The Science and Math Investigative Learning Experiences (S.M.I.L.E.) Program

Estuary Curriculum Outline

Middle & High School

**Vision Statement:** By December, students will know what an estuary is, the different functions it serves, and how pollution and climate change are impacting them.

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| Topic | Activity Summary | Materials | Source |
| Welcome to SMILE |
| Welcome to SMILE! – Logistics  | * Getting to Know You Icebreaker
* Membership Form Collection
* SMILE Expectations (Timelines, Attendance, Good Grades, Good Behavior)
* SMILE outline of year’s events
* Student Club Jobs
* Field Trips (explanation and permission forms)
* HS – Four-Year Plan Worksheet
* Fun Science Inquiry Activity
 | * Handouts from SMILE website (club curriculum tab)
 | [www.uri.edu/smile](http://www.uri.edu/smile) - “Club Curriculum” tab |
| Introduction to Estuaries  |
| Introduction to Estuaries | * Gallery Walk – students will walk around to 6 different stations with different images and questions. This activity is to introduce students to concepts that will be covered in this unit on estuaries and to stimulate thinking and conversation.
* Idea Pools
* Video - Drop by drop to the sea
* Google Earth/Maps
 | * Colored copies of pictures
* Questions for Gallery Walk
* 2 different colored post-its
* Computer lab (or projector)
 | Jo Ann Basel (Gallery Walk)Video site - <http://www.earthlive.org/tv/index_tv.htm> |
| Wetland in a Pan(WOW, p. 212) | * Students make a model that demonstrates the flood-buffering and filtering effects of wetlands.
 | * Modeling clay
* Long shallow pan
* Sponges
* Watering can
* Cup of soil
* Jar of muddy water
 | Wonders of Wetlands |
| Wetland Metaphor Scavenger Hunt  | * To illustrate and emphasize why wetlands and coastal wetlands in particular are an important part of the ecosystem using physical objects as metaphors for wetland functions.
 | * Items from home: egg whisk, sieve, plant pot with soil, grocery store flyer, pictures, menus, pillow case, etc
 | Adapted from Wonders of Wetlands |
| Wetland Habitats (WOW, p. 87) | * This activity uses a flow chart to introduce and sort out the common types of wetlands.
 | * Copies of Wetland Habitats Flow Chart
* Copies of Habitat Cards
* Pictures of wetlands (from internet)
* Paper and pencils
* Copy of US map (optional)
 | Wonders of Wetlands |
| Wetland Address (WOW, p. 147) | * Students identify plants and animals and their wetland habitats by analyzing clues that describe their adaptations, characteristics, and other species trivia
 | * Set of Wetland Address cards for each group
* Pencils and paper for scoring
* Pictures of organisms (optional)
* Map of world (optional)
 | Wonders of Wetlands |
| Gone Fishin’ | * This activity simulates a catch and release sampling method with fish.
 | * Gold fish crackers – plain
* Gold fish crackers – colored
* Small paper cups
* Small paper bags
* Napkin or paper towel
* pencils
 | Adapted from activity from University of Wisconsin at Superior <http://acad.uwsuper.edu/uwssied/Life/LABS/Recapture.htm>  |
| Pollution, Contaminants & Runoff |
| Treatment Plants (WOW, p. 120) | * Demonstrate the uptake of pollutants into plant tissues
 | * Food coloring
* Fresh celery with leaves
* Clean bottles/jars (1 per group)
 | Wonders of Wetlands  |
| Clean Water Challenge | * Each group will design, evaluate, build, test, and refine a water filtration system that can filter at least 150 mL of dirty water in 15 minutes.
 | * 2 liter clear plastic soda bottles (1 per group)
* Cheese cloth
* Mesh screen
* Coffee filters
* Cotton balls
* Sand
* Gravel
* Activated charcoal
* Scissors
* Markers
* Rubber bands
* Old panty hose for ‘screen’
* Filtration materials: paper towel, shredded newspaper, sponges, mulch, moss, packing peanuts, grass, marbles, etc.
* “polluted” water in gallon jugs
 | Material adapted from activity created by: Dennis Ruez Jr., Environmental Science Institute, University of Texas at Austin. |
| Oyster Mystery | * This lesson is comprised of three mini lessons where students try to figure out what caused a major decline and then increase in oyster populations in Aransas and Copano bays in TX. Students will be given data in the form of tables and graphs to solve the mystery.
 | * Copies of 3 “student masters” packets
* Access to internet if you want students to use the online graphing tool (or you can hand out printouts)
 | [www.estuaries.noaa.gov](http://www.estuaries.noaa.gov)  |
| Our Polluted Seas | * This is a jigsaw activity where student groups will research one of the given websites, answer questions, and share back with the group what they have found.
 | * Computer Lab
 | SMILE |
| Trouble with Microbeads | * Students will learn what microbeads are and how to avoid them when using every day hygiene products by looking at the ingredients. Students will also try to filter out the microbeads. Does it work?
 | * Bring in hygiene products from home (toothpaste, shampoo, facewash, etc.)
* Optional: Beat the Microbead application on Smartphone
* Coffee filters
* Cups
 | Info taken from [www.beatthemicrobead.org](http://www.beatthemicrobead.org)  |
| Homemade Face Scrubs | * Students will learn about environmentally friendly skin care products that work! They will also make one of the recipes.
 | * Teacher look at recipes and choose which ingredients you want to make available to students
* Containers for students
 | By Misty Spinney on Pinterest & [www.sheknows.com](http://www.sheknows.com)  |
| Homemade Cleaning Recipes | * Students will learn about environmentally friendly cleaning products that work! They will also try some of the recipes to test their effectiveness.
 | * Teacher look at recipes and choose which ingredients you want to make available to students
* Dirty items to clean!
 | [www.rodalenews.com](http://www.rodalenews.com)  |
| Climate Change & Green Infrastructure  |
| Climate Change Song | * This can be used to open up the lesson. Lyrics are provided. Class discussion about climate change, sea level rise, and possible solutions.
 | * Copies of lyrics
* Computer to play song
 | A Coastal Cabaret:<http://www.riclimatechange.org/impacts_at_home.php>  |
| Green Infrastructure – Storer Park Example | * Student groups will review the different green infrastructure designs and present it as their own. By doing their presentation, they will have to familiarize themselves with the design features and why the feature will be valuable in the face of rising waters. The group who gets approval by the town council (students) wins the challenge.
 | * Green Infrastructure PowerPoint
 | Capstone Project PowerPoint from Dr. Sheridan from URI’s Landscape Architecture Dep’t |
| Wetland Tradeoffs (WOW, p. 285) | * Students conduct a mock public hearing to make a group decision on an important project
 | * Copy of the script for each student
* Enlarged copy of project proposal sketches
* Any desired props or costumes
 |  Wonders of Wetlands |

ADDITIONAL RESOURCES:

Sea Level Rise Visualizations

<http://www.slideshare.net/riseagrant/ri-sealevelrisevisualize2?utm_source=slideshow02&utm_medium=ssemail&utm_campaign=share_slideshow_loggedout>

Recycling Flash Mob

<https://www.youtube.com/watch?v=GYnd5JRu86E>

Providence Stormwater Animation – By Stephanie Yin for the Land & Water Partnership (Meg Kerr)

 <https://www.youtube.com/watch?v=OApAaAvDc3g>