Climate Education for a Changing Bay

Integrating Perspectives on the Chesapeake Bay through Civic Engagement Workshop, Hull Springs Farm, April 27, 2014

Slides courtesy of Jaclyn Beck, Marine Education Specialist, CBNERRVA BWET Program
Education

Coastal Training Program

Stewardship

Research
So what are we doing?

1) Classroom Lesson
2) Field Experience at school
3) Field Experience at VIMS

Why?

1) To improve climate literacy within local high schools
   • Understanding changes in sea level and inundation and the associated responses of critical habitats and coastal communities are key to the Chesapeake Bay region
   • Relative sea level rise and associated impacts in the region represent some of the highest rates reported along East coast
Climate vs Weather

Weather is the day-to-day state of the atmosphere, and its short-term variation in minutes to weeks.

Climate is the weather of a place averaged over a period of time, often 30 years.
1) Fall here tends to be dry and cool.

2) The temperature is currently 3° C.

3) We average 200 inches of snow each winter.

4) There is a hurricane affecting the Gulf Coast.

5) Our warmest month is August.
Climate Change

Climate Change Video
1) Climate Change is happening
2) Science is based on facts
3) It’s a complex issue
Local Relative Sea Level Rise Rates

- Glacial Groundwater Withdrawals
- Land Subsidence
- Groundwater Withdrawals

Do the Math

~ 3.0 mm/yr “Land”
+ 1.8 mm/yr “Ocean”
4.8 mm/yr Local RSLR rate

- Global or “Eustatic” Sea Level Rise
  - Thermal Expansion of Water
  - Melting of Continental Ice
What could be impacted as a result of climate change?
Ten Indicators of a Warming World

- Air Temperature Near Surface (Troposphere)
- Humidity
- Temperature Over Oceans
- Sea Surface Temperature
- Sea Ice
- Sea Level
- Ocean Heat Content
- Temperature Over Land
- Snow Cover
- Glaciers

Seven of these indicators would be expected to increase in a warming world and observations show that they are, in fact, increasing. Three would be expected to decrease and they are, in fact, decreasing.
Topographic Map - Map that deal with the surface changes on the earth

Many uses…
How does this impact us locally?
Introduction to Salt Marshes
Salt Marsh Zonation

The elevation determines what plants & animals can grow in each zone.
Low Marsh

- Flooded daily
- Nutrient-rich
- Limited residents & species diversity
- High bio-mass!!!
Spartina alterniflora
smooth cordgrass
Plant adaptations: living in high-saline soils

Halophytes

suculence

salt glands
High Marsh

- Rise in elevation, barely flooded
- Sandier soils
- Greater plant and animal diversity
High Marsh Plants

*Spartina patens*
salt marsh hay
Iva frutescens
marsh elder

Shrub Zone
Why are salt marshes important?
What are the ecosystem services of salt marshes?

- Habitat
- Filter
- Flood/erosion control
- Dune creation
- Recreation
- Economic importance
Habitat

Provide feeding, spawning and nursery habitats for fish, shellfish and birds.
Animals of the Salt Marsh

Detritivore
Deposit feeder
Herbivore
Filter feeder
Scavenger
Predator
Filter
Salt marshes and upland forests associated with estuaries act as filters to remove excess nutrients and contaminants from storm water and runoff.
Flood and Erosion Control

Act as “sponges”
Protect against erosion
Base for sand dunes to form

Wrack
Recreation: fishing, crabbing, kayaking, birding, and boating
Economic Services

- Commercial fisheries
- Supports jobs
  - Wetland management
  - Tourism
  - Education
  - Department of Natural Resources
Human impacts on salt marshes

- Development
- Coastal Growth
- Overharvesting
Sea Level Rise impacts on salt marshes

Short term changes in sea level
- Weather patterns (storms blowing ashore, offshore winds) can cause sea level changes for months at a time
- Lunar tides result in daily changes in sea level
- Ocean currents (Gulf Stream) can influence sea levels

Long term changes in sea level
- Global warming results in warmer ocean water temperatures. Warmer water, because it expands, takes up more area than cooler water temperatures.
- Melting of glaciers globally. The result is rising sea levels
- Land subsidence
What is NERRS doing to monitor Sea Level Rise impacts on their reserve sites?

https://www.youtube.com/watch?v=KRRKWnmOHwo
Transecting the marsh habitat outside
What can you do?

Think Locally

Act Globally
Climate for a Changing Bay – First Classroom Visit (Introduction) and First MWEE Experience on the School Grounds
Climate for a Changing Bay – Final MWEE Experiences at Virginia Institute of Marine Science
HOW TO GET REAL TIME DATA

www.chesapeakebay.noaa.gov/cbibs  www.vecos.org
Sea Level Rise Coastal Viewer

http://csc.noaa.gov/slr/viewer/
CBNERR Website Resources

Resources and Publications

K-12 Education Resources

Curriculum

- Oyster Reef in the Classroom - A Hands-On Laboratory Approach
- TERCC, 2009, Estuaries 101 Curriculum: Earth, Life and Physical Science Modules, Teachers Guide for Grade Levels 6-12, Produced for NOAA/NERRS
- Estuaries 101 Middle School Curriculum - State Standards Alignment - Search by Activity Name
- Estuaries 101 Middle School Curriculum - State Standards Alignment - Search by Virginia SOL
- Estuaries 101 High School Curriculum - State Standards Alignment - Search by Activity Name
- Estuaries 101 High School Curriculum - State Standards Alignment - Search by Virginia SOL
- Estuaries.noaa.gov - web portal with curriculum (Estuaries 101 High School and Middle School curriculum), games, volunteer opportunities, and data
- York River Water Quality Curriculum - Using Real Water Quality Data to Investigate Water Quality Cycles and Answer Applied Marine Science Questions

Publications

- Market Analysis - K-12 Education Program Market Analysis within the Hampton Roads, Virginia Region.
- Needs Assessment - K-12 Education Program Market Analysis within the Hampton Roads, Virginia Region.

Professional Training Material

- Carroll, R., Estuarine Aquarium Keeping for Beginners, Virginia Institute of Marine Science, College of William and Mary, Gloucester Point, Virginia 23060.

www.vims.edu/cbnerr

General Estuaries Information/Presentations

- Estuaries
- What is NERRS?
- What lives in the Chesapeake Bay?
- Water Quality
- Take Action - 10 Ways to Protect Estuaries

Podcasts

- What are Estuaries?

General Field Trip Information

- Field Trip Liability Form
- Field Trip Health Form
- VIMS Registration Form
- VIMS Release Form
Chesapeake Bay National Estuarine Research Reserve in Virginia

Contact me!

Sarah McGuire Nuss
Virginia Institute of Marine Science
P.O. Box 1346
Gloucester Point, VA 23062
mcguire@vims.edu
804-684-7878

www.vims.edu/cbnerr