



**NOAA  
FISHERIES  
SERVICE**

**Southwest  
Fisheries  
Science Center**

and

**NOAA's  
Teacher at Sea  
Program**

# **SEA TURTLE CURRICULUM**

by

**Dana Tomlinson**

**Emory Elementary**

**NOAA "Teacher in the Lab" 2009**







Dear Educators,

2009

I currently teach 6<sup>th</sup> grade at Emory Elementary School in San Diego, and have been an educator for 20 years. I am pleased to say I have had the good fortune to have worked with the National Oceanic and Atmospheric Administration (NOAA) as a Teacher at Sea, a Teacher in the Air, and as one of the first Teachers in the Lab (TIL). During my initial tenure as a TIL, I developed the following unit on Sea Turtles. I worked at NOAA's Southwest Fisheries Science Center, under the direction of Dr. Sarah Mesnick, with Dr. Jeffrey Seminoff, a leading expert in sea turtles. He was gracious enough to include me in his work to the degree I was able. I then immersed myself in all the research I could find on the topic to create the lessons you are about to view.

I have collected and collated many resources into an order that I feel will allow me to engage and be effective in my 6<sup>th</sup> grade classroom. I have not received any compensation for including any of these assets and have no personal connection to any of them. See the Resource List for the original sources. Please use these sites and lessons in any way that works for you in your classroom (I allowed for about an hour per lesson). They are not only for 6<sup>th</sup> grade – they can easily be modified to a variety of grade levels.

Please feel free to contact me, as I am willing to provide further explanation/information if desired.

I have included how the lessons fit into the California State Standards for 6<sup>th</sup> grade and the Ocean Literacy Principles. There is also a great inventory of internet sites that are chockfull of information, resources, games, and ideas. Additionally, there is a list of videos for those of you who have the capability of showing videos in your classroom via a computer.

If space permits, I would recommend for further student interest to have an area available in your classroom with student books on sea turtles, as well as a bulletin board devoted to the topic. From the resource list, you will find titles of student books, as well as many websites from which you can order and/or download items of interest for a bulletin board.

The fate of the sea turtles is in our hands. As educators, we are able to encourage our students to become stewards of their environment to provide them with a future that includes sea turtles still swimming in the world's oceans.

Enjoy,

Dana Tomlinson [d.tomlinson@cox.net](mailto:d.tomlinson@cox.net)  
[http://teacheratsea.noaa.gov/1990\\_2002/index.html](http://teacheratsea.noaa.gov/1990_2002/index.html)  
[http://teacheratsea.noaa.gov/tia/2008/peterson\\_tomlinson/index.html](http://teacheratsea.noaa.gov/tia/2008/peterson_tomlinson/index.html)



## Sea Turtles Lesson 1 Introduction



**Objective:** To provide background and some basic information on sea turtles; to create interest and excitement for the unit

### **Materials:**

Chart paper

Markers

Manila folders, 1 per student

Coloring sheets, 1 per student (your choice from one of the Coloring Books listed in the Resource Guide)

Lined paper, several per student

Class set of Audubon Adventures newspapers, Sea Turtle edition, if available

### **Procedure:**

- Show a short portion of your favorite video of sea turtles (see list of videos).
- Discuss with students that this will be your focus of study: the plight of sea turtles.
- Do a KWL chart with students on the topic (divide the chart paper into 3 vertical columns labeled K, W, L. Under the K, chart what the students KNOW about sea turtles. Under the W, chart what students WANT to know about sea turtles. Leave the L for the end of the unit when you will return to the chart, and write what the students LEARNED about sea turtles.). Post the chart somewhere in the room.
- Pass out folders, lined paper for inside folders (for creating vocabulary lists, taking notes), and coloring sheets. Have the student gluestick the coloring sheet to the front of the folder.
- Inform students that sea turtles in some form have been on earth for over 150 million years, versus human ancestors going back perhaps 2 million years. Use some sort of analogy to help students understand what this means in terms of the evolutionary time line. For example, use a 12 month calendar to represent life since the beginning 4.6 billion years ago. The Earth would form when the year is about half over, dinosaurs show up on the 24th, humans on the evening of the 31st, and all of written history takes up the last ten seconds of the year. Here are a few other websites to give you some ideas:

[http://www.galeschools.com/lesson\\_plans/secondary/science/timeline.htm](http://www.galeschools.com/lesson_plans/secondary/science/timeline.htm)

<http://andabien.com/html/evolution-timeline.htm>

- Pass out Audubon Adventures newspapers and read in whatever form works for you (jigsaw, partner read, whole group, etc.). Collect when finished.
- If these are not available, choose one of the general info websites from the Resource List or a video from the Video List to share with your class.
- Throughout the lessons in the unit, instruct students to take notes, create vocabulary list where you see fit.

**Independent Practice:** Color sheet on front of folder.



## Sea Turtles Lesson 2 Biology

**Objective:** To introduce concept of Classification, classify sea turtles, learn about the 7 different species

**Materials:**

folders

sea turtle identification cards, 1 set per student

[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf), pages 14, 15

index cards, 7 per student

**Procedure:**

- Review or introduce the concept of systematic classification. Go over the 7 categories. Use human beings as an example:

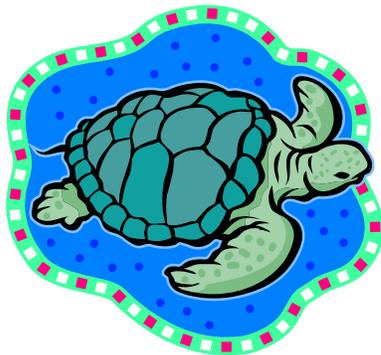
Kingdom: Animalia, Phylum: Chordata, Class: Mammalia, Order: Primates, Family: Hominidae, Genus: *Homo*, Species: *sapiens*.

- Classify your choice of sea turtle (see Sea World's guide, pg. 1 <http://www.seaworld.org/animal-info/info-books/sea-turtle/index.htm>).

- Pass out sea turtle cards. Go over each – use info from the guide to elaborate:

[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf), page 4. Have students cut out the cards and gluestick onto index cards, or have them reproduced onto cardstock.

**Independent Practice:** Finish construction of turtle ID cards. Color.



## Sea Turtles Lesson 3 Adaptations

**Objective:** To reinforce concepts of sea turtle biology, physiology, and adaptations

**Materials:**

folders

class set of worksheets: No Bones About It/How Do Sea Turtles Measure Up? copied back to back (you may want to add “carapace,” “scute” and “plastron” to worksheet).

[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf), pages 19, 20

class set of Kid’s Times: turtle of your choice

<http://www.nmfs.noaa.gov/pr/education/turtles.htm> (you may order them at no charge in quantity from NOAA for the color version)

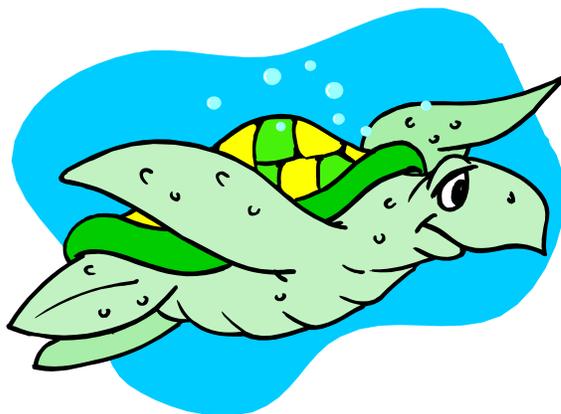
plan for adaptations activity

[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf) page 7

**Procedure:**

- Discuss turtle biology  
[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf), page 5.
- Pass out Kid’s Times. Read these as you see fit.
- Watch video if possible. One idea: [http://www.discoveryeducation.com/Animal-Classifications: If You Were a Reptile](http://www.discoveryeducation.com/Animal-Classifications:If-You-Were-a-Reptile)
  - Sea Turtles (1:53)
- Review adaptations, specifically those that sea turtles may have. Introduce the concept of “functional morphology:” function from form. Do adaptations activity.

**Independent Practice:** Pass out “No Bones About It/How Do Sea Turtles Measure Up?” worksheet. Review instructions on both sides. If time, they may start it in class.



