CONSERVANCY of Southwest Florida
OUR WATER, LAND, WILDLIFE, FUTURE.

Protecting Southwest Florida's unique natural environment and quality of life ... now and forever.

Ocean Matters
Pre and Post-Program Activities

Grade Level: 6-8

Next Generation Sunshine State Standards

- SC.6.E.7.3
- SC.7.E.6.6
- SC.8.L.18.1

Program Overview

Explore the ocean's diverse ecosystems from the shallow coral reefs to the deep ocean trenches. Examine how the ocean influences all life on Earth and how human activities can impact its health. Learn how to take action to preserve the ocean and its incredible creatures for future generations.

Learning Objectives Students will be able to:

1. Understand that humans and the ocean are inextricably interconnected.
2. Describe how the ocean influences weather.
3. Characterize the diversity of life found in the ocean.
4. Evaluate human impacts on the ocean.

Pre-Program Activity 1: Entering the Twilight Zone

Duration of Activity: 1-2 class periods

Students will create their own 'Ocean Zones' diagrams, to better understand the various ocean habitats.

Materials: 5 x 7 index cards, drawing materials, Generalized Ocean Habitats Diagram (attached), large construction paper and/or poster board (optional), reference materials ie, books, encyclopedias, computers

Background:

1. Briefly discuss the major categories of ocean habitats:

- **Intertidal Zones**: on the shore between the high tide and low tide levels.
- **Pelagic Zones**: found in the water column, organisms are either plankton that drift with the ocean current or nekton that can swim and somewhat control their motion in the water.
- **Epipelagic Zone**: (Surface Water-200m deep). Phytoplankton are the primary producers in this zone since there is adequate light for photosynthesis.
- **Mesopelagic Zone**: (about 200m-1,000m deep). Since there is not enough light for photosynthesis, much less energy is available to support animal life. Bacteria and detritus (pieces of dead plants and animals that slowly settle to the bottom) are the primary sources of food for animals like jellyfishes in this zone. Other animals, including squids, fishes, and shrimps can move up and down through the water column, and have a wider range of food available to them.
- **Bathypelagic Zone (sometimes divided further into abyssopelagic zone):** This zone has no light at all. Organisms are dependent upon primary production at shallower water or chemosynthesis.
- **Hadopelagic Zone:** (about 11,000 m deep) Deepest pelagic depth and includes the water column in the deepest ocean trenches.
- **Benthic Zones**: lowest level of a body of water, including the sediment surface and sub-surface layers.
- **Bathyal Zone:** includes the rest of the continental shelf between 300 m – 3,000 m.

- **Abyssal Zone:** includes the ocean bottom between 3,000-6,000 m. Often very muddy and flat in most places and is the largest benthic zone.
- **Hadal Zone:** includes the very deep ocean bottom between 6,000 m and 11,000 m.
- **Vents & Seeps:** unusual deep-water habitats that are a significant energy source for organisms living in benthic habitats and support organism whose food webs are based on chemosynthetic bacteria.

2. Briefly discuss the difference between photosynthesis and chemosynthesis:
   - One of the major scientific discoveries of the last 100 years is the presence of extensive deep see communities that do not depend upon sunlight as their primary energy source. Instead, these communities derive their energy from chemicals through a process called **chemosynthesis** (in contrast to photosynthesis in which sunlight is the basic energy source). Some chemosynthetic communities have been found near underwater volcanic hot springs called hydrothermal vents.

