



Learning Lessons from Estuaries

Through field trips to a local estuary, students are immersed in ecological diversity

PHOTOS COURTESY OF THE AUTHOR

— **Christine Schnittka** —

There is something that draws us all to the sea and especially to the fertile estuaries that nuzzle up to its shores. An estuary serves as both a nursery and a grave for sea creatures. If life evolved from some primordial sea, it may well have been an estuary—a place where ocean and rivers meet and fresh and salty waters mingle in the brackish tide.

Here in the United States, with so many of us living within a day's drive of an estuary, choosing one can be the start to a perfect immersion science field trip. This article describes annual trips to three islands in the Chesapeake Bay and the long-term impact these trips have had on students. The bay is our local estuary, but this example of an immersive field experience could be duplicated in other ecosystems around the country (see “On the web” at the end of this article for information on planning an estuary field trip).

Annual Chesapeake trips

For nearly a decade of teaching science, my students and I experienced annual trips to the Chesapeake Bay. But these were not seaside vacations. Instead, they were three-day immersions in the sulfur-scented salty marshes on small islands in the middle of the largest estuary in the United States. These trips were science immersion at its best. Surrounded by water, we lived and learned on slowly sinking islands.

Our affordable yearly trips (under \$100 per student) were hosted by the Chesapeake Bay Foundation (CBF), a private, nonprofit education group with a mission to teach those of us living, working, and playing in the watershed about



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Students in the marsh on Fox Island.

appreciating, conserving, and learning some of life's key lessons from the bay. The CBF educators were enthusiastic, patient, fun-loving, highly trained, and skilled teachers. Each trip was tailored to meet my specific educational objectives, and all trips ended up meeting National Science Education Standards in some way, especially Life Science Content Standard C, The Interdependence of Organisms (NRC 1996, p. 181).

Each year I took one group of students in the fall and another in the spring. There was a choice of mid-week or long weekend trips, which was convenient for chaperones, and I never had any trouble recruiting a few parents to join us. We brought our own food for the three days, and each student was responsible for bringing some portion of it and helping prepare at least one meal. Over the years, we made trips to three different islands—Fox Island, Port Isobel, and Smith Island. Each trip had a different mission, and each island had its own slightly different flavor.

Fox Island, the most remote, is inhabited by two or three CBF educators in an old hunting lodge on stilts, crowned by a look-out crow's nest, and surrounded by marsh, mud, and open water. Port Isobel is a tiny island just off Virginia's Tangier Island. The island has the most modern accommodations for students, and while it has a remote feel to it, it's just a short boat ride away from touristy Tangier.

Smith Island is actually a collection of islands, and we stayed in the sheltered little town of Tylerton, situated in the middle of the collective islands, just north of the Virginia/Maryland border. To prepare for this trip, the class read Tom Horton's book, *An Island Out of Time*, which describes his life in Tylerton as a CBF educator (1997). This

book also describes the economic plight of the watermen and crab pickers on Smith Island, and the ecological plight of the Chesapeake Bay.

A true immersion

The Chesapeake Bay is a rich, fragile habitat, a veritable seafood factory, and a migratory bird hatchery. The bay is also downstream from over 19 major rivers and 400 lesser tributaries that feed it with fresh water from higher lands. The fresh water travels first through cities, farmers' fields, and our own back yards, bringing along some unwanted bits of chemical pollution in the process. While living on an island in the middle of everything down-

stream, my students were brought face-to-face with an often unseen but integral and connected part of their lives.

Year after year, we—the students, chaperones, CBF educators, and myself—spent our days canoeing around pieces of the islands through “guts” that divide them (**Safety note:** Teachers must follow proper safety guidelines, see “Safety precautions,” p. 35). We gently scraped the eelgrass beds out in deeper waters and pulled up a myriad of creatures, including baby blue crabs, seahorses, puffer fish, and grass shrimp. We trekked through the spongy marshlands and the black bubbling mudflats in knee-deep detritus with tightly laced wet sneakers. We were one with the periwinkles climbing up the *Spartina* and the fiddler crabs scurrying about the cordgrass's stalks.

We picked up human trash that had floated to the filtering shores (plastic motor oil containers, aluminum cans, old boots) as well as human evidence of not-too-ancient habitation—bricks from a home, pottery fragments, corks gone adrift from an old crab pot, and the occasional arrow head.