## Sea Turtles Lesson 4 Life Cycle

**Objective:** To describe the life cycle of sea turtles and identify natural mortality factors

**Materials:**

folders

class set of worksheets: Temperature Will Tell

[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf), page 9

If you have a Project WILD curriculum, plan for Turtle Hurdle activity

<http://www.projectwild.org/index.htm>, pages 158-162; if you do not have this

curriculum, consider signing up for a training to receive it

Green sea turtle reproduction worksheet, attached; class set

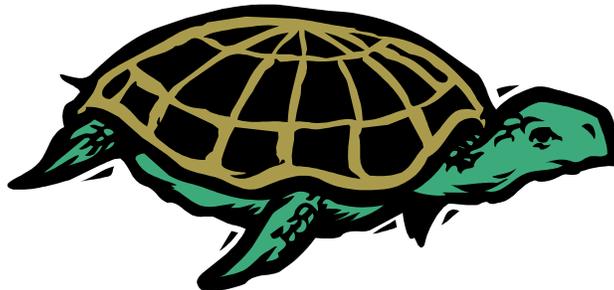
**Procedure:**

- Discuss sea turtle reproduction  
[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf), page 8
- Watch video if possible. Here are some ideas:  
<http://www.discovereducation.com/>
  - Animal Alphabet: U & V
    - U is for Underwater sea turtle (4:42)
  - Beneath: The Caribbean
    - Marine turtles (2:55)
  - Reproduction in organisms
    - Reproduction of green sea turtles (1:31)
- Explain and begin Temperature Will Tell activity. Pass out worksheets. Make sure students are on the right track. Finish at home.
- Have students perform Turtle Hurdle activity, if possible. If not, have class do attached Green sea turtle reproduction worksheet.

**Independent Practice:** Finish Temperature Will Tell activity.

**Answers:**

[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf), bottom of page 26.



Name \_\_\_\_\_

## Green Sea Turtle Reproduction

After what you've learned about female sea turtle reproduction, answer the following questions. Keep these statistics in mind about green sea turtles:

- life span: at least 100 years
- sexual maturity reached: 30 years (it's later in life due to being herbivorous - the protein in a carnivorous diet allows other species to reach maturity earlier)
- amount in each egg clutch: 100 eggs average (75-200)
- number of clutches produced in a season: 3.3 clutches
- frequency of egg production: every 3 years

1. Approximately how many eggs will the average green sea turtle lay in one season?

\_\_\_\_\_

2. Approximately how many eggs will she produce in a decade?

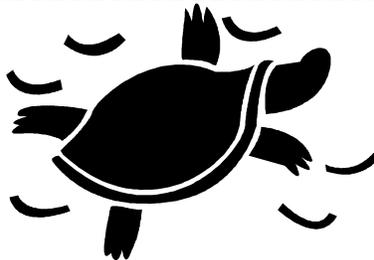
\_\_\_\_\_

3. Approximately how many eggs will she produce in her lifetime?

\_\_\_\_\_

4. Knowing all this, why do you think that green sea turtles (and other species) have a 'natural survivorship' (without human impact) that we believe is less than 1 out of every 1,000 eggs (that's 1/1000 produces an offspring survives to adulthood)? \_\_\_\_\_

\_\_\_\_\_



# KEY

Name \_\_\_\_\_

## Green Sea Turtle Reproduction

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- amount in each egg clutch: 100 eggs average (75-200)
- number of clutches produced in a season: 3.3 clutches
- frequency of egg production: every 3 years

1. Approximately how many eggs will the average green sea turtle lay in one season?

\_\_\_\_\_ 330 \_\_\_\_\_

2. Approximately how many eggs will she produce in a decade?

\_\_\_\_\_ 1000 \_\_\_\_\_

3. Approximately how many eggs will she produce in her lifetime?

\_\_\_\_\_ 7000 \_\_\_\_\_

Knowing all this, why do you think that green sea turtles (and other species) have a 'natural survivorship' (without human impact) that we believe is less than 1 out of every 1,000 eggs (that's 1/1000 produces an offspring survives to adulthood)?

