



Project AWARE





Project AWARE Specialty Program Instructor Guide

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**Visit projectaware.org
to learn what you can do
to conserve underwater
environments.**

Introduction

This section includes suggestions on how to use this guide, an overview of program philosophy and goals, a flow chart to show you how program components and materials work together for success, and ways you can organize and integrate student learning.

How to Use this Guide

This guide speaks to *you*, the PADI Instructor. The guide contains two sections – the first contains standards specific to this program and the second contains knowledge development presentations. All required standards, learning objectives, activities, and performance requirements specific to the Project AWARE Specialty program appear in **boldface** print. **The boldface assists you in easily identifying those requirements that you *must* adhere to when you conduct the program.** Items not in boldface print are recommendations for your information and consideration. General course standards applicable to *all* PADI courses are located in the General Standards and Procedures section of your PADI *Instructor Manual*.

Course Philosophy

The Project AWARE Specialty program is a nondiving program designed to familiarize divers and nondivers with the plight of aquatic ecosystems around the world. It also describes what individuals can do to help protect aquatic resources. Thus, the goals of this course are to familiarize participants with:

- The role Project AWARE Foundation plays in protecting aquatic ecosystems worldwide.
- The importance, and the interdependent nature, of aquatic ecosystems.
- The pertinent issues concerning the environmental status of underwater environments, such as pollution, fisheries and coastal zone management.
- Information needed to take specific actions to help conserve underwater environments.

Course Flow

Conduct the Project AWARE Specialty program as follows:

- Ask participants to read the *AWARE – Our World, Our Water* publication available for download from projectaware.org.
- Have participants watch, either on their own or with you, all or selected Project AWARE Public Service Announcements and/or the Protect the Living Reef video – found on the Project AWARE website (www.projectaware.org) – depending on their interest.
- Provide participants with the Project AWARE Knowledge Review (available in the *AWARE – Our World, Our Water* publication or Appendix of this guide) and ask them to look for answers to the questions as you elaborate.
- Conclude by going over the completed Knowledge Reviews. Clarify information as necessary for understanding.

Section One:

Course Standards

This section includes the course standards, recommendations, and suggestions for conducting the Project AWARE Specialty program.

Standards at a Glance

Topic	Course Standards	
Minimum Instructor Rating	PADI Instructor or Assistant Instructor	
Prerequisites	Interest in the aquatic world	
Minimum Age	None	
Ratios	Not applicable	
Hours	Recommended: 2	
Materials	Instructor: <i>Project AWARE Specialty Program Instructor Guide</i>	Student Divers: <i>AWARE – Our World, Our Water</i>

Instructor Prerequisites

To qualify to teach the Project AWARE Specialty program, an individual must be a Teaching status PADI Assistant Instructor, Open Water Scuba Instructor or higher.

Participant Prerequisites

Participants only need to have an interest in the aquatic world to enroll in the course. There is no minimum age or experience requirement.

Materials

Instructor Materials

Use the Project AWARE Specialty program materials prescriptively to accommodate various sequencing preferences and teaching and learning styles.

Required

- *Project AWARE Specialty Program Instructor Guide*

Recommended

- Project AWARE Certificate of Recognition
- Project AWARE decal
- *AWARE – Our World, Our Water*
- AWARE Ten Ways a Diver Can Protect the Underwater Environment
- AWARE Ten Tips for Underwater Photographers
- *The Encyclopedia of Recreational Diving*
- Project AWARE Public Service Announcements
- *Life on an Ocean Planet* (ask your PADI Sales department for availability)

Note: Some items are in the Appendix of this guide or available for download from projectaware.org

Participant Materials.**Recommended**

- *AWARE – Our World, Our Water*
- AWARE Ten Ways a Diver can Protect Underwater Environment
- AWARE Ten Tips for Underwater Photographers
- *The Encyclopedia of Recreational Diving*
- *Life on an Ocean Planet* (ask your PADI Sales department for availability)

Assessment Standards

To assess knowledge you may review the Project AWARE Knowledge Reviews with participants.

Certification and Recognition Procedures

Participants may receive either a Project AWARE Specialty certification card or a Project AWARE Certificate of Recognition or both. When teaching this course to scuba divers, Project AWARE Specialty certification acknowledges participants achievement and brings them a step closer towards Master Scuba Diver rating. It's recommended that you encourage participants to choose a Project AWARE version of the PADI certification card (rather than the standard certification card) by donating to the Project AWARE Foundation. When teaching non divers, Project AWARE Certificate of Recognition can serve as an acknowledgement.

Links to Other Courses

Other PADI programs teach the skills and emphasize practical application of environmentally sound diving and snorkeling techniques. Although you may offer the Project AWARE Specialty program as a stand-alone program it's strongly

recommended that you combine it with another PADI program based on participant needs and desires. Here are a few suggestions:

- **Peak Performance Buoyancy Specialty Diver Course**

For certified divers – have participants watch the *Peak Performance Buoyancy* video and read the associated booklet. Incorporate a review of their completed Peak Performance Buoyancy Knowledge Reviews with the Project AWARE knowledge development session. During the Peak Performance Buoyancy specialty dives, emphasize streamlining equipment and body awareness around sensitive environments, such as coral reefs. This allows divers to apply knowledge and skills while earning two specialty certifications – Project AWARE and Peak Performance Buoyancy.

- **Peak Performance Buoyancy Clinic**

For certified divers, when completing open water dives is not practical – have participants watch the *Peak Performance Buoyancy* video. After completing the Project AWARE knowledge development session, schedule a confined water dive. Use the Peak Performance Buoyancy Specialty outline – Dive One guidelines for conducting a buoyancy clinic. Emphasize streamlining equipment and body awareness around sensitive environments, such as coral reefs. In addition to their Project AWARE specialty certification, recognize divers who complete the clinic with a Project AWARE certificate.

- **AWARE – Fish Identification, Underwater Naturalist or Digital Underwater Photographer Specialty Diver Courses**

For certified divers, integrate the Project AWARE knowledge development session into the specialty diver course. During specialty dives, emphasize proper buoyancy control, streamlining equipment and body awareness around sensitive environments, such as coral reefs. This allows divers to apply knowledge and skills while earning two specialty certifications. For individuals (divers or snorkelers) undertaking the PADI Digital Underwater Photography and/or Underwater Videography Specialty Course expand on how underwater image makers can use their photos or videos for conservation.

- **PADI Skin Diver Course and Discover Snorkeling**

For skin divers and snorkelers, integrate the Project AWARE knowledge development session into the program. Skin diver students may earn a PADI Skin Diver certification and Project AWARE specialty certification. In addition to their Project AWARE specialty certification, recognize Discover Snorkeling participants with a Project AWARE certificate.

- **AWARE – Coral Reef Conservation Specialty Course**

For all environmental enthusiasts – expand the coral reef section of the Project AWARE Specialty by integrating the AWARE - Coral Reef Conservation knowledge development session. Encourage participants to apply their knowledge by participating in coral reef monitoring such as CoralWatch, shoreline and

underwater cleanups and other environmental activities, and by getting involved with conservation organizations. This promotes awareness and encourages ongoing participation by allowing participants to earn two nondiving specialty certifications.

- **PADI AI Course / IDC**

Course Directors / IDC Staff Instructors conducting the programs may choose to have the candidates complete the Knowledge Reviews and review those prescriptively. This will add valuable environmental knowledge to the program, and will create AI / Instructor Candidates who are better prepared to teach the Project AWARE Program. Course Directors / IDC Staff Instructors can also include presentations from the Project AWARE Program into Knowledge Development teaching assignments.

