



DEERING ESTATE



SHARK
RESEARCH &
CONSERVATION
PROGRAM



Marine Conservation Science & Policy: Sea Grasses

Grade Level:

4th – 12th

Subject Area

Science

Biology

Duration

1.5 Hrs

Benchmarks:

Body of Knowledge

Life Science

Nature of Science

Physical Science

Big Idea

Organization and Development of
Living Organisms.

The Practice of Science

Standards

SC.K.N.1.1

Collaborate with a partner to collect
information.

SC.K.N.1.4

Observe and create a visual
representation of an object.

SC.8. G.5.2

Describe the impact of human
modifications on the environment
and ecosystems.

SC.912L.17.16

Discuss the large-scale
environmental impacts resulting
from human activity.

Focus Question

What are sea grasses? What animals live in this habitat and what services does it provide? How can we better protect this environment?

Objectives

Students will discover special features of seagrass and explore the coastal ecosystem of the seagrass meadow, Students will learn to:

- Identify features of seagrass meadows and animals that live in this habitat.
- Analyze the importance of this ecosystem and elaborate ways to protect it.
- Work in small groups to form a vocabulary alphabet demonstrating knowledge of seagrass meadows.

This will be a project-based learning module in which the students will work in small groups to present a visual representation of this habitat, discussing its importance and ways to protect it.

Background

Seagrasses are submerged aquatic plants that grow on the bay floor, with long, thin, grass-like leaves covering parts of the ocean floor to form seagrass meadows. Despite popular misconception, seagrasses are not seaweeds; seagrasses are actually more closely related to flowering terrestrial plants and belong to a group of plants that includes grasses, lilies and palms. Like their terrestrial relatives, seagrasses produce seeds, roots, stems, fruit, veins and leaves and are the only flowering plants beneath the sea. In contrast, seaweeds have no flowers or veins, and their roots merely anchor rather than absorb nutrients. These similarities to land plants and differences with seaweeds lead scientists to suggest that seagrasses evolved from algae to land plants and then transitioned back to the sea over 100 million years ago.¹

Seagrasses use **photosynthesis** to harness the Sun's energy to convert carbon dioxide and water into sugar and oxygen, which they use for energy. Their roots also absorb nutrients from the sediment of the ocean floor and act as anchors securing them to the bottom. Seagrasses also have tiny air pockets in the leaves to keep them buoyant, and to exchange gases throughout the plant. Because seagrasses use photosynthesis to create energy, they are the primary producers and basis of many marine food webs, supporting diverse ecosystems.

Seagrasses can reproduce through sexual reproduction, the fertilization of a female plant by male pollen, and **clonal growth**. Asexual clonal growth is when seagrasses, similar to terrestrial grasses, send root-like rhizomes out sideways to produce new shoots, so that entire seagrass meadows can actually be connected stems with the genetic code of only a few plants. The oldest known plant is a clonal growth in the Mediterranean of the seagrass *Posidonia oceanica*, which dates back to the last ice ages at over 200,000 years old.¹

Seagrasses only grow in the photic zone, the shallow ocean depths where enough light penetrates for photosynthesis. There are 72 distinct species of seagrasses found in salty or brackish water. usually along gently sloping coastlines that are somewhat protected from the

Vocabulary:

Seagrass:

Angiosperms, flowering plants that grow submerged in salty and brackish waters, forming meadows that support a complex food web.

Photosynthesis:

The process by which plants produce energy by converting carbon dioxide, hydrogen and other nutrients in to simple carbohydrates, releasing oxygen as a by-product.

Clonal Growth:

The reproduction process that send root-like rhizomes out sideways to produce new shoots, used by terrestrial and seagrasses

Seagrass Meadows:

Highly productive coastal ecosystems formed by dense growths of seagrass and supporting thousands of organisms from shrimp to sea turtles.

Food Web:

The natural overlapping interconnections between food chains in an ecosystem, including primary producers, consumers and decomposers.

Prop Scarring:

Damage to seagrass meadows and other coastal ecosystems by boat propellers; these scars can take years to recover and can be avoided by responsible boating.

Environmental Stewardship

The responsible use and protection of the natural environment through conservation and sustainable practices.

Background

turbulence of battering waves. Some seagrasses are long, flat and ribbon-like while others resemble spaghetti, ferns or paddles, reaching lengths of 3 inches to 35 feet. Seven species of seagrass are found in Florida, including turtle grass, shoal grass, manatee grass, widgeon grass, stargrass, paddle-grass and Johnson's sea grass.³ All are found in Biscayne Bay.