so few hatchlings survive to adulthood due to predation, and once they reach adulthood, there are numerous threats to sea turtle survival

## Sea Turtles Lesson 5 Satellite Telemetry

**Objective:** To introduce satellite telemetry as a way of tracking sea turtle motility

**Materials:**  
folders

**Procedure:**

- Describe sea turtle tagging and tracking  
[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf),  
page 10
- Check out websites that track turtles. Here are some ideas:  
<http://www.topp.org/>  
<http://www.seaturtle.org/tracking/>  
<http://www.seaturtle.org/tracking/images/turtletrax2.jpg>  
<http://stort.unep-wcmc.org/imaps/indturtles/viewer.htm>  
<http://www.tourdeturtles.org/alt-index.html>  
<http://cccturtle.org/satelliteturtles.php>  
<http://seamap.env.duke.edu/>
- Have students use the classroom as an analogy for the ocean by Turtle Tracking in the Classroom  
[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf), page 12.
- Consider adopting a turtle.  
<http://www.seaturtle.org/adopt/>  
<https://www.propeninsula.org/adopt/1.html>
- Set up a weekly tracking system for a live turtle, perhaps one you have adopted, like the activity here:  
[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf) , page 10.

**Independent Practice:** Study vocabulary. Make sure all papers in folder are completed.



## Sea Turtles Lesson 6 Threats

**Objective:** To inform students as to what threatens the world's sea turtles

**Materials:**

Folders

Prepare for the Game of Life

[http://www.nmfs.noaa.gov/pr/pdfs/education/kids\\_gameoflife.pdf](http://www.nmfs.noaa.gov/pr/pdfs/education/kids_gameoflife.pdf)

Chart paper

Markers

“Threats to Sea Turtles”

**Procedure:**

- Play the Game of Life so that students have a better understanding of what it means for a species to be threatened/endangered  
[http://www.nmfs.noaa.gov/pr/pdfs/education/kids\\_gameoflife.pdf](http://www.nmfs.noaa.gov/pr/pdfs/education/kids_gameoflife.pdf)
- Post chart paper. Have students brainstorm a list of all the threats they can think of to sea turtles. Save to add to later.
- Share food chain that shows how sea turtles are predators and prey.  
[http://www.nmfs.noaa.gov/pr/pdfs/education/kids\\_foodchain.pdf](http://www.nmfs.noaa.gov/pr/pdfs/education/kids_foodchain.pdf) (page 1). Introduce the idea of “marine subsidy:” that this marine animal affects the terrestrial habitat.
- Inform students of the threats that they did not come up with. See the attached “Threats to Sea Turtles,” which comes from many sources credited in the Resource List.
- If time allows: Food for Thought activity  
[http://www.nmfs.noaa.gov/pr/pdfs/education/kids\\_food.pdf](http://www.nmfs.noaa.gov/pr/pdfs/education/kids_food.pdf)

**Independent Practice:** Have students write a list of at least 5 things they, as students, can do to help sea turtles.





## Threats to Sea Turtles

### **The Struggle for Survival**

Sea turtles have been around for approximately 100 million years, in numbers too large to count. However, within the last 100 years their numbers have dramatically declined, placing all seven species on the IUCN (The World Conservation Union) Red List of Threatened Species. Each year, The IUCN reviews the conservation status of thousands of plants and animals and lists those in danger of extinction on the Red List.

### **What is Happening to the Sea Turtles?**

It is estimated that only one in thousands will survive to adulthood and reproduce.

#### **Direct threats**

Predation: Until they can make it to the water from the nest, sea turtle hatchlings make a tasty meal for crabs, sea birds, raccoons and foxes, reptiles and ants. As young hatchlings, they are also prey. As adults, their only predators are sharks and killer whales.