Community Outreach Tool

You can use the Project AWARE Specialty program as a community outreach tool that also helps you attract and retain customers.

You may use the program to:

1. Present information on environmental awareness to community groups and schools.
2. Recruit volunteers for your conservation activities, such as beach and underwater cleanups, coral reef monitoring, etc.
3. Recruit nondivers and divers into other programs within the dive center or resort.
4. Demonstrate that the PADI organization and its members not only teach people how to dive but also how to take responsibility for the aquatic environment.
5. Protect the dive industry's future by educating divers and nondivers about the plight of the aquatic realm.
6. Keep people interested in diving during winter months or other times when participating in dive activities may be impractical in the local area.
7. Raise awareness and inspire nondivers and divers to take action.
8. Expand the curriculum when conducting PADI courses at universities and colleges.

Section Two:

Knowledge Development

The philosophy of this program is to introduce divers and nondivers to the Project AWARE conservation ethic. This means to introduce participants to Project AWARE Foundation, expand their knowledge about the plight of underwater environments around the world and to emphasize the role divers and nondivers can play in conserving underwater environments.

Participants study independently by reading the *AWARE – Our World Our Water* publication, available at projectaware.org for download. Use the publication to clarify and address prescriptively any participant misconceptions and to enhance learning tailored to the local dive environment and individual interest. Use the following teaching outline, which appears in point form, as a road map for conduct, content, sequence and structure of the Project AWARE Specialty program.

In the end, you should have equipped participants with basic knowledge needed to support conservation of underwater environments. **Regardless of how you conduct knowledge development, after completing the program that results in a PADI certification, participants will be able to explain the following learning objectives.**

Knowledge Development

Learning Objectives

By the end of knowledge development, participants will be able to explain:

About Project AWARE Foundation

- **Why are divers and snorkelers the natural ambassadors for the aquatic environment?**
- **What is the Project AWARE Foundation?**
- **What steps is Project AWARE Foundation taking to protect the aquatic world in partnership with PADI?**

The Aquatic World

- **How is all water on earth ultimately connected?**
- **How does the ocean compare to land in terms of size, area, living space and temperature?**
- **What are the two primary types of freshwater ecosystems found on the surface of the Earth and what distinguishes them?**

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- **What are the two primary ocean zones and what distinguishes them?**
- **What is the average mineral (salt) composition of the ocean, and where does it come from?**
- **What is the base of the marine food chain, and why are some areas much more productive than others?**

Coral Reefs

- **Why would the term biotic reef be a more descriptive name for coral reef?**
- **Why coral reefs are important and what benefits do they provide?**
- **What is the current status of the world's coral reefs?**
- **What are the major threats to coral reefs?**

Aquatic Resources in Peril: Pollution

- **What are the sources of pollution entering the ocean?**
- **What is the largest source of oil pollution in the ocean, and what are some of the consequences of this pollution in the marine environment?**
- **What effects do organic matter, solid wastes, plastics, heat effluent, discarded munitions and the introduction of alien species have on the aquatic environment?**
- **What key international legal measure regulates the intentional pollution of marine environment by oils and other harmful discharge from ships?**

Aquatic Resources in Peril: Mismanaged Fisheries

- **Why are many marine fisheries near collapse?**
- **What are some of today's most destructive fishing practices?**
- **What can you do to support sustainable fisheries?**

Aquatic Resources in Peril: Degraded Coastal Zones

- **Why are coastal zones important?**
- **Why are wetlands so important?**
- **What pressures contribute to the destruction of wetlands?**

Troubled Waters

- **What are the six most environmentally threatened marine regions of the world?**
- **What factors or conditions make these regions so threatened?**

Your Role in Protecting Underwater Environments

- **What are the "Ten Ways a Diver Can Protect Underwater Environments"?**
- **How can you get involved in conservation activities?**

Knowledge Development

Teaching Outline

Suggestions to you, the PADI Instructor, appear in note boxes.

Note:

Prior to teaching the course, make sure that you and your students download the most recent version of AWARE – Our World, Our Water from projectaware.org

A. Program Introduction

1. Staff and participant introductions

Note:

Introduce yourself and assistants. Explain why you offer the program and your involvement in conservation of underwater environments if participants are not familiar with you.

Have divers introduce themselves and explain why they are interested in this program. Break the ice and encourage a relaxed atmosphere.

Give times, dates and locations as appropriate for any other activities you have planned in association with this program such as cleanup, coral reef monitoring, AWARE Kids mission, etc.

As applicable, review with participants knowledge and skills useful to Project AWARE Specialty such as those gained in PADI Underwater Naturalist, Peak Performance Buoyancy, Digital Underwater Photographer, AWARE - Coral Reef Conservation courses, etc.

2. Program goals – this program will help you:
 - a. Understand the role Project AWARE Foundation plays in protecting aquatic ecosystems worldwide.
 - b. Appreciate the importance of, and the interdependent nature of, aquatic ecosystems worldwide.
 - c. Grasp the pertinent issues concerning the environmental status of underwater environments, such as pollution, fisheries and coastal zone management.
 - d. Take specific actions to help conserve underwater environments around the world.
3. Program overview — classroom presentations
4. Certification
 - a. Upon successfully completing the program, you will receive the nondiving PADI Project AWARE Specialty certification or a Project AWARE Certificate of Recognition or both.

- b. Certification means that you will be qualified to apply for the Master Scuba Diver rating if you are a PADI Advanced Open Water Diver and a PADI Rescue Diver (or qualifying certification from another training organization) with certification in four other PADI Specialty ratings, and you have 50 logged dives.

Note:

Use the PADI Student Record File. Explain all program costs and materials, and what the costs do and do not include. Cover and review points about scheduling and attendance.

5. Class requirements
 - a. Complete paperwork.
 - b. Program costs.
 - c. Materials needs.
 - d. Schedule and attendance.

B. About Project AWARE Foundation**• Why are divers and snorkelers the natural ambassadors for the aquatic environment?**

1. Noticing both short and long term changes in the aquatic realm, be it marine or freshwater, is unavoidable for people who regularly put on masks and venture underwater.
2. Because of intimate familiarity with the underwater world, divers and snorkelers are the natural ambassadors for the aquatic environment. Today they are some of the strongest supporters of programs and initiatives such as:
 - a. Volunteer monitoring.
 - b. Underwater and beach cleanups.
 - c. Marine parks and protected areas.
 - d. Legislative actions to support sustainable fisheries and protect endangered habitats and species.
3. In 1989 PADI introduced Project AWARE (Aquatic World Awareness, Responsibility and Education) as an environmental ethic campaign to harness each diver's potential as an advocate and protector of the underwater environments.

• What is the Project AWARE Foundation?

4. What began as an environmental ethic quickly formed into the Project AWARE Foundation, a registered, nonprofit organization that involves divers and water enthusiasts in projects and activities to conserve underwater environments. The Foundation also supports research, education and conservation projects through its established grant program.

5. Since the nonprofit designation in 1992, Project AWARE has created an international presence with offices in Australia, Japan, the United Kingdom, and Switzerland.
6. You can join the team of environmental divers and contribute to conservation by becoming a Project AWARE Patron.
 - a. Project AWARE Patrons take action for the underwater environment and their donations support conservation and data collection initiatives.
 - b. All patrons receive a subscription to Project AWARE's email newsletter containing information about conservation activities and action alerts from around the world related to the underwater environment.
7. Through Project AWARE, thousands of people worldwide are exposed to environmental awareness through interactions with PADI Professionals. For the most up-to-date information, visit Project AWARE Foundation online at projectaware.org

Note:

If time permits, take this opportunity to visit the Project AWARE Foundation website with program participants. Guide them to find upcoming volunteer and other action opportunities such as coral reef monitoring, cleanups, AWARE Kids activities, etc.