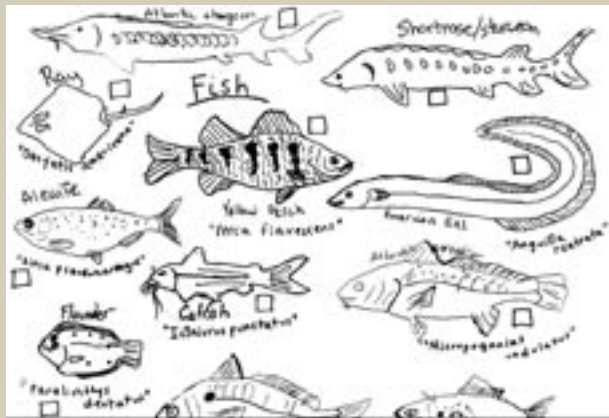
We studied the creatures that call the bay home, catching them up in seine nets, crab pots, and eel pots. We played hide-and-seek in the tall *Phragmites australis*, an invasive species of weedland plant daring to overtake the native black needle rush (*Juncus roemarianus*) and *Spartina alterniflora*.

While we slept in the lodge on Fox Island we were lulled to sleep by the sounds of water lapping upon the dock and soothed by the breeze of salty air. In our island home that we shared with CBF educators, we used solar energy to power our lights at night, composted all of our kitchen scraps, used the *Clivus Multrum* (a composting



FIGURE 1

Portion of a page from a student's fish field guide.



toilet) for a bathroom, and had a grey water system (using wastewater generated from other household processes, such as washing dishes and hands). We had to pump fresh water from a well by riding a stationary bike in the kitchen and learned that 24 sets of dishes can be washed in two inches of soapy warm water.

Every night, students climbed up to the crow's nest on the roof to watch the Sun set over the bay before capturing the day's events and lessons in their science journals. As students shared excerpts from their journals with one another, an entire picture of each day was vividly painted.

Lessons learned

Studying and living in an estuary affords the opportunity to learn so many things about the natural world.

Estuaries are diverse ecosystems with intricate food webs and varied habitats. Although they are resilient to change, an upset in the balance of life in an estuary can cause a ripple effect felt by the blue crab and humans alike. By studying the ecological aspects of an estuary, students can better understand the ecology of the natural world as a whole system.

We often began our preparation for the trip by reading field guides. Using information from these field guides, students then created their own field guides based on what they expected to encounter at a particular location and time of year. These homespun field guides were compiled, copied, and distributed, and students were tasked with checking off their finds on the trip. Every year, the compiled guide was rather extensive with all the plants, mollusks, arthropods, birds, and fish we expected to find. In the process of drawing and reading about all these organisms, students began to see the connections among them (Figure 1).

The next step involved conducting research on a particular organism. Once students had familiarized themselves with the organism, I had them write an ode to the organism in the style of Chilean poet, Pablo Neruda (Peden 1990). Students shared these odes with each other and then we all looked forward to finding the chosen creatures during our trip (Figure 2).

Next, we would study the watershed. Every lake, river, stream, or estuary has one. A watershed is the area of land that drains into the particular body of water, and the Chesapeake Bay's watershed covers portions of six states, including New York. In learning about the watershed, students colored in maps, traced and labeled all the major tributaries leading into the bay, and determined their own watershed ad-

FIGURE 2

One student's ode to a bay organism.



Oh Northern Pipefish
 May I be so bold?
 As to comment on how you hold
 That long thin snout you call your nose.
 Stuck out in front of your tiny face
 It looks quite plainly out of place.
Syngnathus fuscus is your Latin name,
 But all you pipefish look the same.
 Shallow sea grasses you call your home,
 Surrounded by creatures you are never alone.
 No one can see you so you hide in the masses
 The masses, the masses, the masses of grasses...
 -Josie

FIGURE 3

A student's map of the Chesapeake Bay watershed.



dress (Figure 3). Finding the stream closest to their home, students found out how they could paddle their own way to the bay.

Like many other estuaries and large bodies of water in and around the United States, the Chesapeake Bay struggles with a variety of environmental issues. Overfishing, eutrophication caused by excess nutrients and overgrowth of algae, hypoxia (lack of dissolved oxygen), toxins, invasive species, dredging, and disease all put a huge strain on the system.

During the unit on the Chesapeake Bay, students learned about these environmental threats, how other bodies of water are being compromised as well, and learned ways to protect and preserve fragile aquatic ecosystems. Our main source of information was the *Bay Journal*, a free monthly publication from the Alliance for the Chesapeake Bay (see “On the web” at the end of this article).

During our bay unit of study, a convenient mnemonic we used was “TWO-SAV the bay.” “T” stood for trees, “W” for wetlands, “O” for oysters, and “SAV” for submerged aquatic vegetation. Each of these factors is vital to the preservation of balance in the Chesapeake Bay ecosystem, and after studying about each of them in the classroom, students learned to appreciate each aspect firsthand.

Student reflections.

“The trips to the bay made science real. It wasn’t testing chemicals in test tubes or culturing bacteria in Petri dishes. The bay made science come to life because all my experiences with it were based on the ways of the Earth, the lifecycles of animals, the decomposition of materials, and even the smallest cells. My views of science were broadened through several different examples of how life works together in just one ecosystem.”