Activity: Research Ocean Habitats

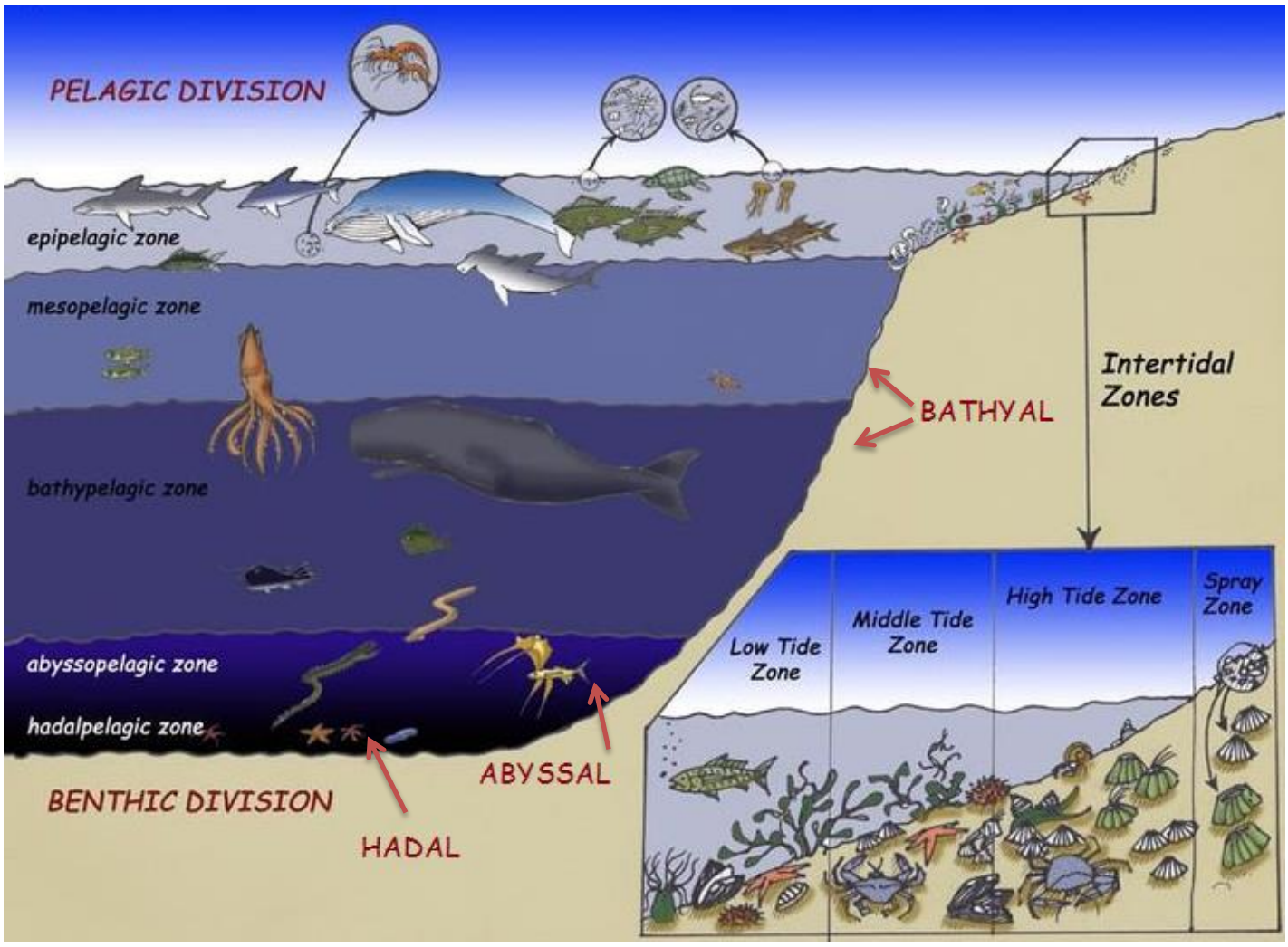
Directions:

1. Show students the following video (~5 min) to give insight to organisms found in the ocean at several different levels.
   http://www.ted.com/talks/david_gallo_shows_underwater_astonishments
2. Assign students to groups of four or have students work independently.
3. Assign each student or group one or more of the following deep ocean habitats to research:

Intertidal Zone	Subtidal Zone
Mesopelagic Zone	Abyssal Zone
Hadal Zone	Hadopelgic Zone
Hydrothermal Vents	Bathyal Zone

4. Each student or group should identify four- to-six organisms found in their assigned habitat, and determine the energy/food source for each organism.
5. Students should prepare a 5 x 7 index card for each organism with an illustration, size of the organisms, notes on where the organism is found, and energy or food source of the organism.

6. Additional research topics: Students could research other parameters for their ocean zone, such as water temperature, depth, density, etc.
7. Have each student group orally present their research to the entire class if time allows.