- **What is Project AWARE's mission and purpose?**

8. Project AWARE is dedicated to conserving underwater environments through education, advocacy and action.
 - a. Project AWARE partners with divers and water enthusiasts to protect aquatic environments around the world.
 - b. Project AWARE involves divers and nondivers in environmental projects, activities and campaigns working toward global conservation solutions.

- **What steps is the Project AWARE Foundation taking to protect the aquatic world in partnership with PADI?**

9. Project AWARE Foundation:
 - a. Emphasizes environmentally sound approaches to dive practices, dive operations and dive skills. These include: mooring buoy use, responsible boating and diving practices, buoyancy control, proper techniques and equipment placement for underwater photography, responsible wreck diving guidelines and dive training programs including this program.
 - b. Implements initiatives to expand diver participation in conservation activities and data collection including global underwater cleanups, coral reef monitoring, shark sightings and identification, environmental education and advocacy.
 - c. Empowers children to get involved in environmental solutions through its AWARE Kids program.

- d. Advocates implementation of sustainable business practices and extends financial support for aquatic environmental projects, public education and outreach programs, and research.

C. The Aquatic World

- **How is all water on earth ultimately connected?**

Note:

Flip a globe upside down or take the earth for a spin in Google™ Earth to show participants how all water on Earth is connected.

1. With over 70 percent of the earth's surface covered by water, Earth is clearly the water planet, and all water on it – be it fresh or salt, in liquid, vapor or ice state – is ultimately connected through the hydrologic (water) cycle. While the majority of us learn that there are five oceans and an array of seas, in reality, there really is only one ocean.
- **How do aquatic regions compare to land regions in terms of size, area, living space and temperature?**
2. The ocean covers over two-thirds of the Earth's surface, comprises 99 percent of its living space and contains 97 percent of its water. The remaining three percent of earth's water is split between the two percent held frozen in glaciers and ice caps and the one percent flowing in rivers, lakes and underground reservoirs. The ocean accounts for an area of over 361 million square kilometres/139 million square miles, and a volume of about 1.3 billion cubic kilometres/310 billion cubic miles.
 - a. The Pacific alone is 25 percent larger than all of earth's land surfaces combined.
 - b. The average depth of the ocean is about 3.8 kilometers/2.4 miles
 - c. The Mid-Ocean Ridge is the Earth's longest mountain range. At 16,000 km/10000 miles, it is four times longer than the Andes, Rockies, and Himalayas combined. It winds around the globe from the Arctic Ocean to the Atlantic skirting Africa, Asia and Australia-and crosses the Pacific to the west coast of North America.
 3. While we may think of the ocean as mildly cold to warm, its average temperature is actually a bone-chilling 3.5° Celsius/38.3° Fahrenheit. Ocean temperatures range from below 0° Celsius/32° Fahrenheit in Arctic regions (dissolved salts prevent ocean from freezing) to 37° Celsius/98.6° Fahrenheit in the Persian Gulf.
- **What are the two primary types of freshwater ecosystems found on the surface of the Earth and what distinguishes them?**
4. Surface water amounts to only a third of one percent of the Earth's water yet freshwater ecosystems are varied and vitally important regions.

5. Lentic ecosystems, such as lakes and ponds, are inland depressions with standing water formed through glacial erosion and depositions, rock and debris accumulation blocking streams or by earth movement that caused land to sink and flood.
 - a. Lentic environments are divided into:
 1. The littoral zone – the area near a lake margin where light can penetrate to the bottom and rooted plants can grow.
 2. The limnetic zone – open water where plankton and fish thrive.
 3. The profundal zone – area below the depth of effective light penetration.
 4. The benthic zone – the bottom of the lake or pond.
 - b. Temperature heavily influences most lentic environments because the amount of sunlight entering the water varies seasonally.
 1. During summer, sun heats up the surface layer. This warm, less dense, surface water floats atop colder, denser, deeper water. Two distinctly different, non mixing, layers of water become established, separated by a steep drop in temperature: a thermocline.
 2. In the fall, the surface layer cools off and eventually mixing occurs as wind churns the waters. The cycle repeats again in the spring.
6. Lotic ecosystems are running water habitats, such as rivers and streams. These environments are subject to constant change and require a continuous supply of nutrients from land-based sources.

- **What are the two primary ocean zones and what distinguishes them?**

7. The ocean is comprised of two zones:
 - a. The photic zone: the depth to which light can penetrate sufficiently to enable photosynthesis. It varies from only a few metres/feet in extremely turbid coastal water to a maximum of about 200 metres/650 feet in clear open ocean.
 - b. The aphotic zone: the zone of perpetual darkness below the photic zone which accounts for more than 99 percent of the ocean.

- **What is the average mineral (salt) composition of the ocean, and where does it come from?**

8. On average, seawater contains about 3.5 percent dissolved inorganic material (salts) made up of all the elements and components comprising the Earth's crust.
 - a. Rivers are the major sources of dissolved elements, discharging 16 billion metric tonnes/18 billion tons a year of sediment that carry an estimated 3.2 billion metric tonnes/4 billion tons of dissolved salts.

- b. The Yellow River of China deposits the most (1.6 billion metric tonnes/1.8 billion tons annually) with the Ganges a close second (1.3 billion metric tonnes/1.4 billion tons).
- **What is the base of the marine food chain, and why are some areas much more productive than others?**
9. At the base of any food chain are primary producers: organisms that make their own food, primarily through photosynthesis. On land plants are the primary producers, in the ocean phytoplankton play that role. These organisms can survive only in the photic zone. Their nutrient supply is controlled by water circulation.
 - a. The areas of coastal upwelling on the west coast of North America, South America and West Africa – where dense, cooler, and usually nutrient-rich water is driven towards the ocean surface, replacing the warmer, usually nutrient-depleted surface water – are especially rich in nutrients. This wealth of nutrients accounts for extremely high productivity of those areas.
 - b. Due to proximity to nutrient input, coastal waters generally have high organic production.
 - c. Antarctic, Arctic and some equatorial waters are moderately productive because water is mixed by currents and winds.

D. Coral Reefs

- **Why would the term biotic reef be a more descriptive name for coral reef?**
1. The term coral reef often does not do justice to the complexity of the coral reef ecosystem. Some suggest the term biotic reef – reef created by biological processes – as a more illustrative and accurate way of describing coral reefs.
 - a. Coral polyps are animals that form colonies. In shallow, tropical waters these corals build reefs by secreting an internal, hard skeletal structure composed of calcium carbonate. Most reef-building corals have symbiotic relationships with algae called zooxanthellae living inside the coral tissue. The algae provide the coral with energy from photosynthesis and use the coral's waste products in exchange for shelter.
 - b. Coral reefs are some of the most extensive shallow marine communities on earth, and are estimated to cover about 284,300 square km/110,000 square miles worldwide. Yet, that's about one tenth of one percent of the total sea bottom or an area the size of Ecuador or the state of Nevada, USA.
- **Why are coral reefs important and what benefits do they provide?**
2. Coral reefs are home to about 25 percent of all known marine species and are used by countless other species at some point in their life cycle. Coral reefs are among the most biologically diverse and productive communities, often referred to as the rain forests of the sea.

