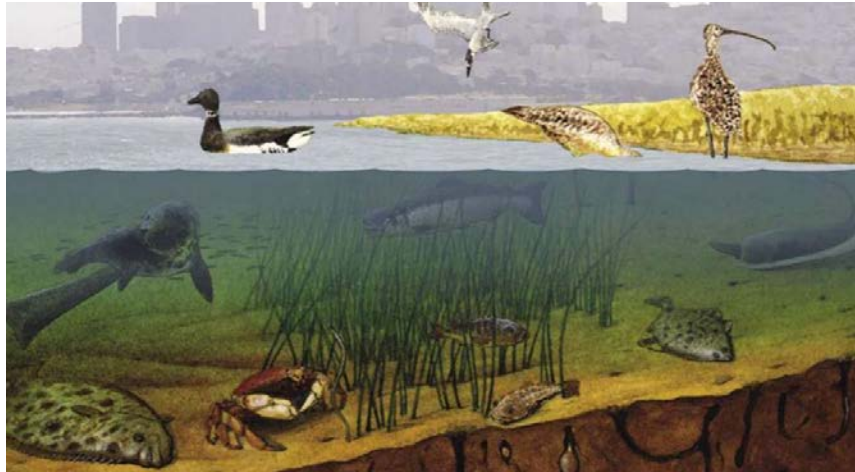


Modeling Matter near Marshes



I. Academic Content Standards, 5th Grade

CA-NGSS 5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Also, supports CCSS.ELA-Literacy.SL.5.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.

II. Unit of Study:

This lesson was written to be the second lesson in a unit of study about the San Francisco Bay that will also cover the performance expectations in Earth's Systems 5-ESS2-1, CA-History and Social Studies 5.1.1, and Earth and Human Activity 5-ESS3-1. The initial lesson could be a field trip on the San Francisco Bay or a "Habitat in a Bucket" style in-class exploration. After the students have created their models described in this lesson, they could learn about interactions between the biosphere, hydrosphere, geosphere, and atmosphere using a lesson like this one:

<https://betterlesson.com/lesson/634345/the-earth-s-systems> followed by an assessment activity incorporating what they learned into their models. San Francisco Bay NERR has also created a social studies lesson focused on human use of the estuary (Social Studies 5.1.1), which then leads into how science ideas can be used to improve the health of the estuary (5-ESS3-1). The unit as a whole, or just this lesson, can be adapted to other complex ecosystems

(oceans, lakes, forests, prairies) by substituting a few place-specific elements (like the starting picture and organism cards in this lesson).

III. Academic Learning Outcomes

1. All students will understand some ways in which matter moves among different components of the San Francisco Bay ecosystem and will be able to demonstrate that understanding by illustrating and describing the relationships between the sun, plants of some kind, several animals, and decomposers (or mud) within the bay ecosystem.
2. All students will demonstrate they can work independently and collaboratively with a small group by listening to others, presenting arguments based on evidence and well-reasoned opinions, developing a shared model, and revising that model, if needed.

V. Materials & Resources

- Book: *The Secret Bay* by K. Ridley, Tilbury House Publishers. 2015. With paperclip connecting pages 11-26 to make it easy to skip that section.
- Example I notice/I wonder/It reminds me of Science Notebook entry
- Example of color copy of bay illustration
- 24 8 ½"by11" gray scale copies of the bay illustration from Subtidal Habitat Goals Project (student resource #1)
- 16 11"by17" gray scale copies of the bay illustration from Subtidal Habitat Goals Project
- 8 11"by17" color copies of the bay illustration
- 8 color sets of Bay Plants and Animals Cards, laminated if planning to reuse (see student worksheets at the end of the lesson)
- Tape
- Each student needs their science notebook, pencil, and eraser
- Technology: Elmo, projector, slide with bay illustration

VI. Implementation

1. The teacher will (TTW) open the lesson by reading aloud from [The Secret Bay](#). She will skip the pages 11-26 (because they are more relevant to marshes of the Northeastern U.S. and to keep the book short and interesting).

2. After reading the excerpt of The Secret Bay, TTW ask all students to return to their desks and take out their science notebooks, pencil, and good eraser, and set up an I notice, I wonder, It reminds me of entry.

