Sandy Shore Species

2nd grade Ocean Literacy Unit

Content

Curriculum Summary

Theme:
The diversity of life on sandy shores makes it an excellent ecosystem to explore animal adaptations. In this unit, students will learn different physical and behavioral adaptations animals use to survive Oregon sandy beaches.

Goal: Students will be able to identify some common adaptations that animals use to survive on Oregon sandy beaches.

Objectives:
1. Students will be able to identify some of the animals that live on Oregon sandy beaches.
2. Students will be able to differentiate between behavioral and physical adaptations.
3. Students will be able to give examples of animal adaptations.
4. Students will understand the different functions of adaptations including mobility, protections, eating, hunting, and camouflage.
5. Students will understand that species are distributed unevenly in sandy beach ecosystems.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.
- 2.2 Interaction and Change: Living and non-living things change.
  - 2.2L.1 Describe life cycles of living things.
- 2.3 Scientific Inquiry: Scientific inquiry is a process used to explore the natural world using evidence from observations.
  - 2.3S.2 Make predictions about living and non-living things and events in the environment based on observed patterns.
  - 2.3S.3 Make, describe, and compare observations, and organize recorded data.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.
- 5.f. Ocean habitats are defined by environmental factors. Due to interactions of abiotic factors such as salinity, temperature, oxygen, pH, light, nutrients, pressure, substrate and circulation, ocean life is not evenly distributed temporally or spatially, i.e., it is "patchy". Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert.
- 5.h. Tides, waves and predation cause vertical zonation patterns along the shore, influencing the distribution and diversity of organisms.

Unit Lessons:
This unit is designed to include interdisciplinary instruction to achieve student objectives. Each lesson independently supports specific learning objectives but when taught as a comprehensive unit will achieve the larger learning objectives.

Unit Vocabulary:

Adaptation: a characteristic that helps a species do something that is important to survive

Beach wrack: piles of seaweed and other things carried to the beach by waves and wind

Behavior: the actions of an animal

Bill: the beak of a bird

Burrow: the hole or tunnel a small animal digs in the ground

Camouflage: color or marking that help a living thing hide by blending in with the things around it

Characteristic: something you can observe about a thing, such as how it looks or what it does

Exoskeleton: a hard shell of an animal to protect its body

Haul out: an animal pulling itself out of the water

Holdfast: the part of kelp that attaches it to the bottom of the ocean

Invertebrate: an animal without a backbone

Metamorphosis: when an animal's body completely changes appearance through its life cycle

Molt: to shed an exoskeleton

School: a group of animals in the water

Surf: where the waves break as they approach shore

KWL

Lesson at a glance: Students will access their background knowledge about animal adaptations.

Goal: Students will start thinking about how animals adapt to meet their needs.

Oregon Content Standards:

SCIENCE

- 1.1 Structure and Function: Living and non-living things have characteristics and properties.
  - 1.1L.1 Compare and contrast characteristics among individuals within one plant or animal group.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.c. Some major groups are found exclusively in the ocean. The diversity of major groups of organisms is much greater in the ocean than on land.

Materials:

- ❑ A large sheet of white butcher paper
- ❑ Different colored markers
- ❑ Tape

Time: 20 minutes

Activity:

1. Tape the white butcher paper on the wall and reproduce the grid below.
2. Assess students' prior knowledge to the unit by asking students what they already know about each of the functions of adaptations: camouflage, mobility, protection and hunting/eating. Write *all* responses in the *What you KNOW* column.
3. If there is any disagreement, write down both opinions with question marks next to them. Tell students that they will find out more about the adaptations of sandy beach species as the unit progresses.
4. After you have exhausted their knowledge, have them come up with questions they have about sandy beach species adaptations. Write them down in the *What you WANT to know* column in a different color.
5. Keep this chart up throughout the unit and refer back to it as questions are answered.
6. At the end of the unit, return to the chart. Ask students what they learned about the functions of sandy beach species' adaptations. Write down their responses in a different color in the *What did you LEARN* column.
7. Look at their *What you WANT to know* column and answer any questions left.
8. Look at their *What I KNOW* column and check for accuracy. Correct any misconceptions left.

Conclusions:
This chart should be referenced regularly through the unit as misconceptions are corrected and new knowledge is acquired.

Extensions:

1. Use the student responses in *What do you want to know* column as the guidance for a student directed inquiry and have students find out the answer by doing some research, asking a local scientist, watching a video of the phenomena or taking a field trip.
2. Have students select something they learned that was of interest to them. Have them write it down, expound upon it, and draw a picture to go with it.

Animal Adaptations: camouflage, mobility, protection, and eating/hunting

What you KNOW:	What you WANT to know:	What you LEARNED:

Big Book of Amazing Adaptations of Sandy Species

Lesson at a glance: Students will learn about animal adaptations in a relaxed setting. By reading the story out loud to students, the teacher is insured that the information is accessible to all students.

Goal: Students will be able to identify some common adaptations that animals use to survive on Oregon sandy beaches.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Materials:

- ❑ Big Book of Amazing Adaptations of Sandy Species (see appendix)

Time: 30 minutes.

Activity:

Read the book out loud to students. You may want to read it in sections if your students have a hard time sitting still.

Conclusion:

This big book contains all the major concepts about animal adaptations that your students need to learn. Have it available for students to consult during the unit and review it as needed when clarification is necessary.

Expert Reading Groups

Lesson at a glance: Students will learn about animal adaptations by reading about them and filling out a graphic organizer.

Goal: Students will become an expert on one function of animal adaptations; movement, eating and hunting, camouflage, and protection.

Oregon Content Standards:

SCIENCE

- 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

OTHER CONTENT AREAS:

Reading, study skills

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Time: 20 minutes per reading group

Materials:

- ❑ Graphic organizers, one for each student
- ❑ Highlighters, pencils
- ❑ Data sheets on camouflage, movement, protection, and eating/hunting. Enough for each student in that reading group.

Activity:

1. Separate students into reading groups of four or five students of similar reading ability. You may have more than one group studying one function of adaptations.
2. Assign each reading group an adaptation to study and give them a data sheet.
3. Have students read their data sheet aloud, round robin style. If the reading is too high for them, read it out loud yourself and have them follow along, pointing to the words while you read them.
4. Help students highlight the information on their data sheet that they will need to fill in their graphic organizer.
5. Help students fill in their graphic organizer.

Conclusion:

1. Review what the students found out about their adaptation.
2. Review key vocabulary.

Extensions:

- GLAD trained teachers: have the experts go back to their classroom groups. Each classroom group now has an expert on an adaptation function and students can complete a blank process grid.
- Have students study one of the animals and its adaptations that were referenced in the reading sheet at a greater depth.

Camouflage

Sandy shore animals have adaptations.

One adaptation is camouflage.

Camouflage is when an animal is hard to see in its environment.

Animals have physical and behavioral adaptations for camouflage.

Speckled sanddab are a type of fish that live nearshore.

They are flat, brown and spotted to look like sand.