3. People benefit from the resources and processes provided by coral reef ecosystems – these ecosystem services include provision of food, income, and protection of coasts from storms. Half a billion people depend on reefs for food and income and about 30 million of us are almost completely dependent on coral reefs.
 - a. Coral reefs attract tourists, which boosts local economies.
 1. Tourism is the world's largest industry and sustains 10 percent of all jobs.
 2. The economic potential of tourism greatly overshadows that of fishing. One year of world tourism revenue is around 25 times greater than the world's marine fisheries revenue.
 3. In some areas, a single square kilometre of coral reef can generate nearly three million dollars in tourism revenue (and between a \$100,000-600,000 US in goods and services a year). The same square kilometer dynamited for fishing yields a one-time income of \$15,000 US.
 4. Coral reef tourism can bring benefits to the local area but it must be well planned and sustainably managed.
 - b. One-sixth of the world's coastlines is protected by coral reefs.
 1. Coral reefs act as coastal barriers protecting islands and coastal communities from storms, wave damage and erosion. Coral reefs act as coastal barriers protecting islands and coastal communities from storms, wave damage and erosion.
 2. Low-lying islands in the tropics owe their existence to coral reefs that absorb incoming wave energy. Corals and mangroves absorb up to 90 percent of the wave energy.
 3. Following the degradation of the natural reef, the estimated cost of installing artificial breakwater around Malé, Maldives, was \$10,000 US per square metre/yard. Estimated costs of protecting coral reefs through management of marine protected areas, is only \$0.77 US per square metre/yard per year.
- **What is the current status of the world's coral reefs?**
 4. In 1998, World Resource Institute estimated that 58 percent of the remaining coral reefs were at immediate risk of destruction from human activities.
 - a. South and Southeast Asia, East Africa and Caribbean reefs are at the greatest risk. In places like the Philippines, Indonesia and Jamaica, the majority of the reefs are seriously damaged or dead.
 5. In 2000, research showed that 11 percent of the world's coral reefs were degraded beyond recovery; and by 2004, 20 percent of reefs were declared dead, in part due to raised sea surface temperatures that caused major bleaching events.
 6. The 2008 Status of the Coral Reefs reported that 19 percent of coral reefs were effectively lost. (Scientists attribute the 1 percent difference in coral loss since the last assessment to a strong recovery of reefs in the Pacific following the major

bleaching events of 2005). Another 35 percent of coral reefs is in a critical or threatened state with a loss predicted in the next 10 to 40 years.

- **What are the major threats to coral reefs?**

7. The reasons for coral reef decline are both global and local and include both anthropogenic (human-induced) and natural factors.
 - a. Globally, climate change is the most devastating human-induced threat to reefs.
 1. Climate change, caused by increased CO₂ emissions, leads to increases in ocean temperatures, which causes coral bleaching and ocean acidification, a decrease in oceans pH, which reduces coral's ability to secrete its limestone skeleton.
 - a. The 2008 Status of Coral Reefs Report warns that unless we act now, we may have 8 to 10 years before climate change begins to devastate the reefs as we know them.
 - b. Local threats include:
 1. Overfishing - disrupts the ecological balance by eliminating top predators and/or herbivorous fishes that keep algae growth, the major coral competitor on the reef, under control.
 - a. Destructive fishing methods such as the use of dynamite and cyanide.
 2. Removal of fish, invertebrates, and other reef organisms including live rock, for the aquarium trade, souvenir industry, jewelry, etc.
 3. Land based sources of pollution, such as excess sedimentation from inland erosion, especially in areas near large rivers and estuaries, fertilizers, pesticides and chemicals pollution, and eutrophication (excess nutrient input) from sewage.
 4. Overpopulation and overdevelopment of coastal areas leading to increase sedimentation, excessive nutrient inputs and habitat degradation.
 5. Anchor and collision damage by large ships.
 - c. Natural threats to reefs include.
 1. Severe storms and hurricanes that can destroy the reef framework.
 2. Earthquakes, such as the 26 December 2004 quake that caused the tsunami in the Indian Ocean.
 3. Bioerosion is a natural and integral process to reef formation. But, when it outpaces reef growth, it can lead to a collapse of a reef structure.

E. Aquatic Resources in Peril: Pollution

- **What are the sources of pollution entering the ocean?**

Note:

Note up-to-date information for your local area regarding pollution in the instructor outline below. Depending upon program requirements, you may also ask program participants to research local aquatic pollution issues for a home-study assignment.

Facilitate this discussion by listing participants' responses on a board. This exercise will help them to think about the pollution of aquatic environments (what they know, what they don't know, and what they'd like to know).

Regardless of your instructional approach, review with participants the major sources of pollution listed below.

1. The ocean is not only a major source of food, but also the passive recipient of enormous amounts of wastes:
 - a. Forty-four percent of marine pollution enters the ocean via agricultural and industrial runoff.
 - b. Thirty-three percent of marine pollution propellants (hydrocarbons and biocides) enters the ocean via atmospheric deposition from rain and snow.
 - c. Twelve percent of marine pollution enters the ocean through maritime accidents, or ships dumping bilge water, ballast water and garbage.
 - d. Ten percent of marine pollution enters the ocean via dumping of industrial, municipal or agricultural wastes and dredge spoils.
 - e. About one percent comes from other sources, offshore mining.
2. Pollutants can remain in the ocean, be returned to the atmosphere, be ingested, or dissolve. Ocean currents carry them to the most remote areas of the earth. Heavy metals, pesticides and others are now detectable in the waters of Antarctica and have bioaccumulated in the bodies of top predators such as sharks or polar bears.
- **What is the largest source of oil pollution in the sea, and what are some of the consequences of this pollution in the marine environment?**
3. Approximately 1.3 million metric tonnes/380 million gallons of petroleum products enter the oceans every year, with only about five percent accounted for by oil spills. The Exxon Valdez oil spill, the largest in history, contributed 41.6 million litres/11 million US gallons, or just over 3% of the petroleum that makes its way to the ocean every day.
 - a. Petroleum products can be degraded by bacteria and fungi, and either dissolve, sink, form tar balls or a surface film.
 - b. Spilled oil must be prevented from reaching land, where cleanup is much more expensive and less effective.
4. Consequences of oil pollution in the ocean
 - a. Seabirds drown or die of hypothermia due to loss of thermal insulation and buoyancy. Oil destroys water repellency of plumage, allowing water

- to penetrate. Ingested oil causes intestinal, renal and liver disorders, and can kill embryos if eggshells are permeated.
- b. Mortality often occurs among marine mammals, such as seals, walrus, sea otters, etc.
 - c. Direct risk to humans is minimal because we can detect taste and odor, thus avoiding ingestion. Some hydrocarbons in oil are carcinogenic, but appear not to accumulate in edible marine organisms.
 - d. Small levels of oil in water can cause behavioral changes in marine organisms, such as anesthesia and drowsiness. Behavior in lobsters and mussels is affected by such minute amounts of oil that they may be used as early indicators of pollution.
 - e. In the case of fisheries, shellfish are most vulnerable to oil damage. Not only are beds destroyed, but even low levels of contamination produces a taint.
- **What effects do organic matter, solid wastes, plastics, heat effluent, discarded munitions and the introduction of alien species have on the aquatic environment?**
 5. Organic matter makes up the greatest volume of waste in coastal water.
 - a. Organic waste is broken down by bacteria into inorganic products such as carbon dioxide, water and ammonia, which enrich the marine system.
 - b. If organic input exceeds breakdown ability, the intense bacterial activity depletes oxygen in the water causing massive die-offs of marine life.
 - c. Sewage contains nitrates and phosphates that nourish plants and, in turn, zooplankton. But eutrophication, increase in nutrients inputs, results in overgrowth of phytoplankton and deoxygenation of water that can kill both plant and animal life.
 - d. Algal blooms are events in which estuarine, marine, or fresh water algae accumulate rapidly in the water column forming patches of phytoplankton near the surface. Blooms associated with the production of natural toxins, depletion of dissolved oxygen or other harmful impacts are generally described as harmful algal blooms (HABs).
 6. Solid wastes, such as dredging spoils are often oxygen-depleted and contaminated with metals and oils. The particulate matter in the spoil and other industrial wastes blocks photosynthesis, clogs feeding and respiratory organs in marine animals and smothers bottom-dwelling organisms.