Seagrass meadows are considered one of the most productive ecosystems in the world; a single acre can produce over 10 million tons of biomass every year. The high productivity provides indispensable feeding and nursery grounds for a myriad of organisms founding a complex **food web**, with a single acre capable of hosting an estimated 40,000 fish and 50,000,000 invertebrates.² Seagrass beds support many crustaceans, snails and fish species by providing a protecting buffer from strong currents, and are an essential food source for herbivores like the endangered manatee and green sea turtle. Additionally, seagrasses are known as "the lungs of the sea", producing 10 liters of oxygen daily per meter of seagrass. Their stabilizing roots also reduce erosion and protect coastlines.

Seagrasses also provide economical benefits. For over 10,000 years humans have used seagrasses to fertilize fields, insulate homes, fill mattresses, make bandages, thatch roofs, and as source of food. In Florida alone, seagrasses support the commercial fish and shellfish harvest, earning over \$124 billion annually.² Estimates value an acre of seagrass in Florida at \$20,500, while an acre of corn in comparison earns \$373. Despite the extraordinary economic and ecologic contributions of seagrass meadows, this vital habitat faces many threats.

Seagrasses endure natural pressures such as storms, excessive grazing and disease, but this valuable ecosystem also suffers from human threats. Because of their coastal proximity, seagrass beds are especially vulnerable to runoff pollution from urban and agricultural areas, carrying contaminants such as pesticides, household chemicals, oils, automotive wastes, fertilizers and other chemical and debris. This excess leads to algae blooms, which deplete oxygen supplies and smother seagrasses, causing massive die-offs. Dredging and **prop scarring** also tear up meadows, leaving open spaces that take years to regrow.

Unfortunately, the world is losing an estimated 1.5% of seagrasses annually, or about 2 football fields every hour, disappearing faster than the rainforest. To protect this valuable habitat, South Florida is limiting harmful fishing practices, reducing dredging and trawling, and decreasing runoff. Some simple steps that everyone can take to protect seagrass meadows include: limit pesticide and fertilizer use; don't litter; don't dump toxic substances down drains as drains; go slow and avoid shallow areas when boating, or pole off seagrass meadows rather than using the engine; educate others; and support local conservation efforts by donating and volunteering. If everyone contributes and practices **environmental stewardship**, and participates in restoration efforts, the globally vital seagrass habitats will be protected for future generations.

Supplemental Resources

1- "Indian River Seagrass Habitats." Smithsonian Marine Station.

http://www.sms.si.edu/IRLspec/Seagrass_Habitat.htm

2- "Seagrass." Florida Department of Environmental Protection.

<http://www.dep.state.fl.us/coastal/habitats/seagrass/>

3- Virtual Tour: The Seagrass Habitat. Odyssey Earth.

<http://www.odysseearth.com/videos/the-seagrass-habitat/>

Vocabulary:

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Extension Activity:

Students will find a current event relating to seagrass meadows in Biscayne Bay (or Florida) and summarize the article, reflecting on the status of the local seagrass and current threats.

Assessment:

Students will complete the seagrass worksheet in class and write a reflective paragraph on what services local seagrass meadows provides for them, and how they can do to help protect local seagrass meadows.

Program Partner:

Seagrass Alphabet

Materials

- Index cards or paper of similar size
- Coloring utensils (crayons, markers or colored pencils)
- Pen or pencil
- Tape

Procedure

1. Divide the students into four groups; assign two groups six letters of the alphabet and two groups seven letters of the alphabet so that together they make the full alphabet.
2. Using an index card for each letter, students will write a relevant word from today's lesson beginning with each letter (i.e. G=Green Sea Turtle)
3. On each word's index card, students will define the word, connect it to today's lesson and draw a representation. (i.e. The green sea turtle is a large marine reptile that is endangered. They are the only herbivorous sea turtles and like to graze on seagrasses.)
4. Each group will present their letters in order of the alphabet, taping each index card on the board or around the room. Highlight the interconnections between all of these seagrass organisms and conduct a class discussion on the importance of this complex ecosystem.

Worksheet Answer Key

1. Photosynthesis
2. Roots
3. Producers
4. Pollution
5. Seagrass
6. Clonal growth
7. Flower
8. Seagrass meadow
9. Green sea turtle
10. Environmental stewardship
11. Economic
12. Consumers
13. Prop scar
14. Antarctica
15. Lungs
16. Habitat
17. Manatee

