



Virginia Master Naturalist Program Basic Training: Coastal and Estuarine Ecology and Management Presentation Handout

Authored by Michelle Prysby, Senior Extension Specialist and Virginia Master Naturalist Program Director, Department of Forest Resources and Environmental Conservation, Virginia Tech

Meet the Chesapeake Bay

North America's largest estuary; >200 miles long by up to 30 miles wide; holding 18 trillion gallons of water; average depth of 21 feet; home to 348 species of finfish, 173 species of shellfish, 29 species of waterfowl; 500 million pounds of seafood produced annually;

Physical Factors Influencing Bay Ecology

1. **Salinity** – Saltier near the ocean, near the eastern shore, in deeper waters, and in drier months (Figure 1).
2. **Temperature** – Fluctuates greatly because it is relatively shallow. Temperature is increasing over the longer term.
3. **Circulation** – Driven by flow of rivers and ebb and flow of tides plus wind. Promotes mixing of nutrients and disperses organisms.
4. **Dissolved Oxygen** – Higher when water is cool, wind provides mixing, and nutrient inputs are low. Hypoxic (low oxygen) and anoxic (no oxygen) areas form when the water is warmer and inputs of nutrients stimulate plankton growth, resulting in a “Dead Zone” (Figure 2).

Bay Habitats

1. **Shallow water** – Supports Submerged Aquatic Vegetation (SAV), which add oxygen to the water, consume nitrogen and phosphorus, protect shorelines, provide habitat for fish, crabs, and turtles.
2. **Open water** – Home to a food web with phytoplankton as the base. Plankton are consumed by small fish, which are consumed by larger fish.

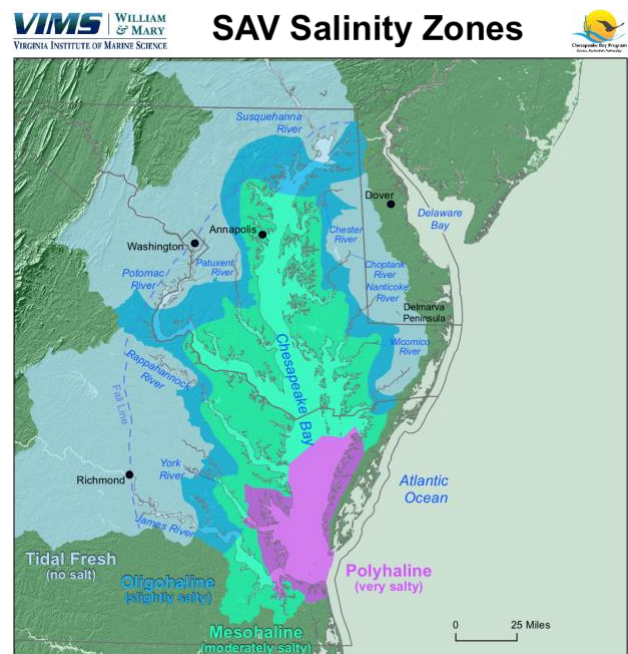


Figure 1. Submerged Aquatic Vegetation Salinity Zones in the Chesapeake Bay. (David Wilcox (VIMS), Courtesy of the Chesapeake Bay Program.)

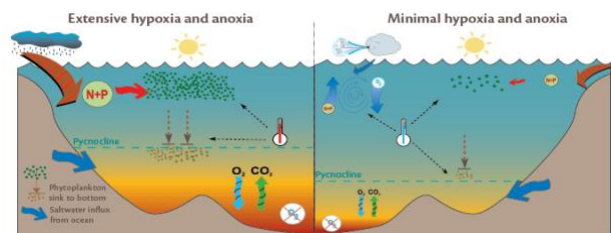


Figure 2. Conditions leading to hypoxia and anoxia. (Caroline Wicks, Integration and Application Network, University of Maryland Center for Environmental Science) (<http://ian.umces.edu/imagelibrary>)

3. *Reefs* – The Eastern Oyster forms large reefs, feeding on plankton and cleaning the Bay water.
4. *Wetlands* – May be tidal or non-tidal and saltwater, brackish, or freshwater. Tidal wetlands include saltmarshes dominated by cordgrass, forested wetlands, freshwater marshes. Provide many benefits, such as absorbing runoff, filtering sediment and toxins, storm protection, and habitat for vertebrates (e.g., diamondback terrapin) and invertebrates (e.g., fiddler crabs.)
5. *Beaches* – Harsh environment with a small number of plants adapted to those conditions. Home to the endangered Northeastern Beach Tiger Beetle.

