

Narragansett Bay Research Reserve
“Teachers on the Estuary” 2010 Lesson Plans

Elementary School Lesson Plans:

Making a Watershed (Ciano)

Grades 3 and 4 Estuary Principles: #1

To be completed over several class periods

Students will learn about watersheds by reading material, writing poetry, and a hands-on activity. They will be able to identify Narragansett Bay and their relationship to it, explain the term estuary and come up with a working definition of how a bay is connected to the ocean and where fresh water comes from - explaining how water travels from mountaintop to stream to bigger stream moving over rocks, joining a river carrying what washes into it (runoff) such as rocks, nutrients from soil, trash, gas, oil, pesticides, etc. Students will create a watershed model made out of simple items found in a kitchen and demonstrate that water, sediments, and dissolved material drain from the land into a body of water.

Marsh Munchers (Fish & Kenner)

Grades 3-6 including Special Education Estuary Principles: #'s 1, 2, 3, & 6

1-2 periods for background information, 1 period to play game. May repeat.

Students will learn about and play a food-web based game. By describing the salt marsh habitat in terms of the plants and animals that live there and the importance of salt marshes students will have a basic understanding of the infrastructure involved in this ecosystem. Teachers will describe the role of detritus in the marsh food web and mention decomposers and their importance – using the terms **predator, prey, producers and consumers**. Explain to students that their identity is a secret and that each envelope contains the identity of one animal that lives in a salt marsh. The only way others will know what they are is by the way they **feed**, exchanging tokens within a designated “tidal cycle”. Upon completion of the game draw a food web based on what feeding interactions took place.

Water Cycle and Estuaries (Stephen)

Grades 3-5 Estuary Principles: #1, & #3

To be completed over several class periods

Students will take a pretest to assess their level of knowledge. Then will be introduced to estuaries, rivers, streams using “What is an estuary?” Discuss the parts of the water cycle: evaporation, transpiration, condensation, precipitation, run-off, and ground water and how they might affect an estuary. Students will apply their understanding to complete a diagram that includes estuaries as part of water cycle. Students will organize the information to make their own diagram of an estuary. Students will discover/compare various landforms in an estuary using Google Earth. Students will create a PowerPoint presentation about estuaries and the water cycle, using information from www.estuaries.gov.

Middle School Lesson Plans (Grades 6-8):

Celebrating National Estuaries Day by Exploring Narragansett Bay with Maps and Data

(Elliott) 6th Grade Estuary Principles: #1, #2 and #3

To be completed over several class periods

Begin with an announcement that National Estuaries Day is coming and we are going to be celebrating it. Our first task is to increase our own awareness on our estuary and watershed. Begin as individuals to create a chart in science notebooks and then make a class chart. Using Google Earth, locate, label and identify features along the 400 miles of Rhode Island's coastline and take screen shots of the finished product, then print maps of Narragansett Bay. Using information from the System Wide Monitoring Program, graph the data. Share your knowledge on National Estuaries Day.

Making Connections Between the Moon and Salt Marshes: A field Trip (Hanson)

6th Grade Science #1 & #2 Estuary Principles:

Pre-Trip 1–2 class periods; Trip 2.5–3 hours; Post-Trip 1–2 class periods

Students will become familiar with moon phases, the relative motions of the Earth and moon, gravity, and the effects that the gravitational interactions between the moon and the Earth have to create tides. A trip to the marsh will be made by two different groups of students. One group will gather data during high tide and the other will take the same measurements at low tide. Students will study the salt marsh by examining maps of the area and discussing what it is and how it functions. They will briefly examine typical organisms and discuss the marsh zones they inhabit and how the changing tides act to change many abiotic factors in the marsh, flushing out stagnant water and waste while bringing in fresh minerals and biotic materials. After the field trip students will share and combine data from. Analyze the data and correlate salt marsh data with position of moon and answer questions.

High School Lesson Plans (Grades 9-12):

Rising and Falling: The Moon and Tides (Bamburg)

AP Environmental Science 11-12

To be completed over several class periods and a month of lunar observations.

Estuary Principles: #1

Students will be observing the moon for a month and using data about Narragansett Bay to investigate a probable cause and effect relationship between the moon and the regular variation in water level. Students need to observe environmental systems; develop and conduct an experiment; utilize appropriate techniques and instrumentation; analyze and interpret data; which includes statistical and graphical representations; make conclusions and evaluate their quality and validity; communicate accurately and meaningfully about observations and conclusions.

We Must Evacuate! (Lawless)

9th Grade Physical Science Estuary Principles: #1

To be completed over several class periods

This lesson is designed to help freshman and sophomore students understand the inter-connectedness of Earth Systems. Students will be able to express their understanding of how major Earth events or catastrophes can affect all the Earth Spheres with an emphasis on watersheds and estuaries. Show a clip from the movie "Day after Tomorrow" (where the President is being debriefed by his cabinet about the impending doom of the country). Examine questions: What data would you request from scientists to

help you plan? Develop a scenario for coastal cities and include ramifications on estuaries. Which industries would suffer the most adverse effects? Which would benefit the most? Students will be placed in groups of five. Each group will elect a President. This team member will oversee the entire project. The President will help collect data and help finalize all statements. This team member will be the public speaker and will present all material.

Flounder Frenzy! (Steiz)

12th Grade Estuary Principles: #'s 1 through 4

To be completed over several periods between September and November

Students will study estuaries by looking at Flounders. The size of the winter flounder population has declined in Narragansett Bay, presumably due to warming of the Bay's water leading predators like ctenophores and shrimp to eat earlier in the season thus consuming the eggs of the winter flounder. Parameters including salinity, temperature and water clarity, will be graphed and compared to the flounder population graph to identify any correlation. Students will collect flounder with a trawl net; they will measure the flounder and release them back into the bay. Summer flounder will also be measured. In the winter, we will have a fisheries PHD candidate come to the classroom to teach about what the length of the flounder we caught tells us about the population health.

Ecology: Ecosystems and Estuaries (Borba)

Emphasis on 11th grade Estuary Principles: #2, #3, & #6

To be completed over several class periods

Students will watch the program *Elements of Biology: Ecosystems: Organisms and Their Environments*. Students will choose a local ecosystem to study, such as a salt march, beach, dune, park, pond, or field near the school and will work in pairs to study one element of the ecosystem and observe its' plants and animals. Each pair will observe their ecosystem on two occasions. Answer questions and graph data. After students have completed the assignment, they will pool their observations to create the ecosystem's food web. Every student will draw a food web.

Estuaries – Food Webs & Ecological Pyramids (Nelson)

9th and 10th Grades Estuary Principles: #3

1–2 class periods

Students are assigned organisms from the estuary that is found in poster online at <http://www.padillabay.gov/popups/EstuaryPoster.htm> to learn about. Complete handouts, print pictures and organize them into three main groups to construct a food web using the cut out labeled pictures of their organisms. Students arrange the pictures using arrows to indicate the direction of energy flow. They will describe the organism to the class including its predator(s), prey, and interesting facts. Students will then work in groups and study one of the ecological pyramids in their textbook or using another source. Students will create an example of their ecological pyramid using the food chain they focused on. Each group of students will present their work to the class.

** NOTE: Times listed are estimations; lessons can be altered to fit times desired.*