Hunting: for food, eggs, shells (jewelry, combs, eyeglass frames), skin

Disease/Sickness: When papilloma tumors develop predominant fibrous tissue, they are called fibropapillomas. Green sea turtles develop fibropapillomas that appear as lobe-shaped tumors. These tumors can infect all soft portions of a turtle's body. Tumors grow primarily on the skin, but they can also appear between scales and scutes, in the mouth, on the eyes, and on internal organs. Scientists aren't yet certain what causes fibropapilloma tumors or how they are spread. <http://www.turtles.org/tumour.htm>

#### **Global Warming:**

- With melting polar ice caps and rising sea levels, natal beaches are starting to disappear.
- The gender of a sea turtle is determined by the temperature at which the egg incubates. Increasing nest temperatures could result in all female sea turtles, which in and of itself, would cause the extinction of all the species.
- Global warming will also increase water temperatures, changing ocean currents that are critical to migrating turtles, especially baby hatchlings that are mostly transported by the currents into the open ocean thousands of miles from their nesting sites. Warming ocean temperatures are also likely to negatively impact the food resources for sea turtles and virtually all marine species.

### **Indirect threats**

**Commercial Fisheries:** Turtles become entangled or ensnared in fishing nets and hooks and drown (called “bycatch”).

Trawl fisherman in many countries are required to use a Turtle Excluder Device (TED) to help keep turtles out of their nets. However, not all fishermen use these devices and turtles are still being killed. <http://www.seaturtles.org/article.php?id=985>

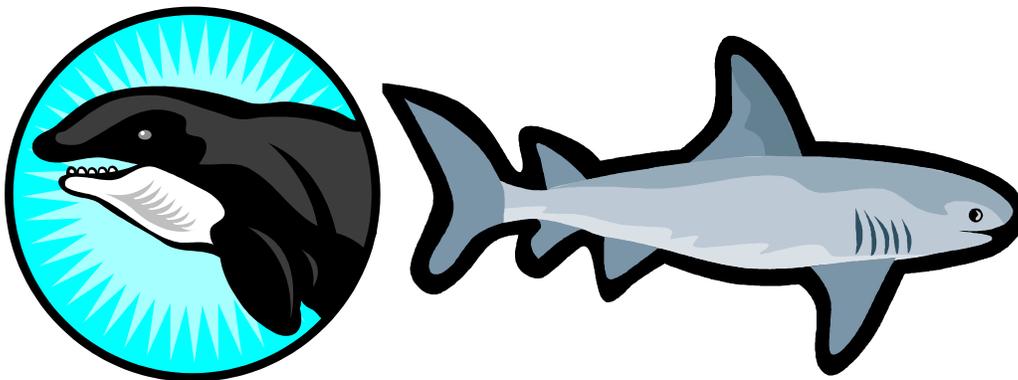
Longlines: <http://www.seaturtles.org/article.php?id=983>

**Habitat Degradation:** The destruction of turtle habitats is limiting the ability of turtles to reproduce and repopulate. Turtles return to the same coast on which they hatched to mate and to lay their eggs. If the beach or habitat has changed or is perceived as dangerous, the turtle will abort the eggs at sea. **Erosion of beaches** is natural, but we are building walls, jetties, and other buildings that prevent the turtles from reaching the beach and nesting. Sometimes eroded sand is replaced with new sand and/or the sand will be compacted to make the beach more erosion-proof. This can also inhibit turtle nesting. **Beach traffic** (feet or vehicle) can deter and/or destroy nesting sites.

**Pollution:** Trash, debris, sewage and chemicals are being dumped into our oceans and water ways in alarming quantities. This pollution kills aquatic life. Chemical pollution may be to blame for causing diseases that are killing the turtles. Solid waste pollution can be mistaken for food such as jellyfish, and ingested, blocking the turtle's intestinal tract. Turtles can also become entangled in debris and die.

**Lighting:** Street, business and residential lighting create a false horizon, and hatching turtles may be drawn inland instead of to the sea. Many of these turtles become prey, dehydrated or road kill. A majority of sea turtle species nest at night, but artificial lights deter adult females from approaching the beach and nesting.

**Boating:** A sea turtle's shell is not as hard as it seems. It is made of living tissue and is comprised of the turtle's backbone and ribs. Because sea turtles must surface to breathe, they can be hit with passing boat propellers that can slice through the shell or skull. Boaters moving at fast speeds in the water usually do not see the surfacing turtles.