Their camouflage helps to escape predators like birds, bigger fish and mammals.

Their shape and color are examples of physical adaptations.

Fiddler crabs live under the sand.

They are dark brown during the day.

They are beige at night.

Changing colors to blend into the environment is an example of a behavioral adaptation.

Movement

Sandy shore animals have adaptations.

Animals have adaptations that help them move in an environment.

Animals have physical and behavioral adaptations for movement.

Mole crabs live under the sand.

Their bodies are smooth and oval shaped.

They have flat legs.

Their body helps with digging in sand and swimming.

The shape of their body is a physical adaptation.

Pelicans live nearshore.

Groups of pelicans can fly in V's.

Flying in a V helps the pelicans fly for longer distances and times.

Flying in a V is a behavioral adaptation.

Protection

Sandy shore animals have adaptations.

Animals have adaptations to protect themselves from predators and their environment.

Animals have physical and behavioral adaptations for protection.

Clams live under the sand.

They have a hard, thick shell.

The shell protects them from waves and predators.

A hard shell is an example of a physical adaptation.

Northern anchovies live nearshore.

They swim in large groups called schools.

A big school of anchovies looks like one giant fish and scares off predators.

Swimming in schools is an example of a behavioral adaptation.

Eating and Hunting

Sandy shore animals have adaptations.

Animals have adaptations that help eat and hunt in an environment.

Animals have physical and behavioral adaptations for eating and hunting.

Rove beetles live in the beach wrack.

They have large jaws they use like a knife to slice prey.

They eat beach hoppers and kelp fly maggots.

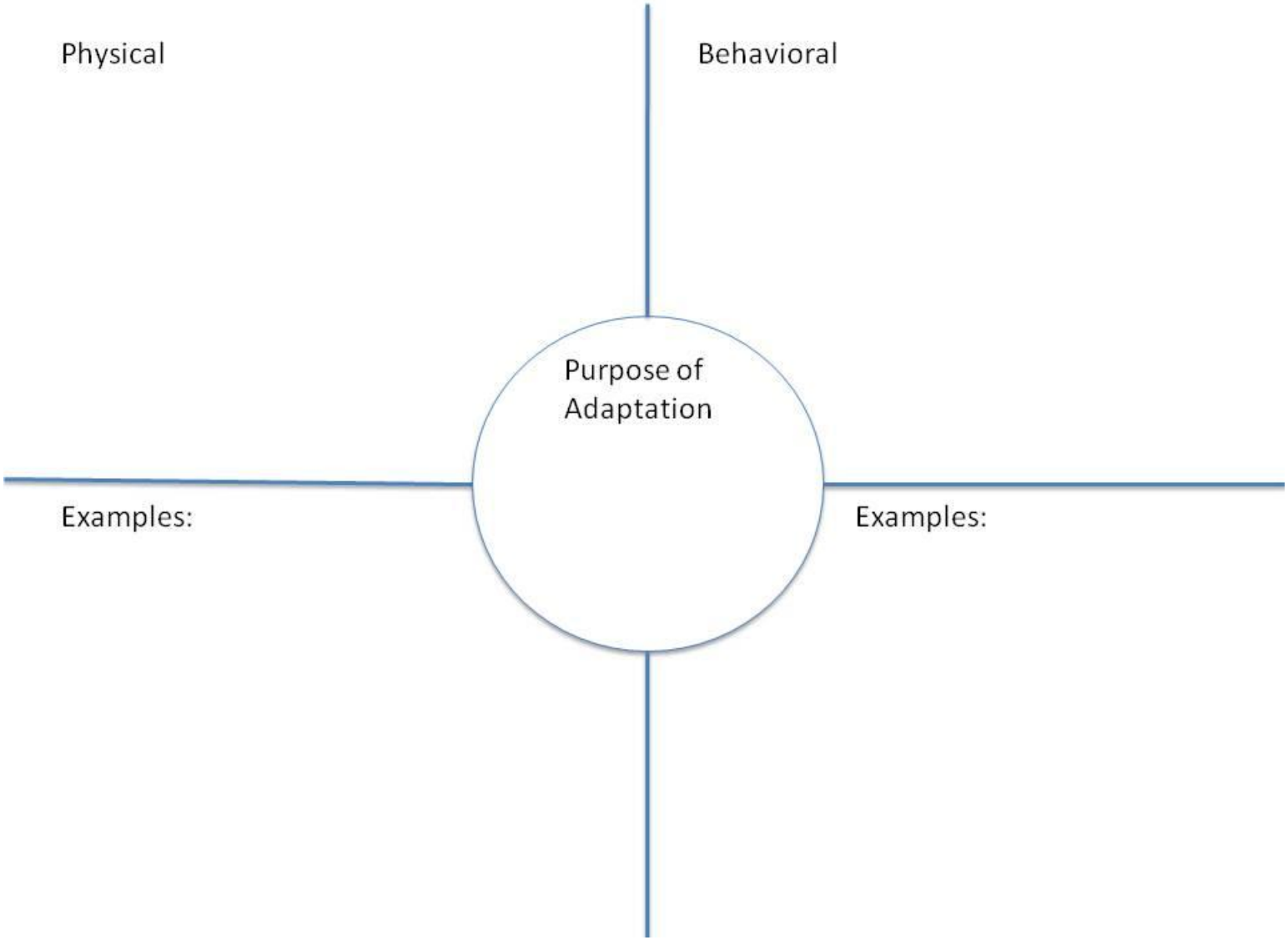
Large jaws are an example of a physical adaptation.

Gulls live on the beach.

They eat clams, crabs and other invertebrates.

Gulls drop hard-shelled animals on parking lots to break them open.

Dropping prey on a hard surface to open them is an example of a behavioral adaptation.


Physical
Behavioral
Purpose of Adaptation
Examples:
Examples:

Pictoral Input Chart and Activity

Lesson at a glance: Students will learn about the features and zonation of a sandy beach. They will also learn some common animals found there.

Goal: Students will be able to identify some animals that live on sandy beaches and their adaptations.

Oregon Content Standards:

SCIENCE

- 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.f. Ocean habitats are defined by environmental factors. Due to interactions of abiotic factors such as salinity, temperature, oxygen, pH, light, nutrients, pressure, substrate and circulation, ocean life is not evenly distributed temporally or spatially, i.e., it is "patchy". Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert.
- 5.h. Tides, waves and predation cause vertical zonation patterns along the shore, influencing the distribution and diversity of organisms.

Materials:

- ❑ White butcher paper
- ❑ Different colored markers
- ❑ Picture cards printed on cardstock and cut apart, preferably laminated for durability
- ❑ Tape
- ❑ *Sandy Beach Pictoral Input Chart Animals*, cut apart

Time: 45 minutes, preferably broken into two segments

Activity:

Preparation:

1. Use an overhead projector and project the *Sandy Beach Pictoral Input Chart* onto a large piece of white butcher paper.
   Alternate: Use colored butcher paper to create a sandy beach.
2. Copy the chart onto the butcher paper in pencil.
3. Copy the *Sandy Beach Zonation* information onto the butcher paper in pencil next to the correct zone (or on white paper to add to your colored butcher paper sandy beach.)

