

# Teachers on the Estuary (TOTE)

## Narragansett Bay Research Reserve

### August 9-12 and November 17, 2012

### Course Syllabus

#### Course Information

- Title:** Narragansett Bay Research Reserve, Teachers on the Estuary
- Semester:** Summer & Fall 2012
- Schedule:** Thursday, August 9, 2012 Full Day (~6 hours)  
Friday, August 10, 2012 Full Day (~10 hours)  
Saturday, August 11, 2012 Full Day (~9 hours)  
Sunday, August 12, 2012 Half Day (~2 hours)  
Saturday, November 17, 2012 Half Day (~3 hours) (to be held at the Audubon Environmental Education Center in Bristol, RI)
- Location:** Narragansett Bay Research Reserve Headquarters\* and other locations on Prudence Island, RI
- Instructor:** Maureen Dewire, Education Coordinator, Narragansett Bay Research Reserve  
55 South Reserve Drive, Box 151, Prudence Island, RI 02872  
Maureen@nbnerr.org (401) 683-1478

\*Please note that like many coastal areas, Prudence Island is home to many biting insects, including ticks, mosquitoes and flies. We will spend much of our time immersed outdoors to enhance our field experience and to take full advantage of the island as an outdoor classroom. Please be prepared to be outdoors for a few hours at a time and bring proper clothing and bug spray.

#### Course Description

This course is a pilot for the Teachers on the Estuary (TOTE) program, a research and field-based teacher training initiative of the National Estuarine Research Reserve System, part of the National Oceanic and Atmospheric Administration (NOAA). The goal of TOTE is to improve teachers' and students' understanding of the coastal environment using local examples and to provide resources and experience to support the incorporation of estuary and watershed topics into classroom teaching. The course is also designed to promote stewardship of watersheds and estuaries.

The course will introduce teachers to information, research, and classroom activities about watersheds, estuaries, and coastal systems. The course incorporates investigations in the field and using on-line data. Course content and activities will be aligned with national state science and math frameworks.

**Credit:** The course is offered for 30 hours towards Professional Development Credits through the Rhode Island Department of Education pending approval. Professional Development Credits will be free and are granted through Narragansett Bay Research Reserve. Two graduate credits will be offered through Framingham University for \$75 per credit.

**Grade levels:** The course is designed for science and math teachers in grades 6 through 12. Others are welcome to apply.

**Cost:** Thanks to support from a NOAA Bay Watershed Education and Training grant, the course is offered without charge.

**Support:** Each participant will receive a \$200 mini-grant for education and stewardship projects related to course topics and approximately \$150 in teaching materials upon successful completion of the course requirements.

**Lodging and meals:** Lodging will be provided by the Reserve in our modest cottage that includes 3 bedrooms and 2 baths plus a comfortable living area, dining room and full kitchen. Bedrooms are dorm-style with a mix of bunk beds and single beds. Participants must provide their own linens, pillows, towels and toiletries. All meals will be provided and we will do our best to accommodate special requirements. Please note there is only one small 'variety store' on the island with limited options and operating hours, so our food will be brought over from the mainland with little to no options to supplement. If you have special dietary restrictions, please bear this in mind.

**Application:** Space is limited and participation is by application. Completed applications may be downloaded from [www.nbnerr.org/tote.htm](http://www.nbnerr.org/tote.htm) or [www.estuaries.noaa.gov](http://www.estuaries.noaa.gov) and emailed to [Maureen@nbnerr.org](mailto:Maureen@nbnerr.org) or mailed to NBNERR, Attn: Maureen Dewire, Box 151, Prudence Island, RI 02872.

### **Course Objectives**

Participants will be able to:

1. Describe the NERRS and explain two NERR research projects.
2. Access and use the on-line Estuaries 101 curriculum and other NERRS/NOAA educational products with students.
3. Describe major physical, biological, chemical and geochemical estuarine processes as well as impacts of human activities on coastal systems.
4. Locate, download, and use data relevant to lessons about estuaries.
5. Teach basic estuarine concepts by guiding students in using field and laboratory research techniques analogous to those used at Research Reserves.
6. Explain the six Estuarine Principles and Concepts (listed below).
7. Lead students in learning activities that improve the students' abilities to become stewards of the environment.

### ***Estuarine Principles and Concepts***

- Principle 1. Estuaries are interconnected with the world's oceans and with major systems and cycles on Earth.
- Principle 2. Estuaries are dynamic ecosystems with tremendous variability within and between them in physical, chemical, and biological components.
- Principle 3. Estuaries support an abundance of life, and a diversity of habitat types.
- Principle 4. Ongoing research and monitoring is needed to increase our understanding of estuaries and to improve our ability to protect and sustain them.
- Principle 5. Humans, even those living far from the coast, rely on goods and services supplied by estuaries
- Principle 6. Human activities can impact estuaries by degrading water quality or altering habitats; therefore, we are responsible for making decisions to protect and maintain the health of estuaries.

