



Reducing Marine Debris in Florida Keys National Marine Sanctuary

Lesson Specifications

Age

8 – 12

Timeframe

2 – 4 hours

Materials

Lesson:

- Computer and projector with screen or flipchart
- Habitat cards
- Habitat description cards
- Degradation time cards
- Marine debris cards

Scuba:

- All primary scuba gear
- Gloves
- Marine debris collection bag
- Marine debris (plastic bottles, bags, cans, fishing gear, etc.)

Key Words

Ecosystem, coral reef, sea grass, mangrove, marine debris, degrade

Standards

Ocean Literacy Principles 1, 5, 6



An aerial photo of a coral reef in Florida Keys National Marine Sanctuary. Photo: NOAA

Activity Summary

This lesson introduces students to Florida Keys National Marine Sanctuary and three habitats that can be found there. Students will learn about mangroves, seagrass beds, and coral reefs, and form an understanding of how these habitats are connected in the Florida Keys Coral reef ecosystem. They will also learn about the impact of marine debris on the ecosystem and what they can do to help.

Learning Objectives

Upon completion of this lesson, students will be able to:

- Identify three habitats within Florida Keys National Marine Sanctuary and demonstrate an understanding of how these habitats are interconnected.
- Identify two types of marine debris that affect Florida Keys National Marine Sanctuary.
- Identify two safety hazards marine debris creates in the dive environment.
- Demonstrate at least one method for safely identifying and removing marine debris.

Essential Questions

1. What habitats are represented within Florida Keys National Marine Sanctuary? How are these habitats interconnected?
2. What types of marine debris impact Florida Keys National Marine Sanctuary? How does marine debris impact the habitats in this environment?

National Marine Sanctuary Diver Performance Requirements

At the surface, students will:

- Streamline gear prior to entry.
- Demonstrate proper descent techniques and awareness of the environment.

Underwater, students will:

- Find and identify (using hand signals) two separate types of marine debris.
- Assess safety for marine debris removal.
- Demonstrate a technique for safely removing marine debris.



A map of the National Marine Sanctuary System in the U.S. and its territories.

Background Information

Florida Keys National Marine Sanctuary (FKNMS) is one of the marine protected areas in the National Marine Sanctuary system. These special underwater places are protected for their biological, ecological, and cultural significance.

The sanctuary, covering 2,900 square nautical miles surrounding the Florida Keys, protects North America's only coral barrier reef system. Within the boundaries of the sanctuary lie spectacular and unique marine resources including the world's third largest barrier reef, extensive seagrass beds, mangrove-fringed islands and more than 6,000 species of marine life. The sanctuary also protects pieces of our nation's history such as shipwrecks and other archeological treasures.

Three important habitats within Florida Keys National Marine Sanctuary, mangrove forests, seagrass meadows, and coral reefs work together to keep this ecosystem healthy and vibrant. The approximately 1,700 mangrove-fringed islands of the Keys provide important nursery habitat for many young fish and invertebrates, including recreational and commercial species. Mangroves also provide important nesting and roosting habitat for pelicans, herons and other birds. Expansive seagrass meadows support an array of marine life and serve as feeding grounds for reef fish and spiny lobsters. The sanctuary also includes the world's third largest barrier reef made from living coral, which provides homes to fish and countless other marine life.

Unfortunately, human impacts, such as marine debris, are threatening the health of these essential habitats. Our ocean is filled with man-



A seagrass bed in Florida Keys National Marine Sanctuary. Photo: NOAA

made materials that do not belong there. Plastic, rubber, metal, derelict fishing gear and abandoned vessels pose a direct threat to the health of the fragile ecosystems within Florida Keys National Marine Sanctuary and the larger ocean. Abandoned fishing and trap line can get tangled around corals. Storms move spiny lobster and stone crab traps around on the seafloor and they can end up on top of coral and other living marine life. Fishing line and plastic can cause injuries to marine animals if they become entangled or mistake this man-made material for food. Marine debris also threatens the navigation safety of recreational vessels and ships, the economy, and human health.

The most important thing to remember about marine debris is that it is *preventable*. We can each do our part by reducing our waste, using reusable products, participating in beach and watershed clean-ups, and more! Dive shops in the Florida Keys can also participate in the Blue Star certification program. Blue Star is a program established by Florida Keys National Marine Sanctuary that recognizes tour operators who are committed to promoting responsible and sustainable diving and snorkeling practices to reduce the impact of these activities on coral reefs in the Florida Keys.

Vocabulary	
Ecosystem	All the living things in a given area interacting with each other and their environment.
Coral reef	An ocean ecosystem made up of many small animals called corals. It creates homes for many ocean creatures.
Sea grass	A flowering plant that grows on the ocean floor in shallow water.
Mangrove	Trees or bushes that grow in thick clusters along seashores and river banks.
Marine debris	Man-made litter that ends up in the ocean or other large bodies of water.
Degrade	To break down or decompose.

Preparation – Classroom

Before the activity, instructors should print and laminate the provided materials, including the habitat cards, description cards, time to degradation cards, and marine debris cards.

Procedure

Introduction

1. Use the provided PowerPoint to introduce students to Florida Keys National Marine Sanctuary and marine debris.
2. Take students on a virtual dive in Florida Keys National Marine Sanctuary by visiting <https://sanctuaries.noaa.gov/vr/>
 - Ask students: What do you notice? What types of habitats do you see? Do you notice any marine debris?