Activity:

1. Tape the blank butcher paper on a flat wall and have your students gathered close. (Or have them sit in front of the colored butcher paper sandy beach already made.)
2. Start copying your penciled information in markers, explaining the zones to students as you write.
3. Use different colored markers to write *Sandy Beach Zonation* information next to each zone. The different colors help students organize the information. Read out loud what you are writing as you write it.

Later:

1. Hand out the *Sandy Beach Pictoral Input Chart Animals*, one per student.
2. Start with the Nearshore Waters and have students with those animals tape their animals into that zone on the *Sandy Beach Pictoral Input Chart* that you just drew. Have them present what adaptations that animals has for that zone.
3. Progress down through each zone.

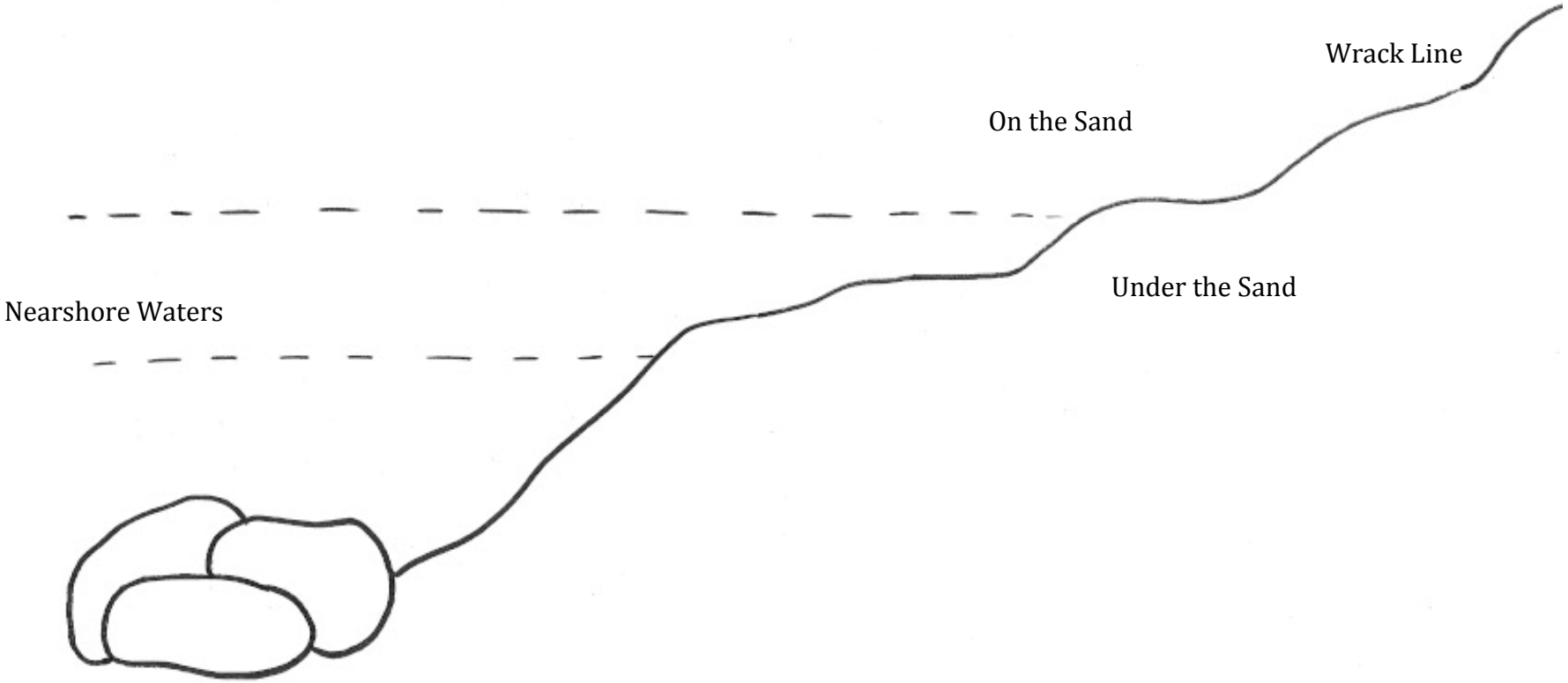
Extensions:

1. Have students draw an imaginary animal for a sandy beach zone.
2. Have them write how that animal is adapted to that zone.
3. Have students present their animal to their small group or to the class.

Conclusion:

Review the characteristics of the Intertidal Zone, Subtidal Zone, and Dunes.

Sandy Beach Pictoral Input Chart



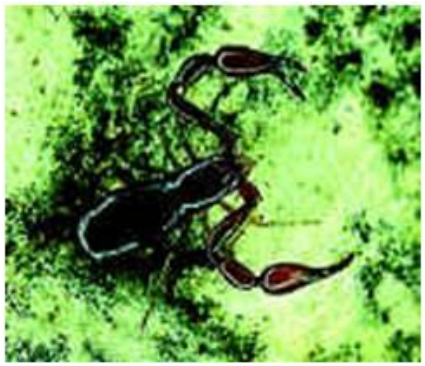
Kelp Flies

Wrack Line

Kelp

Wrack Line

Pseudoscorpians



Wrack Line

Rove Beetles

Wrack Line

Anchovy

Nearshore Waters

Bay Pipefish

Nearshore Waters

C-O Sole

Nearshore Waters

Dungeness Crab

Nearshore Waters

Gaper Clam

Nearshore Waters

Hermit Crabs

Nearshore Waters

Plankton  Nearshore Waters	**Sand Dollar**  Nearshore Waters	**SeaPen**  Nearshore Waters
Shiner Perch  Nearshore Waters	**Speckled Sanddab**  Nearshore Waters	**Starry Flounder**  Nearshore Waters

Striped Surf Perch  **Nearshore Waters**	**Coyotes**  **On the Sand**	**Harbor Seal**  **On the Sand**
Sea Gull  **On the Sand**	**Racoons**  **On the Sand**	**Sandpiper**  **On the Sand**

Sanderling

On the Sand

Turkey Vulture

On the Sand

Snowy Plover

On the Sand

Clams

Under the Sand

Mole Crab

Under the Sand

Beach Hoppers

Wrack Line

Camouflage Experiments

Lesson at a glance: Many sandy shores creatures are hard to see at first because they are well camouflaged. In this activity, students look for camouflaged creatures and see for themselves the advantages it holds.

