatic producers, namely phytoplankton and their role in the Bay's food web. We'll use samples of river water and identify filamentous algae from the dock using microscopes. (3-LS4-3)(3-LS4-4)(4-LS1-1)(5-LS2-1)(5-ESS3-1)(MS-LS1-6)(MS-LS2-4)(MS-ESS2-1) (MS-ESS3-4)

- **PRIMARY CONSUMERS: Oysters and Model Oyster Reef Sorting-** At the station students will learn about primary consumers, namely oysters and the benthic invertebrates that live on the oyster reefs. They will attempt to build a model oyster reef to determine its habitat structure and then sort through a model reef that has been colonized by fish and invertebrates from the Bay. They will sort the organisms and learn about the role that primary consumers play in food webs. (3-LS4-3)(3-LS4-4) (4-LS1-1) (5-ESS3-1) (MS-LS2-4)

- **SECONDARY CONSUMERS: Fish and Seining-** We'll begin by talking about secondary consumers and the types of fish found in the Bay. Students will don waders and use seining nets to sample the populations. After seining we'll survey our secondary consumer population and talk about how they fit into the food web. (3-LS4-3)(3-LS2-2)(3-LS4-4)(4-LS1-1) (5-LS2-1) (5-ESS3-1) (MS-LS2-4)

CHOOSE YOUR APEX PREDATOR STATION:

- **Blue Crabs**- Students will take on the role of scientists and learn about the anatomy for their study creature, the blue crab. They will go to stations, visit with a live crab, and then share their findings. They will discuss how an animal like the crab is adapted to catch prey, and why blue crabs are important to Bay food webs. (3-LS4-3)(3-LS2-2)(3-LS4-4)(4-LS1-1) (5-LS2-1) (5-ESS3-1) (MS-LS2-4)

- **Bay Sharks-** Did you know there were sharks in the Bay? Students will learn about sharks native to the Chesapeake Bay and found along the Atlantic coast. They will learn shark anatomy and then conduct a mock shark necropsy to determine the stomach contents of common sharks and rays in the bay. We'll talk about how sharks, as predators, keep balance in the Bay and oceans. (3-LS4-3)(3-LS2-2)(3-LS4-4)(4-LS1-1) (5-LS2-1) (5-ESS3-1) (MS-LS2-4)

- **River Otters**-Yes otters do live in the Bay! We will learn about river otter adaptations, look at game camera images, and figure out their diet. We'll use tweezers to sort the fish scales, feathers, and crustacean shells from their scat (clean and dried of course) and talk about otters as predators of land and water. (3-LS4-3)(3-LS2-2)(3-LS4-4)(4-LS1-1) (5-LS2-1) (5-ESS3-1) (MS-LS2-4)

Engineering a Blue Crab (5th-12th Grades)

This program requires at least 3.5 hours, and no more than 30 students.

- **Introduction to Blue Crab Anatomy, Hydraulics, and Pneumatics-** Students will start by asking a question about the adaptations that allow blue crabs to live in the Chesapeake Bay. They will then study the life cycle of the blue crab and its molting process. Next they will be introduced to how the blue crab uses fluid movement (hydraulics) to move after molting, and how this relates to pneumatics (motion through compression of air). We will demonstrate these principles, and Newton's 3rd Law, using syringes of air and water.

- **Build a Blue Crab Hydraulic Arm-** In part two of this class students will be introduced to the field of biomimicry, or solving problems using solutions found in nature. They will then be challenged to engineer a model blue crab arm that moves up and down, mimicking the structure of a blue crab arm. After sketching schematics they will then using simple materials, and syringes filled with fluid, to build a hydraulic arm that can lift a light object. (3-5-ETS1-2)(5-ESS3-1)(MS-ETS1-4)

Remotely Operated Vehicle (ROV) Building and Prototype Testing On Water (8th-12th Grades)

This program requires at least 4 hours, and no more than 25 students.

- **Introduction to ROVS: Design and Planning- In** the introduction students will learn about ROVs and how scientists at the Smithsonian and around the world use them for research. Students will then be given a design challenge, including their criteria, materials, and constraints of the project. They will then work in teams (named after famous ROVs) to begin drawing schematics and plans.

- **Building ROVs-** ROV teams will begin building their ROVs using motors, PVC pipes, ballast, and floats. They will focus on scientific principles that will make their mission a success, including factors of the natural environment where they will be testing the ROVs in and on the Rhode River.

- **Testing on the Water-**The completed ROVs will be tested on the docks, allowing students to modify their original design and to participate in iterative testing of their ROV to achieve an optimal design for their challenge. All groups will present the final design to the entire class.
(MS-ETS1-1)(MS-ETS1-2)(MS-ETS1-3)(MS-ETS1-4)(HS-ETS1-2)

Movement of Life: Shark and Shark Migration (5th-8th Grades)

This program requires at least 3.5 hours, and no more than 30 students.

- **Shark Migration Mapping-**Students will take no the role of a shark research team based at SERC and looking to tag one of three species of sharks found in the Bay along the Atlantic Coast. They will work in teams and use data from our scientists to track shark migration during spring and fall, as well as pupping grounds. They will then use a budget to decided which port to leave from for tagging, how much to spend on staff and insurance, and where to actually tag. (5-ESS3-1)(MS-LS2-1)(MS-LS2-4)

- **Shark Tag Implantation and Suturing-**In this activity students will learn about acoustic tags used on sharks, and how they are implanted into the sharks. They will then take on the role of scientists learning how to do interrupted suturing for actual tagging in the field. They will be practicing on either a banana or a model provided. (5-ESS3-1) (5-ESS3-1)(3-5-ETS1-1)(3-5-ETS1-3)

- **Engineer, Design, and Build/Test a Shark Tag in Water**- the highlight of the shark tagging activity is when students take on the role of an engineer to design their own new form of neutrally buoyant pop-off shark tag. They will draw, design, build and test the new tag using materials provided. Testing will be in aquariums, on model sharks, with water. After design and testing students will present their ideas as if they were applying for a continuing grant to fund the project. (5-ESS3-1)(3-5-ETS1-1)(3-5-ETS1-3)(MS-ETS1-1)(MS-ETS1-2)(MS-ETS1-4)

- **Shark Biology (optional station)-** Learn about the different species of sharks that live in the Bay, their anatomy, and natural history. We'll then conduct a mock shark necropsy (examining stomach contents), see a preserved spiny dogfish shark, and short shark teeth from the MD region.

Canoe Expedition (5th – Adult)

Learn the basics of canoe, and make two hands-on stops along the way, as well as lunch. We'll paddle, get out to learn, paddle, etch lunch, and paddle more. Stops depend on weather conditions but may include seining, oyster basket sorting, or blue crabs.

Canoe Excursion (5th – Adult)

Instructors will provide basic paddling instruction, life jackets, and canoes. We'll look for wildlife on the Rhode River, such as eagles, otters, muskrats, herons, and more. Students will also learn about the different research labs at SERC and various projects that are or have been conducted. Suggested for middle school students and older. Content can be adapted for grade and age of students.

Canoe Excursions and Expeditions	Minimum # Chaperones	# People Per Canoe (combinations)
3-5th	1 adult per 2 students	2 students + 1 chaperone
6th-8th	1 adult per 4 students	2 students; 1 student & 1 chaperone; or 2 students & 1 chaperone

Questions? Need more information?

Contact Karen McDonald (443) 482.2216 or McDonaldK@si.edu