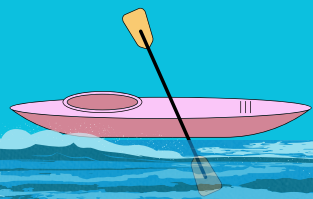




Kayaking & Estuary Exploration



Location: Tomales Bay

Bay Outside Lesson #1

Grade Level:

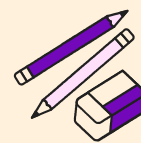
6th Grade

Themes:

Ocean Health, Climate Impacts, and Stewardship

Teacher (your name):

Overview



This lesson is designed to build students' understanding of estuary ecosystems and connect that knowledge to larger environmental challenges like pollution and climate change. Using hands-on science tools, guided discussion, and place-based outdoor exploration, students will conduct water quality tests, collect and analyze marine debris, and reflect on the human activities that affect natural systems. By the end of the session, students should be able to interpret basic environmental data, recognize sources of pollution in aquatic environments, and suggest actions they can take to help protect ecosystems in their communities.

Standards Alignment

- This curriculum draws from the **NOAA Ocean Literacy Framework**, which outlines essential principles for understanding the ocean's influence on humans and vice versa, ensuring that students build scientifically grounded, place-based environmental literacy through real-world exploration.
- National Oceanic and Atmospheric Administration. (2013). *Ocean literacy framework: Principles and concepts of ocean sciences for learners of all ages*.
<https://oceanliteracy.org>

Key Terms

Estuary

A place where freshwater from rivers mixes with saltwater from the ocean. Estuaries are rich ecosystems that support many kinds of plants and animals.

Turbidity

A measure of how clear or cloudy the water is. Water with high turbidity has lots of floating particles like mud, algae, or pollution, which can harm sea life.

pH

A scale that tells us how acidic or basic the water is. A healthy pH for most ocean life is between 7.5 and 8.5. If the pH is too low or too high, it can be harmful to animals and plants.

Salinity

The amount of salt in the water. Ocean water is salty, but the salinity can change with rain, river water, or pollution. Measuring salinity helps us understand changes in the ecosystem.

Marine Debris

Trash that ends up in oceans, bays, and estuaries. It can include plastic, metal, rubber, and more. Marine debris often comes from land and can hurt wildlife or damage habitats.

Stewardship

Taking care of the environment and making choices that help protect it. A steward is someone who looks after the planet and inspires others to do the same.



Lesson 1



Key Topics

1. Estuary ecosystems
2. Water quality (temperature, turbidity, pH, salinity)
3. Marine debris and pollution sources
4. Human impact on ocean systems
5. Environmental stewardship

Learning Objectives

By the end of the session, students should be able to describe key indicators of water health, identify sources of pollution in marine environments, and propose actions they can take as ocean stewards.

Activities

Part 1:

The day begins at the shoreline staging area, where the lead educator greets the group and outlines the goals of the day. The educator might begin by saying, “Good morning everyone! Welcome back to Tomales Bay. Yesterday we explored the bay by kayak, and today we’re going to investigate the health of the water itself. You’ll be scientists and stewards, learning how even a beautiful place like this can be affected by what we do upstream, in our neighborhoods and cities.” Following this introduction, students are led through a quick kayak safety refresher and taught basic paddle signals. After stretching and a short mindfulness activity where students pause and listen to the sounds of the bay, each student receives a waterproof field journal and water testing kit to use throughout the lesson.

Part 2:

Students paddle in small groups to two pre-identified study sites on the bay. At the first location, a sheltered cove, they use their kits to measure water temperature and turbidity, learning how sediment and temperature changes affect aquatic life. At the second stop near an eelgrass bed, students test pH and salinity, recording their data in field journals. The lead educator explains how each metric offers a glimpse into the bay’s overall health and how these indicators can change with weather patterns, pollution, and climate shifts. As students

collect data, educators facilitate small-group discussions with questions like, “Why might this spot have different results than the last one?” or “How does pH affect the animals that live here?” Students may initially struggle to connect the numbers to real-world outcomes, so educators should pause to offer examples (e.g., how turbidity might affect fish finding food) or use visuals to keep students engaged and make abstract concepts more tangible.

Part 3:

After returning to shore, students land at a small beach or accessible shoreline to begin a marine debris survey. The educator introduces the activity by saying, “Even though Tomales Bay looks clean, plastic and other trash often travel here from far away. Let’s see what we can find—and learn—by looking closely at what doesn’t belong.” Students conduct a 30-minute shoreline sweep, collecting debris and categorizing it into types: plastic, metal, rubber, natural debris, etc. They record the number of items in their journals and discuss possible sources of each item. This is followed by a short debrief where students reflect on how everyday consumer habits—plastic water bottles, snack wrappers, fishing line—can end up in coastal ecosystems.

Part 4:

The final part of the session is a group circle back at the original launch site. Students sit together and reflect on what they’ve observed throughout the day. The educator poses open-ended prompts such as, “What did today teach you about how humans impact the ocean?” and “What’s one thing you want to change or share with others now that you know more?” Students may write short reflections in their journals, share thoughts aloud, or engage in a stewardship brainstorm where they suggest personal or school-based initiatives to reduce waste and protect waterways. The session concludes with a reminder that Tomales Bay is part of a global ocean system—and that every action they take, however small, can ripple outward in powerful ways.



Students kayaking in Tomales Bay, CA

Tasks

1. Listen to the welcome and safety instructions.
2. Participate in paddle signal practice and mindfulness activity.
3. Paddle to the first testing site and conduct temperature/turbidity tests.
4. Paddle to the second site and conduct pH/salinity tests.
5. Record findings and discuss observations.
6. Conduct shoreline debris survey and categorize items.
7. Participate in final reflection and group discussion.
8. Brainstorm actionable steps for ocean stewardship.

Materials Needed

- ☐ Waterproof field journals
- ☐ Water quality testing kits (temperature, turbidity, pH, salinity)
- ☐ Pencils/pens
- ☐ Debris collection supplies (gloves, buckets or bags)
- ☐ Kayaks, paddles, and PFDs
- ☐ Safety briefing materials

Resources

- NOAA Ocean Literacy Framework: <https://oceanliteracy.org>