Goal: Students will be able to "see" for themselves how well camouflage works.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.
- 2.3 Scientific Inquiry: Scientific inquiry is a process used to explore the natural world using evidence from observations.
  - 2.3S.2 Make predictions about living and non-living things and events in the environment based on observed patterns.
  - 2.3S.3 Make, describe, and compare observation, and organize recorded data.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Materials:

- ❑ Colored confetti with similar amounts of each color (can also use math manipulatives, game pieces, construction paper cut into small squares, colored parachute and bean bags or anything else that comes in different colors.)
- ❑ Construction paper in a variety of colors that match the confetti pieces

Time: 20 minutes

Activity:

1. Break students into pairs or groups of three
2. Give each group one piece of construction paper and a handful of confetti. The construction paper must match at least one of the colors in the confetti.
3. Explain that the confetti pieces are crabs (prey), that the construction paper is the crab's sandy shore environment and that the students are hungry seagulls (predator).
4. Ask the students which color "crab" they expect will "escape" most often. (You can skip this step if you think students will intentionally try to skew the data)
5. Students sprinkle the confetti onto their construction paper and then turn their backs.
6. One at a time and taking turns, the "hungry sea gulls" turn and pick up one "crab" they see. Important: don't let them just grab. They need to *look and see* a piece of confetti, grab one piece and place it in a cup or pile to the side.

7. When they only have a few “crabs” left, stop the experiment. Have them count and record the colors of crabs they “captured” and the colors crabs that “escaped.”

They can enter this data in a chart. Example:

	Red	Blue	Green
Captured			
Escaped			

8. Discuss: Which color crabs survived and which were eaten by predators.

Conclusions:

1. Review the distinction between behavioral and physical ways of camouflage.
2. Discuss whether color is a behavioral or physical camouflage.
3. Discuss how crabs could camouflage behaviorally (by hiding under rocks, sitting still, etc.)

Extensions:

4. Have student create a bar graph of their data.
5. Pass out pictures or biofacts of different sandy shore creatures and have students describe what features help their animal camouflage in their environment.
6. Have them write their observations in a science journal.
7. Try the Hiding Crabs Experiment as a pre or post activity. As a pre-activity it is a great quick introduction to camouflage and as a post activity it confirms the learning from this experiment.

Hiding Crabs Experiment

Materials:

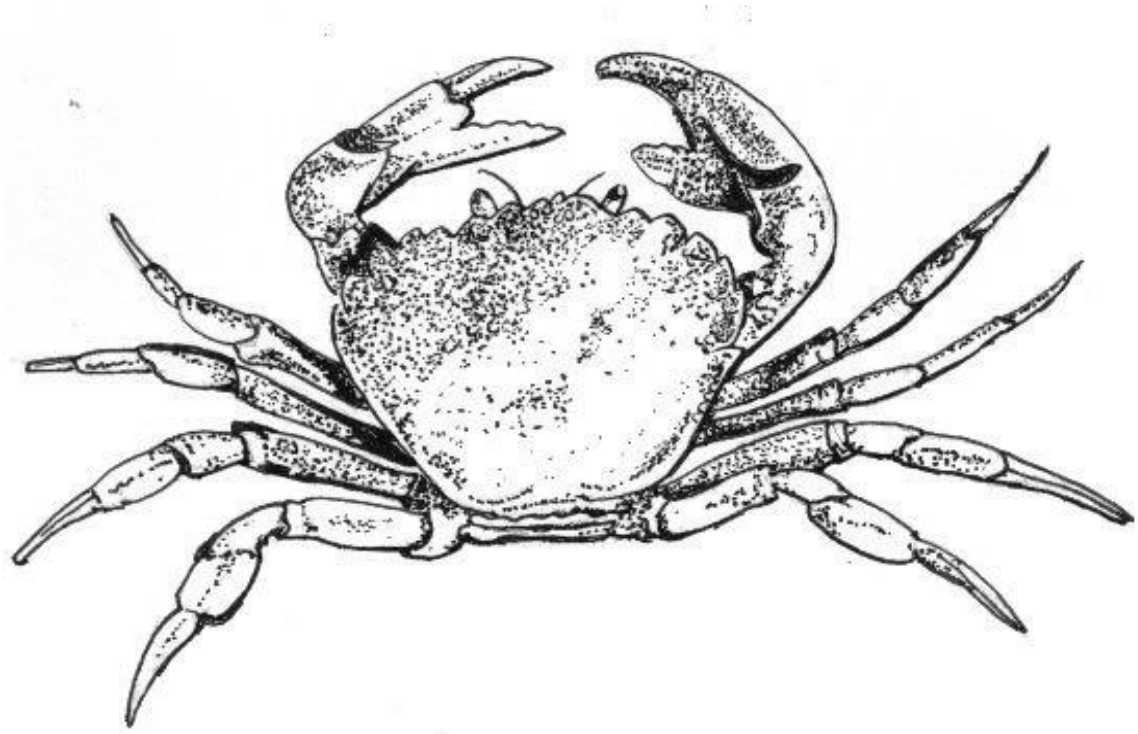
- Newspaper for a background
- Use the template attached to cut three crabs from newspaper
- Use the same template to cut three crabs from bright colored construction paper
- Tape

Activity:

1. Tape the newspaper to the wall, then tape the six crabs on top.
2. Cover and keep hidden from students until ready to do the lesson.
3. When students arrive, uncover this mock "sandy shore" and tell them that they have 20 seconds to count how many crabs they see.
4. Recover after 20 seconds and get a tally of how many crabs students saw.
5. Uncover the "sandy shore" and examine it closely.
   Discuss: Which crabs would be escape predators? Why?

Optional: Add "rocks" and "plants" to the sandy shore and hide some of the crabs under cover.

Crab Template:



Sandy Shore Swimmers

Lesson at a glance: Students will better understand the function of body shape for movement, protection and camouflage by observing fish shapes.

Goal: Students will be able to explain the function of fish shapes.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
    - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Materials:

- Sandy Shore swimmers worksheet
- Examples of different shaped fish, either:
    - Frozen/fresh anchovy (bullet), lingcod (bullet), perch (compressed), Yellow fin croaker (compressed), sole (depressed), and/or flounder (depressed), etc.
    - Classroom fish tank with many examples of different fish
    - Aquarium field trip
    - Video of *Finding Nemo* cued to different types of fish examples

Time: 35 minutes

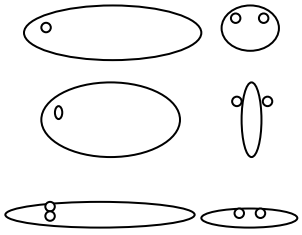
Activity:

1. Give each student a Sandy Shore swimmer worksheet.
2. Review the fish shapes.
3. Have students make observations of different fish shapes.
4. Have students complete the worksheet.

Sandy Shore Swimmers

The shape of an animal living on the sandy shores helps it swim fast or slow, camouflage in their environment, and to protect themselves. A fishes shape is an adaptation to survive in its environment.

Fish Shapes



Bullet shaped- These fish are shaped like a bullet to move through the water fast.
Compressed- These fish are flat from side to side. Being thin helps the fish hide. They are able to move quickly in short bursts.
Depressed- These fish are flattened from top to bottom like a pancake. These flat fish hide from predators and sneak up on prey by lying on the sandy bottom. These fish have flight-like swimming.