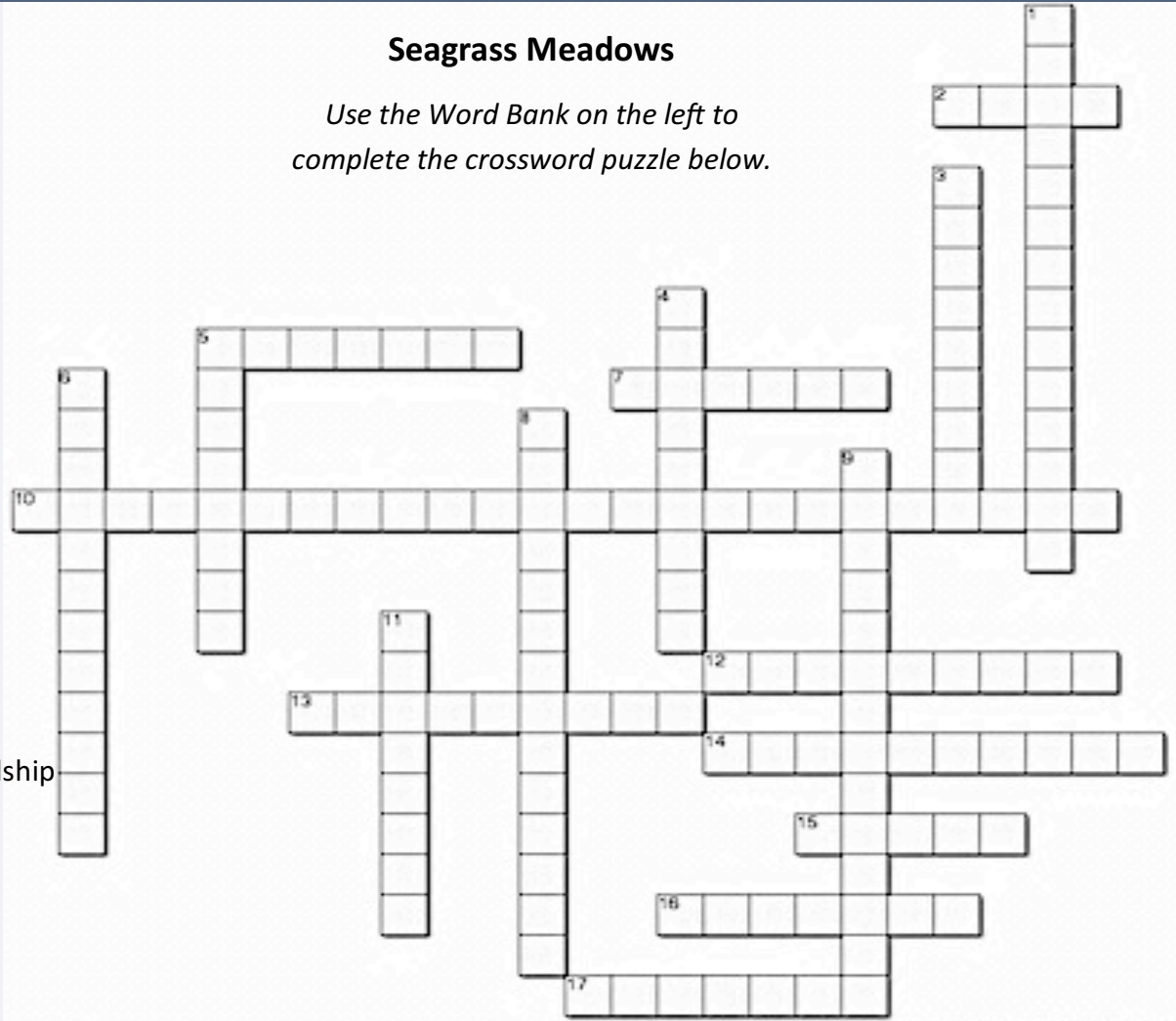


Word Bank

- Lungs
- Manatee
- Habitat
- Clonal Growth
- Root
- Flower
- Producers
- Consumers
- Pollution
- Economic
- Seaweed
- Green Sea Turtle
- Seagrass Meadow
- Antarctica
- Photosynthesis
- Environmental Stewardship
- Prop Scar
- Seagrass

Seagrass Meadows

Use the Word Bank on the left to complete the crossword puzzle below.



Across

2. This part of the seagrass helps absorb nutrients and anchors it
5. Seagrasses are not related to the marine plants
7. Seagrasses are the only marine plants that produce these
10. The responsible use and protection of the environment
12. Seagrass food webs support many _____ that feed on other organisms.
13. Damage to seagrass by motorboats
14. Seagrass grows near all continents except this one.
15. Seagrass meadows are the _____ of the sea because they create so much oxygen
16. Seagrass meadows for an essential _____ for many creatures
17. This endangered mammal grazes on seagrass

Down

1. Process that plants use to create energy from the Sun
3. Seagrasses are primary _____ in the food web
4. Contamination that comes from runoff, dumping and littering
5. Grass-like flowering plants that grow in salty or brackish water
6. Type of reproduction that occurs when send out root-like Rhizomes
8. Highly productive ecosystem formed by marine flowering plants
9. This reptile is an herbivore that loves to graze on seagrass
11. Seagrass meadows have enormous _____ value because they contribute to the commercial fishing industry