Activity: Giant Matching Game

1. Place students in groups of 2-4. Give each a set of group cards (included in lesson materials) with photos of three habitats represented in Florida Keys National Marine Sanctuary (mangrove, seagrass meadows, coral reef).
2. The instructor will pick a description card and read a sentence that describes one of the three habitats (ex: This habitat is often described as a bustling city. Many marine creatures spend their lives here.)
3. Students will hold up the habitat card that corresponds with the statement. (ex: coral reef)

Activity: Marine Debris Sorting Race

1. Break students into two teams. Provide each team with one set of “Degradation Time” and one set of “Marine Debris” cards.
1. Give students 3-5 minutes to match each marine debris item with the time they think it will take to degrade.

2. Review the answers with the students.
3. Gather students and discuss ways to prevent marine debris using discussion questions below.

Discussion Questions

Upon completion of the classroom lesson, assess for student understanding by asking the following questions (*possible answers in italics*).

- How can marine debris impact marine habitats? *It can damage coral and seagrass, animals can eat it, and it can pose safety threats ships.*
- What can you do in your community to prevent marine debris? *Refuse, reduce, reuse, repurpose, recycle, and rot (compost). Participate in beach clean-ups, share your knowledge with your community.*

Preparation – Pool Mission

Students will:

- Practice dive skills while meeting diving performance requirements and sanctuary learning objectives.

To participate in the confined water marine debris clean-up dive, students will need gloves and a mesh bag to remove marine debris.

Prior to the mission, the instructor will set up the underwater environment in the pool. This will include placing marine debris items at the bottom of the pool. Remember to reuse these items! Suggested items include: six-pack rings, plastic straws, balloons, plastic bottles, bottle caps, cans, flip flops, beach toys, plastic grocery bags, clothing, etc.

Procedure

1. Before entering the water for the pool dive, review safe practices for marine debris removal and allow students to practice methods for safely identifying and removing marine debris.

Safe practices for marine debris removal:

- Safety first! Follow all safe diving practices.
- Only dive within your training and experience. Always dive with a buddy and consider having a safety diver on standby.
- Check that you and your buddy are properly weighted and that all gear is streamlined. Practice proper buoyancy throughout the dive.

- Plan and assign dive roles. Buddy A will carry the mesh bag and buddy B will remove the marine debris and place it in the mesh bag.
 - Survey your site and note any potential hazards before you begin removal.
 - Do not overfill your mesh bag. Never lift heavy objects without proper training. Mesh bags should never exceed 5 lbs.
 - Before removing marine debris consider the safety of all divers. Never remove marine debris that could be hazardous.
 - Marine life can grow quickly on marine debris and animals use it as homes. If marine debris has considerable life growing on it, consider leaving it in place.
2. Prior to pool entry, buddy teams will review dive signals that will be used to identify each habitat as well as indicate if it is healthy or unhealthy.
 3. After completing all dive industry performance requirements students will spend time diving and identifying habitats.
 4. Underwater buddy teams will search for marine debris in each of the habitats.
 5. Students will work with a buddy and use appropriate diving techniques to safely remove marine debris from the underwater habitats. This includes assessing the site for hazards, deciding if the debris should be removed, using gloves to remove debris and placing it in mesh bags, and maintaining proper buoyancy and trim.
 6. After the clean-up, students will fill out the Debris Datasheet to report on the various categories and quantities of debris found.

Discussion Questions and Wrap Up

Upon completion of the pool mission, assess student understanding by asking the following questions. (possible answers in italics)

- What habitats did you see underwater? *Seagrass meadows, coral reefs, mangrove forests*
- What marine debris did you locate? *Answers will vary depending on the debris the instructor places underwater.*
- What are some dive safety hazards posed by marine debris? *Entanglement, puncture wounds...*
- What are some ways to safely remove marine debris from underwater habitats? *Use gloves, never lift heavy objects, never remove marine debris that could be hazardous.*
- What can we do to prevent marine debris? *Refuse, reduce, reuse, repurpose, recycle, and rot (compost). Participate in beach clean-ups, share your knowledge with your community .*

Education Standards	
Dive Industry Standards	This lesson could be paired with: PADI Seal Team: Environmental Specialist SSI Scuba Ranger: Search Ranger NAUI Junior Scuba Ranger or Passport Diver
Ocean Literacy Principles	1: The Earth has one big ocean with many features. 5: The ocean supports a great diversity of life and ecosystems. 6: The ocean and humans are inextricably interconnected.

Additional Resources

NOAA's Office of National Marine Sanctuaries This site contains information on each of the sites in the National Marine Sanctuary System. <https://sanctuaries.noaa.gov/>

Florida Keys National Marine Sanctuary This site will provide background on Florida Keys National Marine Sanctuary, ways people can visit, and the work they are doing. <https://floridakeys.noaa.gov/>

Blue Star This site will provide background on the Blue Star certification Program. <https://floridakeys.noaa.gov/onthewater/bluestar.html>

NOAA Marine Debris Program This site will provide more information on marine debris, how it impacts our ocean, and initiatives that NOAA is undertaking to combat marine debris. <https://marinedebris.noaa.gov/>

Marine Debris in the Florida Keys This site outlines marine debris impacts on the Florida Keys National Marine Sanctuaries. <https://floridakeys.noaa.gov/scisummaries/marinedebris2013.pdf>

Ocean and Climate Literacy Principals The ocean and climate literacy principals outline the key facts that an ocean and climate-literate person should understand. <https://oceanservice.noaa.gov/education/literacy.html>

Project Aware Clean Up Dive Guidelines This guide outlines the steps dive shops should consider if they are planning on conducting a clean-up dive. http://www.projectaware.org/sites/default/files/DiveAgainstDebrisSurveyGuide_Vs2.1.pdf

For More Information

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