Note:

Visit projectaware.org to get the latest facts regarding marine debris.

7. Plastic, accounting for over 80% of marine debris, is the most pervasive type of marine pollution.
 - a. It remains in the environment forever, breaking down into smaller and smaller pieces but never completely disappearing.

- b. Plastic is ingested by marine animals who mistake it for food. This blocks the digestive tract or can cause ulceration in the stomach and chemical changes in tissues.
 - c. Plastic also entraps marine life (fishing nets, six-pack rings), causing massive mortality in seals, sea turtles and many others.
8. Heat dissipated in the cooling water from power stations and factories can raise ambient water temperature above life-sustaining levels.
9. Rivers, streams and lakes are especially vulnerable to the introduction of alien species from the release of ships' bilge and ballast water:
- a. Many of these invading species may have no natural enemies and can quickly overtake and kill off native species. Zebra mussels in the US Great Lakes and walking catfish in the US southeast are prime examples.
 - b. Introduction of poisonous algae, aquatic plants and even diseases such as cholera are also spread in a similar way.
 - c. However, seas are not immune from species invasions. Parts of the Mediterranean are dominated by *Caulerpa taxifolia*, a modified species of alga accidentally introduced into the natural environment. Once the invasive plants take hold, they smother and replace virtually every native bottom plant species.
- ***What key international legal measure regulates the intentional pollution of marine environment by oils and other harmful discharge from ships?***
10. As of 2009, 136 countries, representing 98 percent of the world's shipping, were parties to Marpol 73/78, one of the most important international marine environmental conventions. In 1973, the International Conference of Marine Pollution adopted the International Convention for the Prevention of Pollution from Ships (MARPOL) that was further modified by a protocol in 1978.
- a. The Convention consists of six Annexes containing regulations for the prevention of pollution in six areas:
 - 1. Annex I - Oil
 - 2. Annex II - Noxious Liquid Substances carried in Bulk
 - 3. Annex III - Harmful Substances carried in Packaged Form
 - 4. Annex IV - Sewage
 - 5. Annex V - Garbage
 - 6. Annex VI - Air Pollution

F. Aquatic Resources in Peril: Mismanaged Fisheries

- **Why are many marine fisheries near collapse?**

1. In the last 150 years, the worldwide marine fish catch has increased 70-fold. Today it is at a point where most experts believe it cannot be sustained.
 - a. According to the United Nation's Food and Agriculture Organization (FAO), by 2004 the world fishing fleet consisted of 4 million vessels, eight times as many as 30 years ago.
 - b. In 2005, the world reported marine catch was over 80 million tons. Illegal and unreported fishing is estimated to add between 11 and 26 million tons to the overall catch.
2. Overfishing, coupled with habitat destruction, is the primary reason for the near-collapse of world fisheries.
 - a. FAO estimates that 52 percent of marine fish populations are fully exploited and 28 percent are overexploited or depleted. If we don't change how we manage our fisheries, some scientists predict a global fishery collapse by 2048.
 - b. One third of the world's total reported marine catch is discarded. Commercial marine fisheries discard nearly 27 million tons of nontarget fish, seabirds, sea turtles, marine mammals and other ocean life each year as by-catch. Shrimp trawlers discard 80-90 percent of their hauls. (For every kilogram/2.2 pounds of shrimp you eat, 4.2 kg/9.25 lbs of fish were wastefully discarded.)
 - c. Mangroves, estuaries and vital deep sea habitats are being destroyed by uncontrolled development and unsustainable fishing practices.

- **What are some of today's most destructive fishing practices?**

3. Decreasing fish populations, skewed government subsidies structures, and increasing effort needed to catch less and less fish have led to the development of more and more damaging fishing methods such as:
 - a. Long-lines — lines stretching out 130 kilometres/80 miles or more with thousands of baited hooks — allow fishing boats to reel in huge catches. Unfortunately, nontarget fish and sea birds are often hooked as by-catch.
 - b. Gill/Drift nets — mesh nets up to 65 kilometres/40 miles long — are common commercial fishing gear. These large nets efficiently trap the target fish, but also drown nontarget species and marine mammals at the same time.
 - c. Pair Trawling/Seining — two boats operating in tandem towing a net — is a highly efficient fishing technique. By lowering nets to the best depth for target fish, the boats corral and haul up record catches.
 - d. Bottom Trawling/Dredging — dragging the sea floor to collect bottom dwellers causes physical damage by destroying structures and stirring up silt. Like a giant rake, bottom trawling scrapes the ocean bottom of all life and nontarget species are discarded over the side.

- e. Explosives – bombs, often homemade, detonated near reefs – stun or kill not only the desired fish, but also other organisms and destroy the reef structure that might have taken hundreds of years to grow.
- f. Poisons – usually cyanide – are used to temporarily paralyze fish so they may be taken live. Driven mainly by aquarium and live fish restaurant trades, poison use is a major issue in biologically rich areas, such as the Indo-Pacific region. It often results in 50 percent fish mortality.

Note:

For up-to-date information on Project AWARE's Protect the Shark Initiative, refer participants to Project AWARE website – projectaware.org. Prior to your class session, download or request copies of relevant Protect the Sharks materials available in your local area.

- 4. Shark finning – the cruel and wasteful practice of cutting off shark's fins and discarding the still living animal back into the sea, by-catch and targeted shark fishing kill 100 millions sharks a year.
 - a. Sharks are especially vulnerable to overfishing because most of the species grow very slowly, have only 3 to 12 young and can take as many as 30 years to reach sexual maturity.
 - b. Even in areas where shark finning is banned, such as Europe, loopholes in regulation can render enforcement ineffective.

- **What can you do to support sustainable fisheries?**

Note:

For up-to-date information on sustainable fisheries and seafood choices, refer participants to Project AWARE website – projectaware.org. Prior to your class session, download or request copies of a locally relevant seafood guide and distribute those to program participants. Review with participants Project AWARE's 10 Things You Can Do to Support Sustainable Fisheries on the next page and engage them in discussion relevant to their interest and local setting.