Pre-Program Activity 2: Understanding Ocean Currents

Duration of Activity: 1-2 class periods

Follow the link to explore as a class NOAA's Ocean Explorer: Ocean Currents:

http://oceanexplorer.noaa.gov/edu/learning/player/lesson08.html

- Click the play button for the Ocean Currents Lesson Tab. The lesson video is approximately 7 minutes.
- Click on the Global Impact Tab and press play for the video. The Global Impact Video is approximately 5 minutes.
- Explore the activities links on the side of the website.

  El Nino:

  1. After clicking on the El Nino Activity link, read and discuss the introduction with the students.
  2. In this activity, you will explore the links between ocean currents, El Nino, and weather.
  3. Examine the images on the tabs labeled Sea Surface Conditions, Weather and Tracking El Nino. (Note: Each tab may have 2 or more slides associated with that particular topic.)
  4. Answer the corresponding questions. Answers are provided.

  Currents and Marine Life:

  1. In this activity, you will explore the differences between upwelling and downwelling.
  2. Study the graphics and photographs on both the Upwelling and Downwelling tabs. (Note: Each tab may have 2 or more slides associated with that particular topic.)
  3. Discuss the corresponding questions. Answers are provided.

  After clicking on the Currents and Marine Life link, read and discuss the introduction with the students.

Post-Program Activity 1: Marine Debris & Site Clean-Up

Duration of Activity: ~2 hours

Materials: computer & projector, garbage bags, latex gloves, pencils, recycling container

Directions:

1. **Activate students' prior knowledge.** Have students brainstorm different types of litter and debris. Questions for discussion:
   What happens to litter? Where does it come from? Where does it go?
   How could litter end up in the ocean?

   Explain that garbage that does not make it to a landfill (may have to explain what a landfill is) can become litter found along the sides of roads or in waterways, eventually ending up in the ocean. Emphasize that no matter where litter comes from, wind, streams, and ocean currents carry litter throughout the globe, including to the ocean and coasts where it becomes marine debris.

2. **Have students watch the video "Marine Debris".**
   Give each student a Marine Debris video worksheet (see link below). Show students the NOAA "Marine Debris" video https://www.youtube.com/watch?v=qQpCzZI5Vqo (3 minutes, 30 seconds) and have them answer the questions as they watch the video. Discuss the questions with the answer key provided.

3. **Have students list sources and impacts of land-based and ocean/waterway-based marine debris.**
   Divide students into small groups and provide each group with a NOAA Marine Debris Facts Handout. Have half of the groups read about and summarize sources of land-based and ocean/waterway based marine debris. Have the other half of the groups read about and summarize the effects of marine debris on ocean ecosystems, marine wildlife and people. As a class, have the groups take turns presenting what they learned. Emphasize the fact

that sources and impacts of marine debris are highly varied and involve all people, no matter where you live.

4. **Have students watch the video "It's Time to Stop Trashing Our Beaches."**
   https://www.youtube.com/watch?v=Ysaa64XBbcQ (1 minute, 49 seconds)
   While watching the video, tell students to think about how they could help solve the marine debris pollution problem.

5. **Conduct a school site cleanup and compare data.**
   First, have students brainstorm types of debris/litter they may find around the school grounds. Give each group a copy of the worksheet "School Site Cleanup Data Table" (see link below). Explain that the datasheet they will be using is designed to record the same information that is recorded during coastal clean-up events. As needed, refer to the Ocean Conservancy's 2010 Report: Trash Travels (pages 26-32) to show students how to identify and classify different debris items.
   Remind students to use gloves and avoid any materials that could be considered hazardous waste. After groups have collected their data, they will count the total number of debris items in each category for the entire class and then calculate percentages for each category. Compare these percentages to the Top Ten Marine Debris Items Worldwide results from the Ocean Conservancy's 2010 Report: Trash Travels (page 11). Have students record their results in the School Site Cleanup Data Table.

6. **Have students reflect on what they have learned.**
   Start a class discussion by asking students to summarize the effect marine debris accumulation is having on ocean ecosystems and wildlife. Then ask:
   - Are you surprised by the amount or type of debris found? Explain.
   - What are some similarities and differences between the two data sets (school site and world report)?
   - What could be the reasons for these differences?
   - What is the relationship between the debris data collected at the school and the data collected at a costal site?
   - What did you learn about the role YOU play in marine debris?

