

Teachers on the Estuary (TOTE) Agenda

Course description: This course is 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 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. This year there will be a particular emphasis on coastal impacts of climate change.

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 the use of on-line data. Course content and activities will be aligned with state science and math frameworks.

Credit: The course is offered for X graduate credits. Graduate credit is optional and is available from XX State College for \$XX per credit.

Grade levels: The course is designed for science and math teachers in grades 7 through 12. Others are welcome to apply.

Schedule:	Monday	10:00 am – 7:30 pm
	Tuesday	8:30 am – 4:00 pm
	Wednesday	8:30 am – 5:00 pm
	Thursday	8:30 am – 4:00 pm

Course objectives: Participants will be able to

1. Describe the NERRS system 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 graph 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 related to stewardship of the environment.

Estuarine Principles and Concepts

1. Estuaries are interconnected with the world ocean and with major systems and cycles on Earth.
2. Estuaries are dynamic ecosystems with tremendous variability within and between them in physical, chemical, and biological components.
3. Estuaries support an abundance of life, and a diversity of habitat types.
4. Ongoing research and monitoring is needed to increase our understanding of estuaries and to improve our ability to protect and sustain them.

5. Humans, even those living far from the coast, rely on goods and services supplied by estuaries
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 from on-line sources (links will be sent to participants).
2. Attend all components of the four-day sessions
3. Complete a pretest 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.

Course Outline

Monday

10:00 am – 7:30 pm

Introductions to Each Other, XX Reserve, and NOAA Resources

Morning

- Introductions of participants and presenters; overview of course
- Introduction to NERRS system, mission
- Estuary principles and concepts
- Definition of estuary and watershed
- Evaluation strategies
- Tour of Reserve Headquarters
- Canoe trip: Salt marsh values- basic salt marsh ecology exploration, the wetland as a system, inquiry activity, generates questions. Demonstrate and teachers try out Water quality monitoring equipment.

Lunch

Afternoon

- Introduction of journal
- Explore www.estuaries.noaa.gov
- Google Earth and Estuaries 101 activity- (adapted for local watershed)
- How to use data loggers, design of experimental question
- Deployment of data loggers/journal time

Tuesday

8:30 am – 4:00 pm

Morning

Digging into Data Visit to NERR research lab & meet with Research Staff - Adventures in SWMP. How people study coastal systems.

- NODE and other student-friendly NOAA websites
- SWMP graphing tool for students and teachers
- Water Quality Monitoring Parameters- the hows and whys

- Intro to Salt Marsh Systems and Sea level Rise

Lunch

Afternoon

- **Salt Marsh Systems & Sea Level Rise:** Meet graduate researcher studying how coastal systems will respond to global climate change, particularly the response of salt marshes to warming. During this session we will learn about her research into *Spartina alterniflora* specifically and shed some light on general estuarine ecology concepts such as zonation, salt marsh plant adaptations and reproduction. Presentation will be followed by field visit to practice graduate researcher methods
- Debrief: How to apply to classroom
- Journal Reflections

Wednesday

8:30 am – 5:00 pm

Humans and Estuaries

Morning

- Eelgrass activity
- Coastal Management Dilemma: Role play activity: Should our town ban fertilizers?
- Retrieve data loggers, graph, interpret and discuss results. Brainstorm ways to use with students.
- Estuaries 101 Middle School Curriculum- “The Great Plankton Race”

Lunch

Afternoon

- Classroom activities replicating research, How to develop a monitoring program
- Field studies with XX Reserve scientists: biological monitoring for a salt marsh restoration project. Discuss resource management implications with Reserve Stewardship Coordinator
- Field trip to local beach with a focus on sea level rise and salt marsh restoration site
 - Journal reflections

Thursday

8:30 am – 4:00 pm

Watershed Field Study and Wrap Up

Morning

- Watershed study: model how to set up classroom and field studies of an estuary or river and its watershed using the Meaningful Watershed Education Experiences planning model.
- Background information and resources; framing a question; sampling plan; data collection; data interpretation; reporting results
- Field studies in local watershed (model student field studies)

Lunch

Afternoon

- Reflection Activity: Debrief from watershed field studies.
- Discuss stewardship projects/other expectations including follow up. Estuaries 101 Middle School activity- Score One for the Estuaries.
- Estuary Principles presentations by teachers
- Post test and course evaluation