## **Course Expectations**

Participants will be expected to:

1. Review pre-course materials
2. Attend all components of the four-day session plus the follow-up session
3. Complete a pre-test and post-test
4. Complete in-class assignments
5. Participate in activities and discussions
6. Review and pilot an Estuaries 101 lesson or create an original lesson that utilizes NOAA or NERRS data
7. Undertake a stewardship project with their students
8. Participate in evaluation of the course in November and at the end of the 2012/2013 year

## **Course Texts and Materials**

Readings and reference materials will be drawn from the following sources, as well as from NOAA and many other web sites. In addition, many lesson plans and curriculum materials for teaching about estuaries will be provided.

Bradley, M., Raposa, K., Tuxbury, S. 2007. Report on the Analysis of True Color Aerial Photography to Map and Inventory *Zostera marina* L. in Narragansett Bay and Block Island, RI.

Desbonnet, A. and Costa-Pierce, B. (Editors) 2008. Science of Ecosystem-based Management: Narragansett Bay in the 21st Century, Series on Environmental Management. Springer Press.

Doherty, A.M. 1995. Historical Distributions of Eelgrass (*Zostera marina*) in Narragansett Bay, Rhode Island 1850-1995. Narragansett Bay Estuary Program.

Estuaries 101 - <http://www.estuaries.gov/Teachers/Home.aspx>

Intergovernmental Panel on Climate Change. 2007. 4<sup>th</sup> Assmt Report: Climate Change '07. UNEP.

Lambert, K.F. 2005. Nitrogen Pollution: Sources to the Sea. Hubbard Brook Research Foundation

Pryor, D., Saarman, E., Murray, D., and Prell, W. 2007. Nitrogen Loading from Wastewater Treatment Plants to Upper Narragansett Bay. Narragansett Bay Estuary Program.

Raposa, K. and Schwartz, M. Draft. An Ecological Profile of the Narragansett Bay National Estuarine Research Reserve. RI Sea Grant.

Tiner, R.W., Nuerminger, T., and Mandeville, A. 2004. Coastal Wetlands Trends in Narragansett Bay Estuary During the 20<sup>th</sup> Century. Narragansett Bay Estuary Program.

## **Course Requirements**

There are two major assignments for the course:

### **Estuaries 101 or Lesson Plan:**

Teachers can review and try out a lesson from the Middle School or High School Estuaries 101 curriculum *or* develop a lesson for teaching estuary and watershed content for their own classes using NERRS/NOAA data. The goal is for teachers to develop a lesson that they will use and that relates to their class's stewardship project. If choosing to develop a lesson plan, it should be based on material presented in the course. The lesson does not have to be original. Teachers can choose to modify an E101 lesson or another existing lesson for use with their classes. The goal is for teachers to develop a lesson that they will use.

The lesson plan should include sections based on the following format:

- Title
- Grade level and subject area
- Main concepts
- Learning objectives or expected outcomes
- Relevant science or math standards
- Relevant estuarine concepts and principles
- Materials and equipment
- Background information (description and/or links to what the teacher should know to teach this lesson)
- An outline of the lesson
- Tips and hints for other teachers and lessons learned/reflection
- Your sources of information and recommended references

### **Stewardship Project:**

Stewardship projects can be thought of as service projects that will benefit a local watershed or body of water. Examples of stewardship projects include adopting a water body near the school by making a commitment for monitoring and/or cleanup, making a presentation to the community, recruiting community volunteers for a service project, starting a sustainable practice (such as recycling, or replacing incandescent light bulbs with compact fluorescent bulbs) in their school, planting a native garden/learning about invasive species, and teaching others in the community what they have learned. Participants will submit a summary and review of their students' stewardship project at the follow up meeting (and samples or photos of student work if appropriate), or an overview if the project is in the planning stage, with a summary to follow after project activities have taken place.

The **stewardship project proposal** (for credit/grade and to receive the \$200 mini-grant) should include the following sections:

- Goals, objectives, and/or expected outcomes
- Estuary Principles and Concepts addressed by the project
- Description of the project
- How the project idea was developed
- Number of students involved and description of the students (grade level, class, club, etc.)
- Time line

- How stewardship project money will be spent
- How the stewardship project will address the 6 stewardship project criteria (listed below)
  - Address a resource management need in the students' own watershed
  - Be student driven
  - Include outreach to a broader community (beyond their own class)
  - Utilize knowledge or practice skills learned through TOTE training
  - Be an integral part of the instructional program
  - Collaboration with a community organization or volunteer expert in the community

Teachers may work alone or with one or two other participants to develop and carry out the stewardship project and the lesson plan. The completed stewardship project (or proposal) and lesson plans will be due on the follow-up day, Saturday November 17, 2012 and teachers will be asked to present to the group about either their lesson plan or their stewardship project. Stewardship and lesson plans should be sent to the lead educator at least 3 weeks prior to allow time for review and any suggestions or comments. Teachers have until the end of the 2012/2013 academic year to carry out the stewardship project.