~Anne

“It helped me realize how everything is so interconnected—that what we do here at home can drastically affect what happens on the bay. It sparked a curiosity to learn more about what we can do to help keep the environment clean and look out for species that are becoming endangered.”

~Marigene

“I loved going to Fox Island... playing in the detritus, going crabbing, going swimming in the sound, canoeing through the marshes, and hiking at night. The trip helped me to better understand how people impact the environment, especially about how pollution from the entire region in the watershed runs into the bay and throws off the ecosystem’s equilibrium.”

~Caroline

“Interacting with nature in such a hands-on way made me truly love my science classes that I took later on. Just the memories of those trips made me want to go beyond lab work and readings.”

~Tess

“I’m much more environmentally aware since our trip to the island—I recycle more things, I don’t run the water while I brush my teeth, and I take shorter showers.”

~Emily



Nightly journaling.

Students learned much more than biology, botany, ecology, and geology during the six weeks or so that we studied the bay. They learned much more than confidence, courage, cooperation, and curiosity during the three days we lived “survivor-style” in the island marsh. Students learned how to be scientists through questioning, exploring, valuing, and appreciating the wonders of the natural world.

Extensions to the trip

To bring the bay home, we participated in watershed restoration projects, such as the Growing Native project. (**Editor’s note:** All of the organizations and projects described in this section can be further explored through “On the web.”) We collected native seeds and acorns for planting along the Potomac River and its tributaries because the more trees we have along tributaries to the Chesapeake, the cleaner the water is flowing into it. Trees absorb nutrient runoff, prevent erosion, and provide food, habitat, and oxygen.

We also participated in river clean-up projects, such as the Rivanna Conservation Society’s annual river clean-up day called, “Taking out the Trash,” and stream monitoring projects, such as the World Water Monitoring Day project. We tested a stream next to our school for the main indicators of water quality—temperature, pH, dissolved oxygen, and turbidity. Every stream, creek, and river in the 165,760 km² Chesapeake Bay watershed drains into the bay, even the little stream that runs right through the middle of our town of Charlottesville, Virginia.

One year, we brought a tape recorder along and captured sounds of the bay. When we returned home to the foothills of the Blue Ridge, we developed a website with sound-linked clickable photos that made these sights and sounds accessible to the world. This was in the dial-up modem days before streaming video, and our high-tech wonder was enjoyed by many.

For several years, I had students write and illustrate books about the bay, which I kept in the classroom for future bay adventurers to read. These and

other more traditional assessment activities reinforced and really brought home the lessons from the bay.

An estuary close to home

Each year at my school a legacy was passed on. Students said the trips changed their lives (see “Student reflections”). Does your school offer students opportunities such as these? Is there an estuary near you? The Estuarine Research Foundation asserts that “more than half of the American public lives within an hour’s drive of an estuary (ERF),” and I can think of no better way to have students sink themselves into science. ■

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On the web

Bay Resources:

- Bay Journal*: A free publication from Alliance for the Chesapeake Bay (www.bayjournal.com)
- Estuaries Discovery Kit*: Lesson plans for students in grades 9–12 (<http://oceanservice.noaa.gov/education/kits/estuaries/welcome.html>)
- Estuary Live*: Three-day virtual field trip extravaganza (www.estuarylive.org)
- Growing Native*: Involves students in reforestation of the Chesapeake Bay watershed (www.potomac.org/growingnative)
- National Estuaries Day*: Annually takes place on the last Saturday of September (www.estuaries.gov/neday.html)
- National Estuary Program*: Information about estuaries all around the United States (www.epa.gov/owow/estuaries/links.htm)
- Taking out the Trash*: Annual Rivanna River restoration project (<http://rivannariver.org>)
- World Water Monitoring Day*: Involves students in a national water quality project (www.worldwatermonitoringday.org)
- Local estuary education programs:**
- Chesapeake Bay Foundation (www.cbf.org)
- Galveston Bay Foundation, Texas (www.galvbay.org)
- Great Bay, New Hampshire (www.greatbay.org)
- Narragansett Bay, Rhode Island (www.savebay.org)
- San Francisco Bay, California (www.savesfbay.org)
- San Francisco Estuary Project (www.abag.ca.gov/bayarea/sfep/programs/ested)
- Sarasota Bay, Florida (www.sarasotabay.org)
- Tijuana Estuary, California (www.tijuanaestuary.com)

Safety precautions.



While working in and around any large body of water, students should be required to wear personal protective equipment, including chemical splash goggles, gloves, and even hip boots (a minimum of sneakers). Depending on depth of water, life preservers also may be necessary. Students should also wear sunscreen, brimmed hats, and long sleeves to protect themselves from the Sun’s UV rays.