



Science Under Sail

aboard the schooner *Appledore V*

Experience hands-on, inquiry-based science education aboard a tall ship!



- Science Under Sail is a hands-on E-STEM shipboard education program designed for 3rd – 12th grade students.
- Educators can select from a menu of program modules and customize a program to meet their needs (*see back*).
- Students will get the chance to raise the ship's sails on all Science Under Sail programs.

A customized Science Under Sail program is a great opportunity for students to experience interactive learning with a focus on Great Lakes water quality, environmental ecology and/or nautical sciences.

East Tawas State Dock

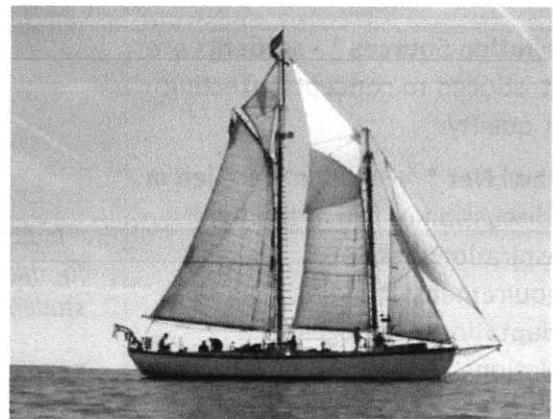
May 22nd – June 13th

9:00 a.m. – 11:30 a.m.

12:30 p.m. – 3:00 p.m.

Each Science Under Sail program aboard *Appledore V* is \$425 and can accommodate up to 18 students and 2 chaperones.

Classrooms with more than 18 students can participate in both a Science Under Sail and land-based program to make a day of environmental education in East Tawas! Contact us for details.



Science Under Sail

Customizable Program Options

East Tawas State Dock: choose 4 options from Freshwater Ecology and/or Nautical Sciences + 1 whole group

Freshwater Ecology	Whole Group	Nautical Sciences
<p>Plankton – students collect and analyze plankton samples and their role in the food web.</p> <p>Benthic – explore the benthic zone by taking a sample and identifying organisms.</p> <p>Invasive Species – identifying non-native species and their impact on the Great Lakes.</p> <p>Wetland/River Observation – students use metaphors to describe the basic functions and value of wetlands.</p> <p>Marine Debris – students identify sources of marine debris, predict decomposition rates and discuss effects of debris on aquatic life.</p> <p>Watershed - students will create a model to observe how the shape of the land determines surface water flow.</p> <p>Water Quality/Chemistry * - students analyze water samples for pH, dissolved oxygen, turbidity and nitrate/phosphate levels.</p> <p>Pollution Sources * - students are introduced to concepts affecting air quality.</p> <p>Trawl Net *^x– students are led in a discussion of fish anatomy, respiration, habitat requirements, feeding adaptations, ecological relationships, and management problems.</p>	<p>Food Web - students explore the interconnected relationships within food webs.</p> <p>Drop in the Bucket – students will review the sources of freshwater on the earth, discuss how little water is available for human use and propose ways to conserve this precious resource.</p> <p>Bioaccumulation* - students are introduced to the concepts of bioaccumulation and biomagnification.</p> <p>Saginaw River in a Jar *^x – students discuss different sources of pollution (both historical and ongoing) and propose ways of reducing the impact of pollution in the area.</p>	<p>Knots – students learn about commonly used knots, what they’re used for and how to tie them.</p> <p>Navigation – students learn about celestial navigation, chart reading and speed calculations using a chip log and an hourglass.</p> <p>Forces in Sailing – students learn about sail designs and sailing angles that propel a ship forward.</p> <p>Buoyancy – students explore Archimedes principle while constructing a miniature vessel designed to carry a load.</p> <p>Simple Machines - students will describe and identify the six simple machines and their application to sailing, identify the difference between fixed and moveable pulleys, and apply the mechanical advantage of a pulley when raising and/or trimming sail.</p> <p>Weather – students define wind, learn about airflow and cloud structures, measure apparent vs. true wind, and visualize fluid dynamics.</p>
	<p><i>* Indicates a module designed for middle and high school students only.</i></p> <p><i>^x Indicates a module only available for Bay City departures.</i></p>	