### **Stewardship Project Notes and Context**

An effective way to guide students to conduct a stewardship project is to use the format for a **Meaningful Watershed Educational Experience (MWEE)** as described in NOAA's Bay Watershed Education and Training grant guidelines. These experiences include three phases:

1. A preparation phase, which involves students in discussions about a question, problem or issue.
2. An action phase, which includes an outdoor experience where students make observations and collect data. This phase could include helping with projects that result in positive impacts to the environment.
3. A reflection phase, which includes evaluating the activity, analyzing conclusions and sharing the results.

The stewardship project could be incorporated into the action phase or could be designed by the students during the reflection stage as a culminating follow up activity.

The stewardship project is an important activity that provides an opportunity for teachers to integrate and apply with their students the skills learned through the Teachers on the Estuary course.

The following TOTE goals and outcomes can be addressed and achieved through stewardship projects:

**TOTE Program Goal:** Teachers and students have knowledge and appreciation of estuary and watershed environments and the necessary skills to act as stewards of estuary and watershed resources.

#### **Mid-Term Outcomes (application of new knowledge):**

- Teachers incorporate experiential learning in their classes and are effective in teaching their students about estuaries and watersheds.
- Students are able to explain how their actions in watersheds affect estuaries.

- Students gain a better understanding of their own watersheds and/or estuaries.

**Long-Term Outcomes (effect or change in secondary target audience)**

- Teachers act as stewards of estuaries.
- Students act as stewards of estuaries.

**\$200 Stewardship Mini Grant:** This grant money may be spent on materials, buses, stipends for speakers or anything needed for the students to accomplish their stewardship projects and should be noted in the proposal what the money will be used for.

**Grading Criteria**

Participants earning Professional Development Credits must complete exercises assigned as part of class work. The computer-based activities completed during the course will be worth 10 percent of the grade, participation and contributions to discussions will be worth 30 percent, the lesson plan will be worth 30 percent and the stewardship project will be worth 30 percent.

**Course Outline: DRAFT (subject to change as details are finalized)**

**Thursday, August 9<sup>th</sup>**

9:45AM-8:30PM

*Morning*

- Travel to Prudence Island, departing on the 10AM ferry out of Bristol, RI for 30 minute ride to Prudence Island
- Welcome, introductions, overview of the course and course requirements including the stewardship plan and lesson plan
- Introduction to PI, NBNERR, NERRS and missions

*Lunch*

*Afternoon*

- Review of estuaries, watersheds and estuary principles (some of this may be conducted in the field during our tour of the Island, where we can be hands-on)
- Driving tour of South End of Prudence Island to include the SWMP station at T-wharf
- Presentation on the System Wide Monitoring Project (SWMP) with a NBNERR researcher
- Continue on driving tour of the remainder of Prudence Island, with several stops to see various habitats; meet with NBNERR Stewardship Coordinator
- Wrap-up and review of TOTE materials and resources

*Dinner*

*Evening*

- Evening hike after dinner and reflection time

**Friday, August 10<sup>th</sup>**

8AM-8:30PM

*Morning*

- Presentations by Coastal Scientists with a focus on climate change impacts, invasive species or similar topics of interest involving current issues
- Exploring Estuaries 101 – HS & MS curriculums in between 2 guest speakers

*Lunch*

*Afternoon*

- Salt marsh field work and techniques
- Water quality and SWMP graphing tool for students and teachers
  - [DataintheClassroom.org](http://DataintheClassroom.org)
  - [Estuaries.noaa.gov](http://Estuaries.noaa.gov)
  - [Nerrdata.org](http://Nerrdata.org)

- Introduction to data loggers, design an experiment and data logger deployment

*Dinner*

*Evening*

- Evening hike after dinner and reflection time

Saturday, August 11<sup>th</sup>

8AM-5:30PM

*Morning*

- Retrieve data loggers and download information
- Invasive species: brief review and then we'll head to the rocky shore to learn how to collect data on the invasive Asian shore crab

*Lunch*

*Afternoon*

- Watersheds and Coastal Management: setting up a model watershed and role playing a coastal management dilemma
- Discussion among one another, stewardship ideas from the past

*Dinner and a free evening!*

Sunday, August 12<sup>th</sup>

8AM-10AM

*Morning*

- Final wrap-up
- Stewardship project – group discussion
- Post-test and course evaluation

**DEPART at 10AM to catch the 10:30AM ferry back to Bristol, RI. NOTE: Any teachers wishing to spend the remainder of the day on Prudence Island, exploring on their own, are welcome to depart with the NBNERR staff at 3:30PM in order to catch the 4PM ferry instead.**