1. What fish did you observe fitting these descriptions? What part of the ocean did they live?

Bullet Shaped	Compressed	Depressed

2. What observations can you make about the
   - Bullet shaped fish _____

     _____
   - Compressed fish _____

     _____
   - Depressed fish _____

     _____

Feeding Fishes

Lesson at a glance: Students will explore the shape of a fishes mouth as an adaptation of its prey and environment.

Goal: Students will be able to explain the function of different shapes of fish mouths.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Materials:

- ❑ Feeding Fishes worksheet
- ❑ Feeding Fishes flash cards

Time: 35 minutes

Activity:

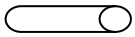
1. Give each student a Feeding Fishes worksheet.
2. Review the mouth shapes.
3. Have students make observations of different fish mouths using the feeding fishes flash cards.
4. Have students complete the worksheet.

Feeding Fishes

The shape of a fish mouth helps it eat different things in different parts of the sandy shore. The shape of a fish mouth is an adaptation to survive in its environment.


Large mouth- for eating large prey


Small mouth- for eating small prey


Tube-shaped mouth- for sucking up tiny plants and animals


Sharp teeth- for eating meat


Mouth near top- eating plants and animals near the surface or above


Mouth in middle- eating plants and animals directly ahead


Mouth on bottom- eating off the bottom

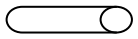
Make observations of the following fish. Based on the shape and placement of their mouth parts, what kinds of things will they eat and where can their prey be found?

Bay Pipefish	Northern Anchovies	Starry Flounder
Eat: Which are found:	Eat: Which are found:	Eat: Which are found:
Shiner Perch	Yellowtail rockfish	Sculpin
Eat: Which are found:	Eat: Which are found:	\Eat: Which are found:

The shape of a fish mouth helps it eat different things in different parts of the sandy shore. The shape of a fish mouth is an adaptation to survive in its environment.

 Large mouth- for eating _____

 Small mouth- for eating _____

 Tube-shaped mouth- for _____

 Sharp teeth- for _____

 Mouth near top- eating _____

 Mouth in middle- eating _____

 Mouth on bottom- eating _____

Fish Printing (Gyotaku) and Haiku

Lesson at a glance: Students will create fish prints and Haiku poems while exploring the bodies of fish.

Goal: Students will make careful observations of fish shape and inference about function.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.
- 2.3 Scientific Inquiry: Scientific inquiry is a process used to explore the natural world using evidence from observations.
  - 2.3S.1 Observe, measure, and record properties of objects and substances using simple tools to gather data and extend the senses.
  - 2.3S.2 Make, describe, and compare observations, and organize recorded data.

OTHER SUBJECTS:

Language Arts, Art, Writing, Social Studies

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.c. Some major groups are found exclusively in the ocean. The diversity of major groups of organisms is much greater in the ocean than on land.
- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

6. THE OCEAN AND HUMANS ARE INEXTRICABLY INTERCONNECTED.

- 6.c. The ocean is a source of inspiration, recreation, rejuvenation and discovery. It is also an important element in the heritage of many cultures.

Materials:

- ❑ Rubber Fish models*
- ❑ Water-based inks or paint (black, red, orange, yellow, green, blue, purple)
- ❑ Large, medium, and small paintbrushes
- ❑ Newspaper
- ❑ Rice paper or white construction paper
- ❑ Pencils

*Rubber fish models can be purchased from www.DickBlick.com. Real fish can be used in place of rubber models but fish should be cleaned well prior to inking.

Time: Two 35 minute classes

Activity:

9. **Engage:** Facilitate conversation regarding Japanese connection to the ocean and resulting art in gyotaku and haiku.
10. **Explore:** Students will study the rubber/real fish. Students will make observations about shape and function.
11. **Create:** Students will create their own fish prints.
    a. Select a fish.
    b. Place fish (flat side down) on top of newspaper.
    c. Using the inks/paints provided, students will paint the fish.
        i. Students should make sure to cover the entire surface of the fish- including eyes, fins, and all the scales.
        ii. Spread the ink/paint evenly over the fish so that the only a thin yet solid layer shows.
    d. Line the paper up over the fish so that the fish is positioned where you would like it to print on the paper. Place the paper on the fish.
    e. Press firmly, covering the entire fish's surface. (Don't let the paper slide/shift)
    f. Carefully remove the paper and set aside to dry.

    g. Students should make new observations about the shape and function of the fish's physical adaptations.
    h. Students should create a haiku of their fish print.

Conclusions:

Have students present their haiku and fish prints to the class. Engage students in a conversation about their observations of fish physical adaptations and function using fish prints as a reference.

Extensions:

1. Prior to beginning the prints, read the story *Kogi's Mysterious Journey* by Elizabeth Partridge, Illustrated by Aki Sogabe.
2. Have students label the different parts of a fish on their fish print.
3. Have students read/create other haikus.

Bird Beak Buffet

Lesson at a glance:
Students learn about the special functions of bird beaks in this fun lesson.

Goal:
Students will be able to compare and contrast bird beaks and how they are used for eating different kinds of food.

Oregon Content Standards:
SCIENCE
- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

Materials:
- ❑ Set of eating utensils for each child: a fork, spoon, chopsticks, and two toothpicks.
- ❑ Various shaped cooked pasta with vegetable oil, and sunflower or pumpkin seeds, a serving for each child.
- ❑ Stations for each of the following:
  - Pelican Station:
    - Cup or scooper with plastic fish in a pan of water
    - Picture of a pelican
  - Hummingbird Station:
    - Turkey baster or eyedropper and a tall vase with colored water
    - Picture of a hummingbird
  - Shorebird Station:
    - Tongs with plastic worms buried in soil or sand
    - Picture of a shorebird
  - Woodpecker Station:
    - Tweezers with rice tucked into the bark of a log
    - Picture of a woodpecker
  - Owl, Hawk and Eagle Station:
    - Scissors with play dough wrapped around a stick (raptors tear off hunks of prey with their talons and beaks)
    - Picture of an owl, hawk and eagle
  - Heron Station:
    - Chopsticks with plastic fish in a pan of water
    - Picture of a heron or egret
  - Duck Station:
    - Strainer with tea leaves in water
    - Picture of a duck
  - Mystery Station:

- Nutcracker with pecans, peanuts, or other nuts
- Covered picture of a sparrow

Time: 1 hour

Activity:

1. Engage: Begin by discussing food with students. Ask them what their favorite foods are. Then ask them what they use to eat them (fingers, forks, etc.) Brainstorm with students why we use knives, forks, and spoons to eat. Ask students what animals use to eat (teeth, paws, claws, mouths, etc.) Ask students what birds eat with.
2. Explore: Provide each student a plate of pasta and seeds and a set of clean eating utensils. Encourage them to try all the utensils to eat each kind of pasta and seed on their plate. Avoid eating with hands.
3. Explain: After students have tried everything, lead a discussion about which utensil served best for eating which food.
4. Elaborate: Use your hand (head) and arm (body) to form a pretend bird. Use the materials at one station to demonstrate a bird eating. Give students time to explore each station. Facilitate a discussion on what they found about the beak adaptations to fit a bird's diet.
5. Evaluate: As a group, collect some of the tools from each of the stations and add the nutcracker. Present the mystery station and explain this bird would need a beak strong enough to crack the outside of the shell. Ask students to raise their hand to indicate which tool would be the best for this task. Select one student to come to the front and try each tool. Discuss why the nutcracker was the best tool. Evaluate students understanding of adaptations for feeding.