Ten Things You Can Do To Support Sustainable Fisheries

- 1. Make informed decisions while selecting seafood.** Support fisheries that are better for the environment and relieve pressure on those that aren't doing as well. Many organizations inform consumers about which seafood can be selected and which to avoid to reduce overfishing and damage to the underwater environment. Visit projectaware.org to download or request copies of current seafood guides
- 2. When buying seafood, look for eco-labels.** The Marine Stewardship Council (MSC) has developed an environmental standard for sustainable and well-managed fisheries. This designation rewards environmentally responsible fishery management practices. The label ensures consumers that the product has not contributed to overfishing. For more information visit <http://eng.msc.org>.
- 3. Ask your local supermarkets and restaurants if they stock seafood with sustainable labels.** If not, encourage them to add sustainable species to their product line. Your consumer power can influence local businesses.
- 4. Don't assume that farmed seafood is always an environmentally friendly alternative.** Depending on the species, farms can introduce or increase waste, toxins, disease and chemicals into the natural environment. Carnivorous species like salmon and shrimp require an unsustainable amount of wild caught fish in order to reach marketable size. This means that the increase in farmed carnivorous fish still put pressure on fished species as they are caught to produce feed. For example, to produce one pound of farmed salmon, requires from 1-2 kilograms/2-5 pounds of ocean fish as food. By knowing your seafood source you can use sustainable seafood guides and eco-labels to guide your decisions.
- 5. Eat lower down on the food chain.** Fish species that are higher on the food chain such as tuna, swordfish and shark, tend to be larger in size and fewer in numbers than those at lower levels. Occasionally eating seafood lower on the food chain can reduce pressure on higher species and make better use of protein sources. For example, it takes approximately 10,000 kilograms of sardines to produce one kilogram of farm-raised tuna. Consider eating sardines or anchovies - fish that live off algae or plants.
- 6. Stay tuned in to fisheries management issues and support initiatives that improve fisheries through responsible management, conservation, fishing practices and fishing gear.** Turtle Excluder Devices (TEDs), for example, are a fishing gear modification that allows larger animals like sea turtles and sharks to pass through shrimp trawl nets.
- 7. Be sure your country has implemented the United Nations (UN) Code of Conduct for Responsible Fisheries and related International Plans of Action (IPOA).** These voluntary measures aim to ensure the effective conservation and management of living aquatic resources. A major focus of these actions is to halt illegal, unreported and unregulated (IUU) fishing, which can cause problems for international fisheries management. If your country hasn't implemented the Code and a national action plan, encourage the government to do so. For more information, visit the UN Food and Agriculture Organization (FAO) website at fao.org
- 8. Support the establishment of Marine Protected Areas (MPAs).** Research indicates that properly designed MPAs preserve biodiversity while providing refuge and nursery grounds for fish species. These MPAs also have the potential to increase fish stocks, and therefore fishing, outside MPA boundaries.
- 9. Think twice before starting an aquarium hobby.** Unless aquarium or ornamental fisheries are carefully and responsibly managed, collection of these species for captive display often damages coral reefs and marine species. Serious concerns include destructive capture methods, overexploitation and high mortality rates during transportation. Project AWARE Foundation supports publication of the Responsible Marine Aquarist book by the Marine Conservation Society. This book addresses concerns, raises awareness of conservation and management issues and summarizes ways that these fisheries are monitored and regulated. For more information visit mcsuk.org.
- 10. Educate your family, friends and coworkers.** Give them the seafood guides and tell them why you support sustainable fisheries and how they can help make a difference. Consumers, through their voices and pocketbooks, have the power to make positive change - but only if they make the effort.

G. Aquatic Resources in Peril: Degraded Coastal Zones

- **Why are coastal zones important?**

1. Most marine organisms originate or spend a major portion of their lifecycle in coastal wetlands or along the continental shelf and one-half of the world's people live within 100 km/60 miles of the seacoast.

- **Why are wetlands so important?**

2. Wetlands provide protection against storms and high seas, as well as provide habitat for fish, shellfish, birds and mammals.
 - a. Mangrove swamps, salt marshes, estuaries and other coastal wetlands are crucial for ecosystem health and food production, yet as a potentially undeveloped real estate, such areas are highly desirable and valuable. The pressure to develop is enormous.
 - b. Two-thirds of the world's fisheries are directly dependent on the fertility of coastal wetlands.
 1. Mangroves, which protect coastlines and serve as feeding and breeding grounds for thousands of marine species.
 2. More than 50 percent of commercially valuable fish spend part or all of their lifecycles in estuaries, and many others spend all of it there.
 3. Salt marshes are highly productive, and can produce two to four tons of organic matter per hectare/.8 to 1.6 tons per acre per year. (This compares to only 0.4 tons per hectare/.16 tons per acre per year for a wheat field.)
 4. Salt marshes not only provide food, but also remove pollutants.
 5. Due to coastal runoff, estuaries are very rich in nutrients and can support a large population of phytoplankton (the base of the marine food chain).

- **What pressures contribute to the destruction of wetlands?**

3. Some estimate that 60 percent of global wetlands have been destroyed in the past 100 years.
 - a. Agriculture, development, and aquaculture projects are the major forces behind the 35 percent loss of mangroves around the world.
 - b. Coastal wetland areas receive the major portion of land-based waste materials. Pollutants range from sewage to toxic materials such as synthetic chemicals and heavy metals.
 - c. Building of coastal structures that interfere with water and sediment circulation.
 1. Man-made structures often interfere with long shore sediment transportation resulting in increased deposition in some areas and erosion in others (as seen in many beach replenishment projects).

2. Dredging and fill operations destroy coasts and shorelines by recovering land, digging channels or damming rivers. Coastal dunes, which are vital to protecting shorelines, are also destroyed by development.

H. Troubled Waters

Note:

Use a globe, Google™ Earth, or other tool to show each of the regions in their geographic context.

- **What are the six most environmentally threatened marine regions of the world?**
 1. While there is virtually no place in the ocean left unaffected by human activity, the Caribbean Sea, the Persian Gulf, the Mediterranean Sea, the Straits of Malacca, the North Sea and the Baltic Sea are some of the most environmentally threatened marine regions of the world. Although some of these regions still offer some of the best diving and snorkeling in the world, their aquatic environments are under ever-increasing pressures.
- **What factors or conditions make these regions so threatened?**
 2. The Caribbean Sea (including the Gulf of Mexico)
 - a. The Caribbean basin has seen an 80% decline in coral cover since the mid 1970s and has the highest proportion of deforested land in the western hemisphere.
 - b. Agricultural runoff from the USA, Mexico and island nations has made it the world's most pesticide-polluted sea. The habitat of the manatee has been all but destroyed, and the Caribbean monk seal has been wiped out.
 - c. Tourism affects the environment by increasing sewage effluent, silting of reefs from hotel development, and increasing demand for local marine resources.
 - d. Heavy industry is on the increase, and with it, industrial waste. Developing oil production and its resulting accidents do not appear to have yet affected the environment.
 3. The Persian Gulf
 - a. The Gulf's coastline is the most rapidly developing area in the world.
 - b. Its shallowness (average depth – 33 metres/110 feet) and lack of effective discharge to the ocean contribute to growing pockets of pollution caused by oil, sewage and industrial growth.
 - c. The discharge from the world's largest concentration of desalinization plants is changing the salinity of habitats and threatening organisms sensitive to this change.

