

A Unique Estuary

Watch the segment online at <http://education.savingthebay.org/a-unique-estuary>

Watch the segment on DVD: Episode 1, 11:04–14:18

Video length: 3 minutes 33 seconds

SUBJECT/S

Science

History

GRADE LEVELS

4–5

6–8

CA CONTENT STANDARDS

Grade 4

Life Sciences

2.a. Students know plants are the primary source of matter and energy entering most food chains.

2.b. Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.

Grade 6

Life Sciences—Ecology

5.a. Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.

5.b. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.

VIDEO OVERVIEW

The San Francisco Bay is a unique and biologically productive estuary.



In this segment you'll learn:

- about the size and scope of the estuary.
- about the Mediterranean climate of the Bay Area.
- that the estuary is a biologically productive region.

TOPIC BACKGROUND

Where the river meets the sea, it's an estuary! The San Francisco Bay is part of a larger estuary, a place where fresh water and salt water mix that is partially enclosed by land. The San Francisco estuary is enormous, encompassing 1,600 square miles and draining 40 percent of the land area of California. Fresh water, mostly from the Sacramento and San Joaquin rivers, flows into the estuary while the tides bring salt water in and out twice each day.

Estuaries are some of the most biologically productive regions on Earth. The shallow, warm water with its plentiful nutrients and tidal mixing allows for rapid plant and animal growth. Phytoplankton, drifting microscopic plants that get their energy from the sun, are the base of a complex estuarine food web that includes invertebrates, fish, birds, and mammals. Some plants and animals are adapted to live in fresh water, some are adapted to live in salt water. There are also animals and plants that survive in brackish, or semi-salty, water. The estuary is an important feeding ground for migratory birds and a nursery for fish, birds, and crabs. The abundant life in the water also supports many organisms that live on land, including insects, reptiles, and mammals.

Formed within the last 10,000 years, the San Francisco estuary has been altered significantly over the last century. Most of the tidal wetlands have been destroyed, and numerous fish and wildlife populations have been completely devastated or their number significantly reduced. Today nearly 10 million people live around the San Francisco estuary and depend on it for food, water, recreation, and other resources. Many people and organizations are working to restore and protect this important estuary.

VOCABULARY

arid

dry, lacking water

biological productivity

how much organic, or living, material is produced in an area

estuary

a semi-enclosed body of water where fresh water and salt water mix

PRE-VIEWING ACTIVITIES

- Have student pairs discuss how they are connected to the San Francisco Bay. How is the Bay important in their lives? Do they depend on the Bay? How?
- Make a list of plants and animals that live in the Bay region. Do these animals and plants depend on salt water or fresh water or both?
- Look at a map of the San Francisco Bay and its watershed. A map can be found online at: <http://sfep.abag.ca.gov/>.

FOCUS QUESTIONS FOR VIEWING

- How many square miles does the San Francisco Bay estuary cover? *1,600 square miles*
- What percentage of the land area of California drains through the San Francisco Bay? *40 percent*
- How many times more water flows out of the San Francisco Bay than out of the Mississippi River watershed? *seven*
- What makes the San Francisco estuary different from estuaries like Chesapeake Bay? *It constricts where it enters the ocean at the Golden Gate.*
- How many places in the world have a Mediterranean climate? *five*
- Why does the productivity in estuaries tend to be really high? *They are shallow, so sunlight penetrates to the bottom.*
- On a per-acre basis, the San Francisco estuary is more productive than which other ecosystems? *the rain forest, the redwood forest, and coral reefs*

POST-VIEWING ACTIVITIES

- Research a bird that was seen in this video segment or that lives in the San Francisco estuary. How does it depend on the estuary? How is it a part of the estuary food web? Write a report or give a presentation to the class.
- Explore estuary food webs. Have student groups make food web cards that have pictures and information and then have them present their webs to the class.
- Investigate how the San Francisco Bay affects the weather in your region. Monitor weather patterns over the course of several months.
- Compare the biological productivity of the San Francisco estuary with another ecosystem. Discuss what factors contribute to the rapid plant and animal growth in the estuary. How do the producers in the estuary support the consumers? Who are the decomposers in the estuary? Have student groups make a poster depicting what they find.

ABOUT THE AUTHOR

Phaela Peck is a science teacher, environmental educator, and writer based in San Francisco. She has an M.A. in environmental education and has developed curricula for numerous science and environmental education organizations in the Bay Area.

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ADDITIONAL RESOURCES

Access USGS – San Francisco Bay and Delta, U.S. Geological Survey

<http://sfbay.wr.usgs.gov>

The USGS offers maps, research, and other detailed information about the Bay and Delta system.

“An Introduction to the San Francisco Estuary,” Andrew Cohen, San Francisco Estuary Institute

Download from <http://sfep.abag.ca.gov>

This 42-page publication discusses the San Francisco Bay estuary in depth, including the environment, plant and animal life, and how human activities have changed the estuary.

Bay Model Visitor Center, U.S. Army Corps of Engineers

<http://www.spn.usace.army.mil/bmvc/>

This website provides information about the San Francisco Bay and the Sacramento–San Joaquin River Delta system as well as information about visiting a working hydraulic model of the Bay.

CREDITS

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NARRATOR: On the entire west coast of the Americas, there is no other estuary like San Francisco Bay. Immense in size—covering over 1,600 square miles—and draining over 40 percent of the land area of California, it is one of the great estuaries of the world. With each day's tides and the fresh water outflow of interior California, more water flows through the Golden Gate each day than flows out the vast Mississippi River watershed—seven times more.

GRAY BRECHIN: It's an estuary, but most estuaries open to the sea like great funnels, like Chesapeake Bay, for example. San Francisco Bay is one of the very few that actually is enormous and then constricts right where it enters the sea to only a mile-wide entry—the Golden Gate.

NARRATOR: San Francisco Bay is a transition point where the rainy, wet Pacific Northwest begins to give way to the arid Southwest. It is one of five places in the world with a Mediterranean climate—wet in winter, dry in summer. And the Bay itself, by allowing intense warm summer days and cool nights, is the reason the Napa and Sonoma valleys, sitting open to its famous fogs, flourish as one of the world's premier wine-producing regions.

In the scope of the entire globe, there are some places that support life sparingly while others support life in abundance. Estuaries are the great nursery grounds of the planet—mixing zones where fresh and salt water meet and life flourishes above and beneath the surface.

SYLVIA EARLE: Estuaries are the part of the planet where land and sea come together. It's magic in a lot of ways. In this not quite ocean, not quite fresh water, a lot of things make their home. The productivity in estuaries tends to be really high because they tend to be shallow and sunlight penetrates right to the bottom.

JEFF MOUNT: So on a per-acre basis, this is more productive than the rain forest, more productive than the redwood forest, more productive than coral reefs. These are the most biologically productive regions on Earth.