Summary:

1. Discuss how looking at a bird's beak can help scientists predict a bird's diet.

Extensions:

Go outside and observe birds in the schoolyard, beach or aquarium. What kind of beaks do they have? What kinds of food do they probably eat?

Craft project:

1. Design your own bird. All birds have feathers, beaks, wings, and feet, but they vary enormously in shape, size, and color. Give students a variety of materials to create their birds such as paint, construction paper, scissors, glue, pipe cleaners, small boxes, plastic tubs, paper bags, egg cartons, and feathers. Have them present their bird to the class.
2. Homemade binoculars. With two toilet paper tubes, masking tape, yarn, and a hole punch, students can build their own pair of binoculars. Afterward making these, go outside and use them to spy birds!

Keeping Wet

Lesson at a glance: Many sandy shore creatures spend part of their time on land but need to stay wet to survive. In this activity, students see how animals use different adaptations to keep wet.

Goal: Students will be able to explain animal adaptations for protection from the sun.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Materials:

- ❑ Three wet paper towels
- ❑ Three plastic containers with lids

Background: Barnacles, clams, and snails are only a few of the animals that can tightly close their shells to the drying air. Later, when submerged again, they can open their shells and feed.

Time: 20 minutes, total but over 24 hours

Activity:

1. Using the biofact box, have students observe different clams, barnacles and other bivalves.
2. Lead a discussion about the function of shells as an adaptation.
3. Introduce that shells also help the soft bodies of bivalves stay wet when the tide, waves, etc go out.
4. Explain that this activity is a demonstration of how bivalves' shells keep moisture.
5. Place the wet paper towels inside the three plastic containers with lids.
6. Close the lid of the first container tightly. Pop off the lid of the second container and place it lightly over the top without sealing it. Remove the lid entirely from the third container.
7. Place all three containers in a hot spot—outside on a sunny day, on a radiator inside, or in a sunny window.
8. Check periodically and see what happens to the paper towels.

Extensions:

1. Discuss: Which towels stayed damp? Which dried out? What do the paper towels and containers represent?
2. Look at pictures of sandy shore critters that need to stay wet. Which ones show adaptations like the plastic containers?
3. Have students record the time it takes for the paper towels to dry out.

Life Cycle of a Crab

Lesson at a glance: Students will explore the life cycle of a crab.

Goal: Students will be able to explain the different parts of the crab life cycle.

Oregon Content Standards:

SCIENCE

- 2.2 Interaction and Change: Living and non-living things change. .
  - 2.2L.1 Describe life cycles of living things.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.a. Ocean life ranges in size from the smallest virus to the largest animal that has lived on Earth, the blue whale.
- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Materials:

- ❑ Life Cycle of a Crab powerpoint, reading sheet, cards, etc.

Time: 35 minutes

Activity:

5. Use the accompanying text to have students individually, group or class read through the life cycle of a crab.
6. Use questioning strategies to identify adaptations for survival during each stage.
   a. Examples: Why so many eggs? Why an exoskeleton? Why would you float with the water? Why claws? Why would you molt? Etc.

Eggs
A male and a female crab will mate and make more than 200,000 eggs. That's a lot!

The female crab will carry the eggs for about two weeks until they hatch. After the crabs hatch from their egg, the parents don't take care of their young.

Metamorphosis *(MEH-tuh-MOR-fuh-sis)*
When crabs first hatch from their eggs, they don't look like mature crabs. They will go through several changes before they are adults. This is called **metamorphosis**. Can you think of another animal that goes through changes as it grows?

- A caterpillar turns into a butterfly
- A tadpole turns into a frog

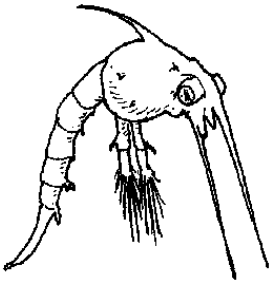
Exoskeleton
Crabs are very different from you and me. They have no bones. Instead their skeleton is a hard shell on the outside of their body called an **exoskeleton**!

When a crab grows, it gets too big for its hard exoskeleton. A crab will shed its old exoskeleton and grow a new one. This is called **molting**. It takes a day for the new shell to harden and be ready to go.

Imagine you molted as you grew. How might this change your lifestyle?

Larva *(LAR-vuh)*
When a young crab first hatches from its egg, it is very tiny and is called a zoea *(ZO-ee)* larva. A crab zoea will swim and float around in the ocean as plankton. A zoea will eat as much as it can to grow.

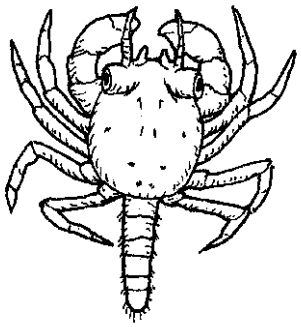
Zoea don't look much like adult crabs. They will go through several molts as their body grows and they reach their next life stage.



Megalops *(MEG-ah-lops)*
After being a zoea, a crab becomes a megalops. When a young crab becomes a megalops it will sink down to the bottom of the ocean. Here it will live for the rest of its life.

Fish eat many megalops because they are bigger than most plankton. Megalops are also easy for fish to see because they are brown.

A megalops larva will only need to molt one more time to look like an adult crab.



megalops larva

Adult Crab

The last life stage of a crab is being an adult crab. When a crab is 3 or 4 years old, they will find another crab and mate. Making more eggs and starting the cycle all over again.

Strange, little mole crabs…
Sentence Patterning Chart

Lesson at a glance: Students will gain vocabulary and complexity in their writing as they use this fun format to create a sentence. They will also think critically about a sandy beach animal and what it does in its habitat.

Goal: Students will be able to use expanded vocabulary about some common animals of Oregon sandy beaches.

Oregon Content Standards:

SCIENCE

- 1.1 Structure and Function: Living and non-living things have characteristics and properties.

OTHER CONTENT AREAS

Writing

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

Materials:

- ❑ A large sheet of white butcher paper
- ❑ 5 different colored markers (preferable red, orange, green, blue, and purple)
- ❑ Post-it notes

Time: 30 minutes

Activity:

1. On the large sheet of butcher paper, copy down the chart below. Using different colors helps students learn the parts of speech.
2. Choose a sandy beach animal (plural) to write down in the noun column. The teacher chooses this one. Example: mole crabs.
3. With students sitting in front of you, explain what an adjective is. Brainstorm adjectives to describe animal. When the column is full, repeat with verbs, adverbs, and prepositional phrases. Remember to use different colored markers to write, one for each part of speech.
4. You will need 5 post-it notes for this next part. Choose two adjectives and put a post-it note next to each one. Choose one verb, one adverb, and one prepositional phrase. Sing the resulting combination to the tune of "The Farmer in the Dell."