## Sea Turtles Lesson 7 How Can We Help?



**Objective:** To inspire students in sea turtle stewardship

**Materials:**

Folders

Chart paper

Markers

“How Students Can Help Sea Turtle Conservation”

**Procedure:**

- Review the threats to sea turtles.
- Have a short discussion on why saving sea turtles is important. Beyond the obvious:  
<http://nationalzoo.si.edu/ConservationAndScience/AquaticEcosystems/SeaTurtles/>
- Share with them what some adults are doing to help. One possibility:  
[http://www.signonsandiego.com/uniontrib/20060530/news\\_1n30turtle.html](http://www.signonsandiego.com/uniontrib/20060530/news_1n30turtle.html)
- Have students pair to share their list of 5 things they can do to help sea turtles. Then, share with another partnership.
- After, chart on the chart paper a list of all that the class members brainstormed. Decide as a class which items to pursue. Create a class plan to follow through. See list of “How Students Can Help Sea Turtle Conservation” for ideas, big and small, to consider. Work on your action items for the remainder of the school year (and beyond?).
- Revisit the KWL chart from the first lesson to chart what the students LEARNED in the L column.

**Independent Practice:** Have students straighten/complete items in folder and study vocabulary for assessment the next school day.





## How Students Can Help Sea Turtle Conservation

- Write letters to legislators, seafood distributors/purchasers to request they only buy fish from folks who are promoting responsible fishing practices.
- Paint murals at school and/or in the community to spread the word about sea turtle conservation.
- Create a class book for internal/external publication about the plight of sea turtles. <http://drawsketch.about.com/library/bl-step-turtle.htm> will help with teaching students how to draw a sea turtle.
- Adopt a turtle. See Resource List for some organizations which use the money from these adoptions for sea turtle conservation.
- Volunteer at a local conservation organization. If you live near a coastline, consider volunteering at a sea turtle camp or joining/forming a sea turtle protection brigade. [www.wildcoast.net](http://www.wildcoast.net) has advice on how to get started.
- Stay educated about issues effecting sea turtles and inform others of what you learn.
- Pick up after yourself and the next time you are at the beach, spend some time cleaning trash off the sand. Even if you live far from the ocean, please don't litter as plastic is carried downstream in rivers into the ocean, often far away.
- Use cloth bags and try your best never to use plastic bags. If you do, reuse them.
- Celebrate without using helium balloons, which have the same affect on sea turtles as plastic bags when they float down into the ocean - the turtles think they are food, eat them, and die. If staff members at your school use balloons in school activities, convince them to find some other way to make merry that won't be a threat to wildlife.
- Eat local seafood caught responsibly. Ask your food server in restaurants how the fish was caught. Do not order fish that was caught on long-lines or by trawlers without TEDs.
- Do not eat sea turtle products and protest places that have them to order.
- Report the illegal trade of sea turtle products to the appropriate authorities. In Mexico: 01800-7703372. In the USA, Michelle Zetwo, 619-557-5494.
- Don't ever buy products that contain parts of sea turtles.
- Reduce, reuse and re-cycle.
- When you do throw items away, be responsible. Be aware what you put down the drain (does it go to the waste treatment plant or into the sewer which leads to the ocean?). Dispose properly of batteries, cleaners, oils, paints, etc.
- Reduce your carbon footprint by walking, cycling, skateboarding, etc.
- Make purchases of items with little waste.
- Encourage adults to use less energy and less water in all ways.
- Plant a native tree.
- If you have occasion to see sea turtles, leave them alone! Don't feed them, or touch them. Just enjoy their beauty from afar.

# **Ocean Literacy**

## The Essential Principles and Fundamental Concepts of Ocean Sciences

### **1. The Earth has one big ocean with many features.**

- a.** The ocean is the dominant physical feature on our planet Earth - covering approximately 70% of the planet's surface. There is one ocean with many ocean basins, such as the North Pacific, South Pacific, North Atlantic, South Atlantic, Indian and Arctic.
- d.** Sea level is the average height of the ocean relative to the land, taking into account the differences caused by tides. Sea level changes as plate tectonics cause the volume of ocean basins and the height of the land to change. It changes as ice caps on land melt or grow. It also changes as sea water expands and contracts when ocean water warms and cools.
- g.** The ocean is connected to major lakes, watersheds and waterways because all major watersheds on Earth drain to the ocean. Rivers and streams transport nutrients, salts, sediments and pollutants from watersheds to estuaries and to the ocean.
- h.** Although the ocean is large, it is finite and resources are limited.