4. The Mediterranean
 - a. The Mediterranean's slow water exchange rate (80 to 100 years) is being taxed by increasing pollution from many sources:
 1. Sewage (most inadequately treated or untreated) from 120 coastal cities, industrial and agricultural chemicals and waste from ships are major contributors.
 2. Oil pollution has fouled many beaches, caused organism die-off, tainted seafood, closed shellfish beds and destroyed marine habitats. The primary cause is de-ballasting and tank washing by oil tankers and discharge of oily bilge water.
 3. Coastal pollution has spawned diseases such as viral hepatitis, dysentery, typhoid and cholera. It has also closed public beaches and has rendered some species of seafood unfit to eat.
5. Strait of Malacca (between Sumatra and the Malay Peninsula)
 - a. The Strait is the fastest route from the Indian Ocean to the South China Sea. An estimated 4300 tankers carrying more than 300 million tons of crude oil and its derivatives pass through each year.
 - b. Oil contamination of the Strait has resulted from 43 tanker accidents in an eight-year period, ten of which released oil.
 - c. Oil-contaminated ballast tank water, spills and accidents from refineries in Singapore are contaminating beaches and depleting fish.
6. The North Sea
 - a. Particularly its southern area, the North Sea contains some of the most heavily trafficked sea lanes in the world.
 - b. It receives the human and industrial pollution of a population of 31 million coastal residents, as well as a large seasonal tourist influx and major river outflow.
 - c. Contaminants are introduced in the forms of untreated sewage, industrial wastes, oil discharge from drilling, tanker accidents and bilge and ballast discharge.
 - d. Threats to fisheries include overfishing and dredging of sand and gravel. Dredging not only destroys habitat, but increases sediment in the water and releases toxic materials from the substrate.
 - e. Although fish have not been seriously contaminated by the presence of metal discharge into the North Sea, mussels must be harvested or cultured in special uncontaminated areas.
 - f. Oil pollution, wetlands destruction and depletion of food sources are a threat to the large shore and sea bird populations of the North Sea.

7. The Baltic Sea

- a. The Baltic Seas has a relatively unique ecosystem where a permanent halocline, a zone where salinity rapidly increases with depth, begins at a depth of about 40 metres/130 feet to 60 metres/200 feet.
 1. Below that depth the waters can become depleted of oxygen from the decaying organic material. Deepwater organisms are killed until oxygenated fresh water is introduced and re-colonization occurs.
- b. Organic waste (40 percent of which is untreated) from 17.5 million people, organic matter from pulp and paper industries, and agricultural runoff contribute to eutrophication.
- c. Metal contamination, primarily from pesticides, brought about a ban on commercial fishing in some coastal areas in the 1960s. However, contamination has fallen to an acceptable level in recent years.
- d. DDT or PCBs, accumulated in fish, pose a danger to fish-eating birds, mammals and humans.

I. Your Role in Protecting Underwater Environments

- **What are the Project AWARE's "Ten Ways a Diver Can Protect Underwater Environments"?**

Note:

Before proceeding hand out the Project AWARE's Foundation's "Ten Ways a Diver Can Protect Underwater Environment," found in the appendix. You can also download the latest pdf from projectaware.org.

As you discuss each of the 10 ways listed below with the participants, provide real life, local examples of relevant behavior, describe your involvement and engage participants in discussion.

1. Dive carefully to protect fragile aquatic ecosystems
2. Be aware of your body and equipment placement when diving
3. Keep your dive skills sharp through continuing education
4. Consider how your interactions affect aquatic life
5. Understand and respect underwater life
6. Be an ecotourist
7. Respect underwater cultural heritage
8. Report environmental disturbances or destruction
9. Be a role model for other divers and nondivers when interacting with the environment
10. Get involved in local environmental activities and issues

- **How can you get involved in conservation activities?**

Note:

As you discuss each point below with the participants, provide real life, local examples of your involvement and describe your Project AWARE activities and efforts such as your support of the Project AWARE Foundation, cleanups, coral reef and whale shark monitoring trips, AWARE Kids activities, etc.

11. Participating in monitoring and conservation activities increases your knowledge, understanding and appreciation for the underwater environment because you learn while making a difference.
 - a. Your observations can contribute to science and management decisions by providing vital information on the local, regional and international status of threatened or endangered species, marine debris, mooring buoy needs, and marine protected areas management.
 - b. Participating in Project AWARE's CoralWatch monitoring provides vital information on the bleaching trends of coral reefs world wide, and photos and information submitted through the Whale Shark Project help inform conservation of this vulnerable species.

Note:

Encourage qualified participants interested in underwater photography to take your PADI Digital Underwater Photographer course. Before proceeding to explain the importance and role of photography in underwater conservation, hand out the Project AWARE Foundation's "Ten Tips for Underwater Photographers" found in the appendix. You can also download the latest pdf from projectaware.org.

- c. Project AWARE, in partnership with Ocean Conservancy, supports the International Cleanup Day on the third Saturday in September when divers, snorkelers and local beach goers congregate to remove debris from local beaches and waterways above and below the surface. Data collected is used to inform, educate and legislate.
- d. One of the most effective ways to protect the environment from anchor damage, especially in areas with coral reefs, is through the installation of permanent mooring buoy systems. For those interested in learning more about the effectiveness of mooring buoys, and ways you may start your own program, a complete booklet – Mooring Buoy Planning Guide – can be downloaded from projectaware.org.
- e. Protected areas, such as parks, reserves and sanctuaries, are one of the best tools for conserving the aquatic environment. Yet without financial support and strong management plans, they can often be nothing more than paper parks. If you dive in a protected area, get involved by volunteering. If you're not a diver you can support protected areas by voicing your concerns to your local, national, and international representatives.

Appendix

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Student Name _____ Date: _____
Day/Month/Year

Knowledge Review Project AWARE

Answer the following questions. Your instructor will review your answers with you.

1. What is Project AWARE Foundation's mission and purpose? Give an example of what Project AWARE is doing in partnership with PADI to protect underwater environments.

2. What are the two primary freshwater ecosystems and what distinguishes them?

3. The ocean is made up of two zones – the _____ zone or the zone of perpetual darkness and the _____ zone or the zone of light penetration.

4. Why are coral reefs important to the aquatic environment?

5. List and briefly describe the single, most important, global threat to coral reef environments:

6. What are the main sources of pollution in the aquatic environment?

7. Why are many worldwide fisheries facing collapse?

- a. _____
- b. _____
- c. _____

8. What are the main problems faced by the world's most environmentally threatened regions?

9. List and briefly describe three of the Project AWARE's "Ten Ways a Diver Can Protect Underwater Environments"?

- a. _____
- b. _____
- c. _____

10. Give an example of how you could be involved in conservation activities with Project AWARE Foundation?

Student Statement:

I've completed this Knowledge Review to the best of my ability and any questions I answered incorrectly or incompletely I've had explained to me, and I understand what I missed.

Student Name _____ Date: _____
Day/Month/Year

Knowledge Review – ANSWER KEY Project AWARE

1. What is Project AWARE Foundation's mission and purpose?
Give an example of what Project AWARE is doing in partnership with PADI to protect underwater environments.

Project AWARE is dedicated to conserving underwater environments through education, advocacy and action. Project AWARE partners with divers and water enthusiasts to protect aquatic environments around the world.

Examples include mooring buoy use, responsible boating practices, buoyancy control, proper techniques and equipment placement for underwater photography, responsible wreck diving guidelines and dive training programs including this course, diver participation in conservation activities and data collection including global underwater cleanups, coral reef monitoring, shark sightings and identification, environmental education and advocacy.
2. What are the two primary freshwater ecosystems and what distinguishes them?

Lentic Ecosystems – Inland depressions with standing water formed through glacial erosion and depositions, rock and debris accumulation blocking streams or by earth movement that caused land to sink and flood. Lentic environments are also influenced by temperature gradients, which cause biological stratification and are divided into the littoral zone, the limnetic zone, the profundal zone and the benthic zone.

Lotic Ecosystems – Running water habitat such as rivers or streams. These environments are subject to constant change and require a constant supply of nutrients from land-based sources.
3. The ocean is made up of two zones – the aphotic zone or the zone of perpetual darkness and the photic zone or the zone of light penetration.