   Example:

   Strange, little mole crabs,
   Strange, little mole crabs,

Strange, little mole crabs,
Burrow madly in the sand.

5. Ask students to come up and mark their selections with post-it notes. Sing their selection. Repeat at least 3 times.

Conclusion:

Review vocabulary learned and parts of speech. Review what students learned about the animal's behavior in their habitat.

Extensions:

1. Have students choose words and write their own sentence on a sheet of paper. Have them expand their sentence into a story and draw a picture to go with it.
2. Copy the words onto sentence strips, using the correct colors. Hand out a full set (2 adjectives, 1 noun, 1 verb, 1 adverb, and 1 prepositional phrase) to groups of four or so students. Groups put them in order and sing their sentence to the class.
3. Hand out all the words randomly to groups of four students. Groups then must acquire their missing pieces by trading with other groups. Then they sing their sentence to the class.

Adjective	Noun	Verb	Adverb	Prepositional Phrase

Writing About Sandy Shore Critter Adaptations

Lesson at a glance: This activity is a reflection after students have visited the beach. Students will write about an animal and what adaptations they observed.

Goal: Students will be able to identify some common adaptations that animals use to survive on Oregon sandy beaches.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.
- 2.3 Scientific Inquiry: Scientific inquiry is a process used to explore the natural world using evidence from observations.
  - 2.3S.3 Make, describe, and compare observations, and organize recorded data.

OTHER CONTENT AREAS

Writing

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Materials:

- ❑ Paper and pencils
- ❑ Written where all students can see:

  I saw a _____ and it held on to _____ by its _____.
  It ate _____with its _____.
  It protected itself from _____by _____.
  It hid itself from _____ by _____.

Time: ½ hour

Activity:

1. Ask students to fill in the blanks for one organism they saw on their field trip.
2. Take pictures of tide pool organisms to help students remember.
3. Compare the adaptations of each of their animals.

Extensions:

1. Have students expand upon their writing by including other adaptations.
2. Have students write a fictional story about how their tide pool creature spends its day.

3. Have students do an oral presentation of their animal's adaptations to their group or the class.

Build an Animal

Lesson at a glance:
Students will build an imaginary animal with adaptations for sandy beaches.

Goal: Students will be able to use what they have learned about adaptations to build an animal fit to live on a sandy beach.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.
- 2.4 Engineering Design: Engineering design is a process used to design and build things to solve problems or address needs.
  - 2.4D.1 Use tools to construct a simple designed structure out of common objects and materials.
  - 2.4D.2 Work with a team to complete a designed structure that can be shared with others.

Ocean Literacy Principals

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.
- 5.f. Ocean habitats are defined by environmental factors. Due to interactions of abiotic factors such as salinity, temperature, oxygen, pH, light, nutrients, pressure, substrate and circulation, ocean life is not evenly distributed temporally or spatially, i.e., it is "patchy". Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert.
- 5.h. Tides, waves and predation cause vertical zonation patterns along the shore, influencing the distribution and diversity of organisms.

Materials:

- ❑ Glue
- ❑ Scissors
- ❑ Tape
- ❑ Various materials such as:
  - ❑ Film canisters (for body)
  - ❑ Toilet paper tubes (for body)
  - ❑ Tissue Paper
  - ❑ Googly eyes
  - ❑ Pipe cleaners
  - ❑ Popsicle sticks
  - ❑ Construction paper
  - ❑ Plastic tubs and lids
  - ❑ Plastic Easter eggs
  - ❑ Egg crates
  - ❑ Etc.

Time: An hour a day over a few days—can be manipulated to fill different time requirements.

Activity:

1. Give students the assignment.
   Students are to build an imaginary animal that lives on a sandy beach. Each student group must design their animal with adaptations that serve the functions of protection, eating/hunting, camouflage and/or mobility. Students do not have to address every type of adaptation but address at least one with a physical adaptation. The animal can live on the dunes, in the intertidal zone, or in the subtidal zone. It can have some of the adaptations of the animals they have learned about but should not be a replica of a real animal.
2. Brainstorm with students how animals meet their needs and other adaptations they have learned about.
3. Have the student explore the materials they will be able to use to design their animal.
4. Depending on the group, either have the students sketch their animal design and then set them loose with the materials or you can have students manipulate the materials immediately.

Conclusions:

When students have finished their animal, have them present it to the class. They should tell the class what sandy beach zone it lives in and how it is adapted to live there.

Extension:

1. Have them write and draw a "Wildlife Report" about their fictional animal to include the animal's name, zone it lives on the sandy shore, physical adaptations and functions, behavioral adaptations and functions, what it eats, etc.
2. Have them write story about a day in the life of their animal.

Animal Adaptations Process Grid

Lesson at a glance: Students will graphically organize common animal adaptations.

Goal: Students will be able to list some physical and behavioral adaptations of animals that live on Oregon sandy beaches.

Oregon Content Standards:

SCIENCE

- 2.1 Structure and Function: Living and non-living things vary throughout the natural world.
  - 2.1L.1 Compare and contrast characteristics and behaviors of plants and animals and the environments where they live.

Ocean Literacy: Essential Principals and Fundamental Concepts

5. THE OCEAN SUPPORTS A GREAT DIVERSITY OF LIFE AND ECOSYSTEMS.

- 5.d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

Time: ½ hour

Materials:

- ❑ Blank process grid copied onto a large sheet of white butcher paper and taped to the wall
- ❑ Different colored markers
- ❑ Blank process grids printed off on 11x17, one for each group

Activity:

1. Tape the large blank process grid onto the wall.
2. Review with student that animals have adaptations that help them survive.
3. Review the different characteristics on the process grid: physical and behavioral adaptations for camouflage, mobility, protection, and eating/hunting.
4. Fill in the process grid together, soliciting answers from the class.

Conclusion:

This should be the last thing you do in this unit as an assessment to see what your students have learned. If they have a hard time doing this activity, it may mean that you need to re-teach some elements.

Extensions:

1. Have groups of four or so students fill in their own blank process grid after expert reading groups.
2. Have students do it individually.