Coastal and Estuarine System Threats

- Shoreline hardening – Walls, jetties, and other hard structures can destroy natural beach and wetland habitats and lead to increased erosion in neighboring areas.
- Nonpoint source pollution – Inputs of sediment, nitrogen, and phosphorus throughout the whole Bay watershed end up as pollutants in the Bay, contributing to zones of low or no oxygen.
- Marine debris – Litter of all kinds, particularly balloons and plastics.
- Invasive species – Animals, e.g., blue catfish, mute swan, nutria, veined rapa whelk, northern snakehead fish. Plants, e.g., Phragmites (Common Reed)
- Sea level rise – Due to both global and regional sources. Predicted to rise 1.5 feet in the next 20-50 years. Some islands are already being submerged, and habitats are already shifting inland where possible. Erosion and storm surge are issues for coastal communities.

Coastal and Estuarine System Management

- Numerous local, state, and federal agencies involved.
- Local Wetlands Boards and Chesapeake Bay Boards are made of volunteers from the community who review permits for activities in tidal wetlands and requests for exceptions to regulations.

- Virginia Coastal Zone Management Program – Network of agencies involved in protecting coastal resources.
- Virginia Institute of Marine Science – Provides coastal management advisory service, education, & outreach

Related Volunteer Activities for Virginia Master Naturalist Volunteers

Education

- Lead educational programs for any age group about the importance of our coastal and estuarine systems and what individuals can do to help them.
- Hold Bay-themed booths at community events and festivals
- Organize workshops to educate property owners about Bay-friendly landscaping and greener ways to protect their properties from erosion.
- Assist schools with Meaningful Watershed Educational Experiences, <https://www.noaa.gov/education/explainers/noaa-meaningful-watershed-educational-experience>
- Conduct environmental education for youth or K-12 teachers as a Project Wet educator or facilitator, <https://www.vaawwa.org/page/project-wet-in-virginia>

Citizen Science

- Phytoplankton Monitoring Network, <https://coastalscience.noaa.gov/monitoring-and-assessments/pmn/>
- Monitoring sea turtle nests, contact the Virginia Aquarium at <https://www.virginiaaquarium.com/>
- Sea Turtle and Stranding Salvage Network and/or Marine Mammal Stranding Team, <https://virginiaaquarium.com/stranding-response>
- Monitoring marine debris (Virginia Balloon Study, <https://sites.google.com/site/virginiaballoonstudy/home>)

Stewardship

- Organizing and leading clean-up events that get the public involved. See Clean the Bay Day (<https://www.cbf.org/events/clean-the-bay-day/>) and Clean Virginia Waterways (<https://www.cleanvirginiawaterways.org>)
- Virginia Oyster Shell Recycling Program (<https://ricerivers.vcu.edu/research-and-restoration/virginia-oyster-shell-recycling-program/>)
- Living shoreline plantings and other habitat restoration (https://www.vims.edu/ccrm/outreach/living_shorelines/)
- Shoreline and oyster restoration with the Chesapeake Bay Foundation (<https://www.cbf.org/programs/volunteer/>)

Acknowledgements

Funding for the development of the Coastal and Estuarine Ecology and Management curriculum materials was provided by the Virginia Environmental Endowment.



[Visit Virginia Cooperative Extension](http://ext.vt.edu): ext.vt.edu

Virginia Cooperative Extension is a partnership of Virginia Tech, Virginia State University, the U.S. Department of Agriculture (USDA), and local governments, and is an equal opportunity employer. For the full non-discrimination statement, please visit ext.vt.edu/accessibility.

2025