- What are you willing to do to address the problem of marine debris?

Worksheets, Videos, & Resources:
Marine Debris Video student worksheet:
http://media.education.nationalgeographic.com/assets/file/Marine_Debris_Video_1.pdf
Answer key:
http://media.education.nationalgeographic.com/assets/file/Marine_Debris_Video_Answer_Key_1.pdf
NOAA: Marine Debris 101- Marine Debris Facts
http://media.education.nationalgeographic.com/assets/file/NOAA_Marine_Debris_101_Marine_Debris_Facts.pdf
School Site Clean-up Data Table
http://media.education.nationalgeographic.com/assets/file/School_Site_Cleanup_Data_Table_1.pdf
Ocean Conservancy International Costal Clean-up 2010 Report
http://act.oceanconservancy.org/images/2010ICCReportRelease_pressPhotos/2010_ICC_Report.pdf

Post-Program Activity 2: Marine Food Web Illustration

Duration of Activity: ~50 minutes

Materials: Marine Food Web Worksheets (provided), colored pencils, scissors, yarn, glue

Directions:
Have students what the video " The Invisible Watery World of Plankton"
https://www.youtube.com/watch?v=65l0JF7nIv8

After watching the video, ask students some of the following questions:

- What role do plankton play in aquatic food webs?
- What do plankton eat, and what uses plankton as a food source?
- What are the two types of plankton?

Explain that all other life in the ocean needs phytoplankton to survive. Phytoplankton get their energy directly from the sun using photosynthesis, just like plants. Zooplankton then feed on phytoplankton, and are then eaten by larger zooplankton, fish, larger fish, and so on. Plankton are at the base of a complex aquatic food web.
During this activity, students will learn how to create their own food web. They will also analyze the feeding relationships between marine organisms and describe plankton's importance to the ecosystem.

1. **Assemble the Marine Food Web Diagram.**
    1. Have students color and cut out the marine organisms on the "Marine Organisms" page.
    2. While students are coloring and cutting, pass around several pieces of yarn to each student. Once each student has colored and cut the marine organisms out, have students glue the phytoplankton to the Marine Food Web worksheet. The sun provides phytoplankton energy needed to survive. Represent the relationship between the sun and phytoplankton with a piece of string.
    3. Draw an arrow to show the direction the energy moves. The arrow represents energy flow from one organism to the next so make sure the arrow faces the right direction. The sun gives energy to phytoplankton, so the arrow faces phytoplankton.
    4. Next, find which organisms consume phytoplankton to gain energy for survival. This is zooplankton. Glue this organism to the worksheet and represent this relationship by connection phytoplankton and zooplankton with a piece of string and an arrow to show energy flow.
    5. Keep adding organisms using the "What do I eat?" table. Add organisms until you reach one that is not consumed by another organism. That organism is called an *apex predator*.
    6. Students will have some cut-out organisms that are not a part of you food web. That's okay! Have students start again with the sun and add organisms as done before.

    For extended learning, discuss the following questions:

    1. What would happen to your food web if the phytoplankton died out because of water pollution?

    2. How would the jellyfish population be affected if sea turtles were removed?

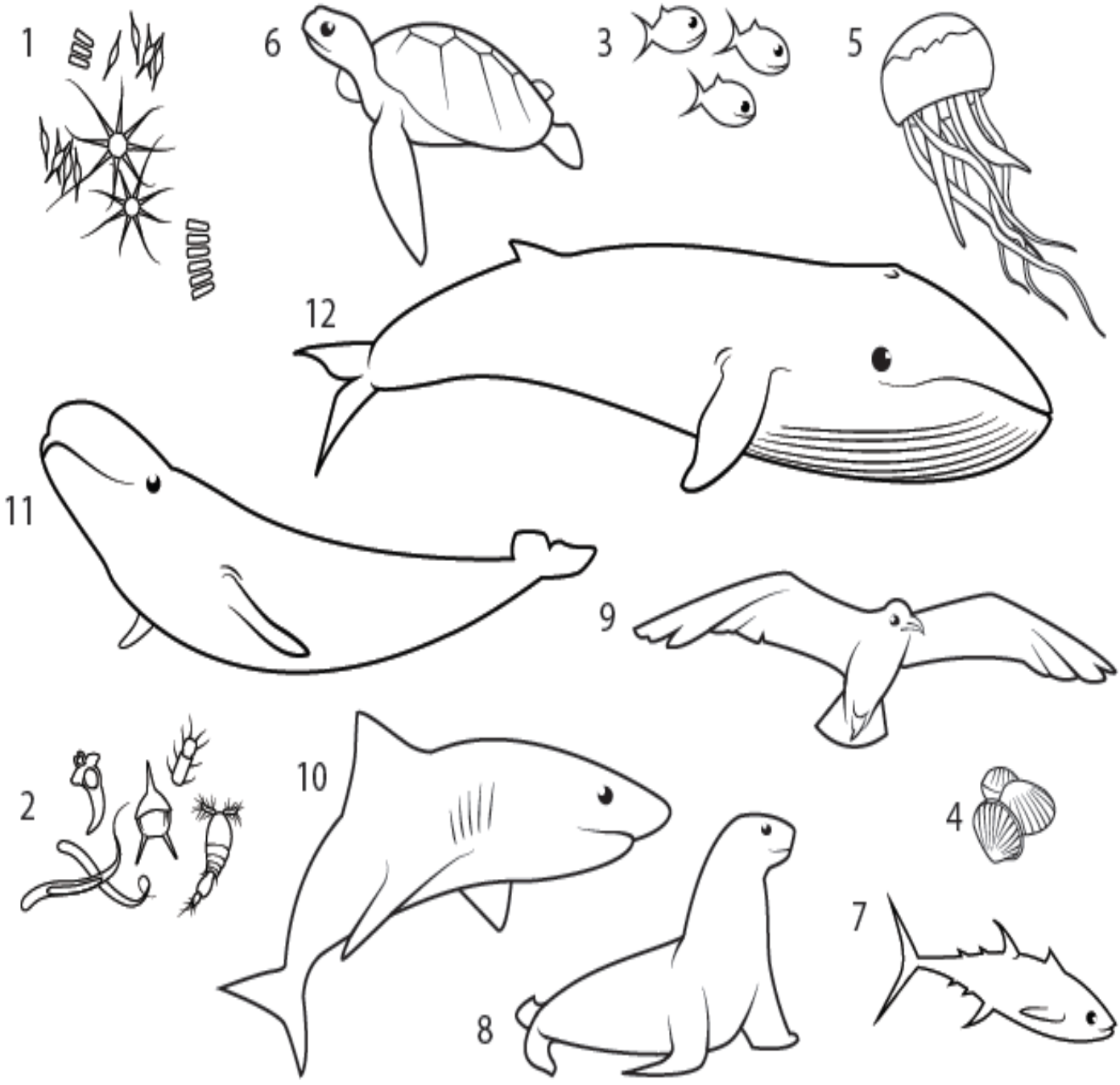
    3. How important are plankton in the marine food web? Explain your answer using evidence from your food web.

    4. Why do we use arrows when creating a food web? What do they represent?

    5. Using the food chain below, summarize the flow of energy from organism to organism.

- Sun → Phytoplankton → Zooplankton → Small fish → Jellyfish → Sea

Marine Organisms



	#	Name	What do I eat?
	1	Phytoplankton	I use energy from sunlight to turn carbon dioxide gas into sugars.
	2	Zooplankton	I eat phytoplankton.
	3	Small fish	I eat zooplankton.
	4	Shellfish	I eat zooplankton.
	5	Jellyfish	I eat small fish and zooplankton.
	6	Sea turtle	I eat jellyfish and small fish.
	7	Large fish	I eat small fish.
	8	Sea Lion	I eat small fish.
	9	Sea Bird	I eat small fish, jellyfish, and shellfish.
	10	Shark	I eat small fish, large fish, and sea lions.
	11	Toothed whale	I eat small fish, large fish, and sea lions
	12	Baleen whale	I eat zooplankton.