	Physical	Behavioral	Examples:
Camouflage			Physical: Behavioral:
Mobility			Physical: Behavioral:
Protection			Physical: Behavioral:
Eating/ Hunting			Physical: Behavioral:

	Physical	Behavioral	Examples:
Camouflage	Body coloration or shape	Movement, staying still	P: Pipefish look like eel grass P&B: Sole are flat, lie on the bottom, bury themselves
Mobility	Body shape allows it to move	Technique for best movement	P: Anchovies are shaped to swim fast P: Flounder have flight-like swimming B: Turkey vultures fly in a V B: Orcas hunt in packs
Protection	Physical features protect it from elements/predators	Activity they do to protect themselves	P: Tide pool sculpin have venomous spines B: Anchovies and perch swim in schools B: Sea pens emit bioluminescence when touched
Eating/ Hunting	Shape of body parts/mouth make it easy to hunt	Techniques for best hunting: ambush, hunting in packs	P: Perch have small mouths because they eat small things P: Pipefish have tube-shaped mouths to 'slurp' up food B: Anchovies swim with mouth open to filter feed B: Orcas hunt in packs

P: Physical adaptation
B: Behavioral adaptation

Modeling the Tides

Lesson at a glance:
Students will make a model of the Sun, Moon and Earth to explain tides.

Goal: Students will be able to explain how the Sun and Moon's gravitation pull creates tides.

Oregon Content Standards:

SCIENCE

2.2E.1 Observe and record the patterns of apparent movement of the sun and the moon.

Ocean Literacy Principals

1. THE EARTH HAS ONE BIG OCEAN WITH MANY FEATURES.

- 5.H. Tides, waves and predation cause vertical zonation patterns along the shore, influencing the distribution and diversity of organisms.

Materials:

- ❑ Students
- ❑ A wide-open area

Time: 45 minutes

Activity:

1. Discuss with students what they know about the movement of the Earth, Moon, and Tides. Ask students to share why they think the tides rise and fall. Tell students that they will work together as a class to make a human model to understand the tides.
2. Select a wide-open area to conduct the activity, such as a field, cafeteria, or gym. If you can find a painted circle on the ground, that will help.
3. Select one student to be the Moon. Select four students to be the Earth. Tell students that the Earth is about four times as big as the Moon.
4. Have students representing the Earth to form a circle, facing outwards and the Moon off to the side.
5. Select four students to be the Oceans of the Earth. Each Ocean student stands in front of an Earth student, both facing the same direction. Have Ocean students link elbows and remind them that all the oceans on Earth are connected.
6. Have the Earth students rest their hands lightly on the shoulders of the Ocean student in front of him or her. Explain that gravity holds the ocean to the Earth.
7. All other students are the Sun. Remind students that 109 Earths would fit in the sun. Imagine with your students how many classes would have to be the Sun in order for this model to be accurate. Have Sun students form a circle, facing outwards and linking elbows. They can wave their fingers to show the rays of light and heat from the Sun.

8. The Earth rotates on its axis in one complete circle every day. Have students who represent the Earth walk slowly in a tight circle to represent the rotation of the Earth. They will hold gently onto their Ocean student, so the "Ocean" will go with them.
9. The Sun rotates just as the Earth rotates, so have your Sun students rotate in a circle. The Sun rotates once every 27 days at the equator.
10. The Moon rotates at just the right speed so that it always keeps one face pointed toward the Earth. Have the Moon student rotate slowly around the Earth so that his or her face is always pointed towards the Earth.
11. After all students have practiced rotating, have them stop, sit where they are, and listen to you explain how the oceans are affected by the gravity of the Sun and Moon.
    - The Earth has gravity that keeps the Oceans from floating off into space. This gravity is strong and the Oceans will never float away.
    - The Sun and the Moon have gravity, too. They pull on the Earth's oceans. Their pull is strong enough to make the Oceans bulge towards them, but not strong enough to pull the Oceans off into space.
    - When the oceans are bulging towards the Moon or Sun, the water pulls away from the coastlines, creating low tides. When the oceans return to normal, the water covers the coastlines again, creating high tides.
12. Have students practice this gravitational effect. The Moon, Earth and Ocean students stand again and return to their positions. Have the Moon rotate around the Earth, wiggling his or her fingers to represent gravity. When the Moon student faces an Ocean student, have that student take three small steps towards him or her. After the Moon passes, the Ocean students should return to right in front of the Earth student holding onto their shoulder.
13. Now have the Sun students stand. Sun students can wiggle their fingers, too, now representing heat, light, and gravity.
14. If the Sun and the Moon are in alignment, the Ocean students should take four small steps towards them. That is called a Spring Tide and creates the highest high tide. This always happens when the Moon either full or new.
15. If the Sun and Moon are pulling in opposite directions, they cancel each other's effect to some extent. The result is a much smaller tide and is called a Neap Tide. This always happens during quarter Moon phases.
16. Try the activity again with the class several more times, allowing students to switch roles.

Conclusions:

1. Review that Earth's gravity holds the oceans onto the Earth, and the Moon and Sun's gravity pulls the ocean towards them.
2. Review that when the ocean bulges towards the Sun or Moon, it pulls away from the coastlines causing low tides.

Extension:

1. Have students create a sketch showing the Earth, the Moon, and the tides.
2. This activity can also be used to show the orbit of the Earth around the Sun, the solar system, help explain night and day, or eclipses.

3. For more information about tides, go to:
   http://home.hiwaay.net/~krcool/Astro/moon/moontides/

Video and Books

- *Giant Octopuses* by Christine Zuchora-Walske
- *Grasper* – Written and illustrated by Paul Owen Lewis
- *Spiny Sea Stars* by Christine Zuchora-Walske
- *Life at the Edge of the Sea* – Produced by the BBC/Distributed by WNET (60 minutes)
- *Seashore* – DK Eyewitness (35 minutes)
- *The World Between the Tides* – Video Presentations Inc.

Science Fair projects ideas

- Which patterns make the best camouflage?
- Can a salt water plant live in fresh water?
- Do certain bird species prefer to eat in a group or alone?
- What color is the best camouflage at night? In water? On the beach?
- Which shapes move the best through the water?

Field Trip Suggestions:

- Any beach with sand
- Oregon Coast Aquarium
- Local State Parks

Brain Pop:

- Camouflage http://www.brainpopjr.com/science/animals/camouflage/
- Hibernation http://www.brainpopjr.com/science/animals/hibernation/
- Migration http://www.brainpopjr.com/science/animals/migration/

Science A-Z

- *Animals, Animals* (Life: K-2: Animals. Nonfiction Books: Low, Mid and High Levels.)
- *Food* (Life: K-2: Animals. Quick Reads: Low Level.)
- *Grab Food* (Life: K-2: Animals. Quick Reads: Mid and High Levels.)
- *Moving* (Life: K-2: Animals. Quick Reads: Low Level.)
- *Hop or Crawl* (Life: K-2: Animals. Quick Reads: Mid and High Levels.)
- *Gulp* (Life: K-2: Animals. Quick Reads: Low Level.)
- *Trapped* (Life: K-2: Animals. Quick Reads: Low Level.)
- *Catch Dinner* (Life: K-2: Animals. Quick Reads: Mid and High Levels.)

MARE Marine Activities, Resources and Education Website

- 2nd Grade Sandy Beach Curriculum: http://lawrencehallofscience.org/mare/oiresources/curriculum/sandy/overview.html