4. Why are coral reefs important to the aquatic environment?

Coral reefs are home to about 25 percent of all known marine species and are used by countless other species at some point in their life cycle. Coral reefs are among the most biologically diverse and productive communities, often referred to as the rain forests of the sea.

5. List and briefly describe the single, most important, global threat to coral reef environments::

Climate change, caused by increased CO₂ emissions, leads to increases in ocean temperatures, which causes coral bleaching and ocean acidification, a decrease in oceans pH, which reduces coral's ability to secrete its limestone skeleton.

6. What are the main sources of pollution in the aquatic environment?

Sources of pollution include propellants, hydrocarbons and biocides, agricultural and industrial runoff, industrial, municipal or agricultural waste dumping and dredge spoils, maritime accidents or ships dumping bilge water, ballast water and garbage.

7. Why are many worldwide fisheries facing collapse?

- a. **FAO estimates that 50 percent of marine fish populations are fully exploited and 25 percent are overexploited or depleted.**
- b. **If we don't change how we manage our fisheries, some scientists predict a global fishery collapse by 2048.**
- c. **One third of the world's total reported marine catch is discarded.**

8. What are the main problems faced by the world's most environmentally threatened regions?

The main problems faced by these environmentally threatened regions include oil pollution, population and industry growth, and chemical and heavy metal pollution.

9. List and briefly describe three of the Project AWARE's "Ten Ways a Diver Can Protect Underwater Environments"?
 1. **Dive carefully to protect fragile aquatic ecosystems**
 2. **Be aware of your body and equipment placement when diving**
 3. **Keep your dive skills sharp through continuing education**
 4. **Consider how your interactions affect aquatic life**
 5. **Understand and respect underwater life**
 6. **Be an ecotourist**
 7. **Respect underwater cultural heritage**
 8. **Report environmental disturbances or destruction**
 9. **Be a role model for other divers and nondivers when interacting with the environment**
 10. **Get involved in local environmental activities and issues**

10. Give an example of how you could be involved in conservation activities with Project AWARE Foundation?
 - a. **Participating in International Cleanup Day**
 - b. **Supporting marine protected areas legislation**
 - c. **Participating in CoralWatch or the Whale Shark Project.**
 - d. **Conducting AWARE kids programs and missions**

Ten Ways a Diver Can Protect the Underwater Environment

- 1. Dive carefully to protect fragile aquatic ecosystems**

Many aquatic organisms are delicate and can be harmed by the bump of a camera, the swipe of a fin or even the gentle touch of a hand. Some aquatic organisms like corals grow very slowly and breaking even a small piece can destroy decades of growth. By being careful you can prevent long-term damage to magnificent dive sites.
- 2. Be aware of your body and equipment placement when diving**

Keep your gauges and alternate air source secured so they don't drag over the reef or other vital habitat. Control your buoyancy, taking care not to touch fragile organisms with your body or equipment. You can do your part and prevent injury to aquatic life every time you dive.
- 3. Keep your dive skills sharp through continuing education**

Before heading to open water seek bottom time with a certified professional in a pool or other environment that won't be damaged. You can also refresh your skills and knowledge with a PADI Scuba Review, PADI Advanced Open Water Diver course or Project AWARE Specialty course such as Peak Performance Buoyancy.
- 4. Consider how your interactions affect aquatic life**

Avoid touching, handling, feeding or riding on aquatic life. These actions may stress the animal, interrupt feeding and mating behavior or provoke aggressive behavior in normally nonaggressive species.
- 5. Understand and respect underwater life**

Playing with animals or using them as food for other species can leave a trail of destruction, disrupt local ecosystems and rob other divers of their experiences with these creatures. Consider enrolling in a PADI Underwater Naturalist, AWARE Fish Identification or Coral Reef Conservation Specialty course to better understand sustainable interactions.
- 6. Be an ecotourist**

Make informed decisions when selecting a destination and choose Project AWARE Environmental Operators or other facilities dedicated to sustainable business practices. Obey all local laws and regulations and understand your effect on the environment. Don't collect souvenirs like corals or shells. Instead, take underwater photos and follow Project AWARE's
- 7. Respect underwater cultural heritage**

Divers are privileged to access dive sites that are part of our cultural heritage and maritime history. Wrecks can also serve as important habitats for fish and other aquatic life. Help preserve these sites for future generations by obeying local laws, diving responsibly and treating wrecks with respect.
- 8. Report environmental disturbances or destruction**

As a diver, you're in a unique position to monitor the health of local waters. If you notice unusual depletion of aquatic life, injury to aquatic animals or strange substances in the water, report these observations to responsible authorities in your area.
- 9. Be a role model for other divers and nondivers when interacting with the environment**

As a diver, you see the underwater results of carelessness and neglect. Set a good example in your own interactions so that others can learn from you.
- 10. Get involved in local environmental activities and issues**

You can greatly affect your corner of the planet. There are plenty of opportunities to support healthy aquatic environments including Project AWARE conservation and data collection activities like local beach and underwater cleanups and CoralWatch monitoring, supporting environmental legislative issues, attending public hearings on local water resources, conserving water or making responsible seafood choices.

10 Tips for Underwater Photographers

1. Photograph with Care

Dive carefully as many aquatic creatures are fragile regardless of size. Improper techniques while taking or editing photos underwater can damage sensitive aquatic life and harm fragile organisms with the bump of a camera or tank, swipe of a fin or even the touch of a hand.

2. Dive Neutral

Camera systems may add weight or be buoyant. Make sure to secure photo and dive equipment and be properly weighted to avoid contact with reefs or other vital habitat. Practice buoyancy control and photography skills in a pool before swimming near sensitive and fragile environments.

3. Resist Temptation

Avoid touching, handling, feeding, chasing or riding aquatic life. Avoid altering an organism's location to get the perfect shot. Many aquatic creatures are shy and easily stressed. These actions may interrupt feeding, disturb mating or provoke aggression in a normally nonaggressive species.

4. Easy Does It

While diving, move slowly and deliberately through the water. Be patient and still while photographing - allow organisms to show their natural behavior for a more significant and meaningful shot.

5. Sharpen Your Skills

Make sure the difficulty of the dive and the environmental conditions are appropriate for your current skills and comfort level. Avoid stabilizing underwater by grabbing onto the reef for a better photo. Enroll in PADI's Underwater Photographer, Digital Underwater Photography and Peak Performance Buoyancy Specialty courses to become a more skilled and successful photographer.

6. Be Informed

Be aware of local regulations and protocols regarding behavior around marine mammals and other species before entering the water. These regulations protect creatures and aim to assure their preservation for future generations.

7. Be an AWARE Diver

Consider enrolling in an AWARE - Coral Reef Conservation, Project AWARE Specialty or Underwater Naturalist course to learn sustainable dive techniques and increase knowledge about the environment you're photographing.

8. Take Only Pictures, Leave Only Bubbles

Avoid souvenir collection. Nearly everything found in the aquatic realm is alive or will be used by a living creature. Removing specimens such as corals and shells can disturb the delicate balance and quickly deplete dive sites of both their resources and their beauty.

9. Share Your Images

Use images for conservation by reporting environmental disturbances or destruction using your photographs as evidence. Assist scientific research and improve resource management by contributing your photos to The Whale Shark Project and other monitoring programs. You may also submit your photos to Project AWARE. Your images have the power to change perspectives and influence conservation.

10. Conserve the Adventure

Join Project AWARE Foundation, the dive industry's leading nonprofit environmental organization. Your support helps conserve underwater environments through education, advocacy and action.