3. As the students finish setting up their Science Notebooks, TTW put the bay illustration (see resource #1) on the screen and ask the students to individually fill in their I notice, I wonder, It reminds me of charts. TTW ask 5-10 students to share something they notice, pulling out topics related to the cycling of matter in the Bay by saying things like, “who else noticed a predator-prey relationship?” or “Did anyone else have a connection between the mud and an animal?”. TTW end the discussion by making the observation that the illustration is missing the sun and noting that she would add the sun to her illustration.

4. TTW will move the students into groups of 3 and distribute three grayscale copies of the illustrations, a large color copy of the illustration to share, a set of the organism cards in an envelope (student resource #2), and a white color pencil to each group. She will then explain the next step and show the written next step on the Elmo. She will say, *“We are going to start by working individually. Using your pencil, you will draw arrows directly onto the black and white illustration showing connections or relationships between the things pictured. For example, Student Y had noticed that the black and white duck-like bird might eat the eelgrass, so if you agree, you could draw an arrow from the brant (the black and white duck) to the eelgrass. You could then think about how the eelgrass makes food, and draw connections to those items. The important thing is to think carefully and creatively about the connections so you can explain why you drew each arrow. There are lots of right ways to do this. Please remember to work quietly and on our own, you will share with your group in 5-10 minutes.”* The written direction will say: *“Think carefully about connections between animals, plants, and the environment in the picture. Draw arrows to show those connections. Be able to explain why you drew each arrow. You can jot down notes to yourself in your Science Notebook, if it helps you.”*

6. After most of the students seem to have finished drawing connections, they will each share their models with the other two students in their group.

7. The teacher will hand out organism cards to students and ask them to make notes and additions or corrections based on what they learn from the cards.
8. After most groups have finished reading the cards and discussing, TTW say something like, *“Our next step is for each group to make one model. Just like your first drafts, these are models of how matter flows around in the Bay. You will use the big color copy on your table and draw the arrows with the white colored pencil. To record your explanation for the arrows, put a number next to each arrow and then write the number below with a brief explanation. The explanation can be just a few words, like ‘duck eats grass’. This draft should have all the best ideas from your group discussion. You will have 10-15 minutes.”*
10. The teacher will assemble groups together so there are 2 big groups of 3 triads (18 total students) and 1 big group of 2 triads (6 students total). She will explain that each sub-group will stand, hold up their second draft model, and explain about 5 of the most interesting connections. The other students will fill out a feedback form that asks for one thing you really liked about the model, one concern or possible mistake you noticed, and one additional idea you want to share.
11. After every group has finished, the groups of 3 will use the feedback forms and what they learned from the other groups to revise their model.

VI. Closure

1. TTW will collect the feedback forms. She will add the science vocabulary words of “Model: A simplified representation of a system” and “Matter: Everything that takes up space and has mass” to the board. She will tell the students she will look over the models and their Science Notebooks to help her plan out the rest of their unit on the San Francisco Bay.
2. TTW will ask the students to open their Science Notebooks and draw a star next to any “I wonder” statements that they still have and add new “I wonder” statements, if relevant questions arose during the lesson.

Student Resource #1: Illustration from Subtidal Habitat Goals Report, Executive Summary, Page 19, Illustration by Tim Gunther of Gunther Graphics: <http://www.gunthergraphics.biz/>.



Student Resource #2: Example Organism Cards. A card would be created for each of the identifiable animal, as well as algae, plankton, sun, and mud. Cards will be printed on individual pieces of paper so students can read at their own pace; faster readers may read more cards. (For complete set of cards, email Sarah Ferner at daviess@sfsu.edu)



Brants are medium sized black and white geese. They migrate to the San Francisco Bay in the winter. Most of their diet is eelgrass, although they may eat some worms or clams too. They depend on eelgrass to survive.



Eelgrass is a flowering plant that forms underwater meadows in shallow areas in the San Francisco Bay. It only survives in areas with fairly clear water, because it needs sunlight to make its' food through photosynthesis. It also needs mud to sink its' roots into. Eelgrass adds oxygen to the water and creates habitat for animals.



Harbor seals are curious, adorable residents of the San Francisco Bay. They hunt fish, like flounder and sculpin, as well as invertebrates like octopus, in the Bay. They also rest on rocks and in marshes along the shoreline. Harbor seal pups are born February-April.