### **2. The ocean and life in the ocean shape the features of the Earth.**

- d.** Sand consists of tiny bits of animals, plants, rocks and minerals. Most beach sand is eroded from land sources and carried to the coast by rivers, but sand is also eroded from coastal sources by surf. Sand is redistributed by waves and coastal currents seasonally.
- e.** The ocean dominates the Earth's carbon cycle. Half the primary productivity on Earth takes place in the sunlit layers of the ocean and the ocean absorbs roughly half of all carbon dioxide added to the atmosphere.

### **4. The ocean makes Earth habitable.**

- b.** The first life is thought to have started in the ocean. The earliest evidence of life is found in the ocean.

### **5. The ocean supports a great diversity of life and ecosystems.**

- a.** Ocean life ranges in size from the smallest virus to the largest animal that has lived on Earth, the blue whale.
- b.** Most life in the ocean exists as microbes. Microbes are the most important primary producers in the ocean. Not only are they the most abundant life form in the ocean, they have extremely fast growth rates and life cycles.
- c.** Some major groups are found exclusively in the ocean. The diversity of major groups of organisms is much greater in the ocean than on land.
- d.** Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (such as symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.
- e.** The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the seafloor. Most of the living space on Earth is in the ocean.

**f.** Ocean habitats are defined by environmental factors. Due to interactions of abiotic factors such as salinity, temperature, oxygen, pH, light, nutrients, pressure, substrate and circulation, ocean life is not evenly distributed temporally or spatially, i.e., it is “patchy.” Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert.

#### **6. The ocean and humans are inextricably interconnected.**

**a.** The ocean affects every human life. It supplies freshwater (most rain comes from the ocean) and nearly all Earth’s oxygen. It moderates the Earth’s climate, influences our weather, and affects human health.

**b.** From the ocean we get foods, medicines, and mineral and energy resources. In addition, it provides jobs, supports our nation’s economy, serves as a highway for transportation of goods and people, and plays a role in national security.

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

**d.** Much of the world’s population lives in coastal areas.

**e.** Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (such as point source, non-point source, and noise pollution) and physical modifications (such as changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

**f.** Coastal regions are susceptible to natural hazards (such as tsunamis, hurricanes, cyclones, sea level change, and storm surges).

**g.** Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

#### **7. The ocean is largely unexplored.**

**a.** The ocean is the last and largest unexplored place on Earth—less than 5% of it has been explored. This is the great frontier for the next generation’s explorers and researchers, where they will find great opportunities for inquiry and investigation.

**b.** Understanding the ocean is more than a matter of curiosity.

Exploration, inquiry and study are required to better understand ocean systems and processes.

**c.** Over the last 40 years, use of ocean resources has increased significantly, therefore, the future sustainability of ocean resources depends on our understanding of those resources and their potential and limitations.

**d.** New technologies, sensors and tools are expanding our ability to explore the ocean. Ocean scientists are relying more and more on satellites, drifters, buoys, subsea observatories and unmanned submersibles.

**e.** Use of mathematical models is now an essential part of ocean sciences. Models help us understand the complexity of the ocean and of its interaction with Earth’s climate. They process observations and help describe the interactions among systems.

**f.** Ocean exploration is truly interdisciplinary. It requires close collaboration among biologists, chemists, climatologists, computer programmers, engineers, geologists, meteorologists, and physicists, and new ways of thinking.



### Shaping Earth's Surface

2. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. As a basis for understanding this concept:
- b. Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.

### Energy in the Earth System

4. Many phenomena on Earth's surface are affected by the transfer of energy through radiation and convection currents. As a basis for understanding this concept:
- a. Students know the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle.
  - b. Students know solar energy reaches Earth through radiation, mostly in the form of visible light.

### Ecology (Life Sciences)

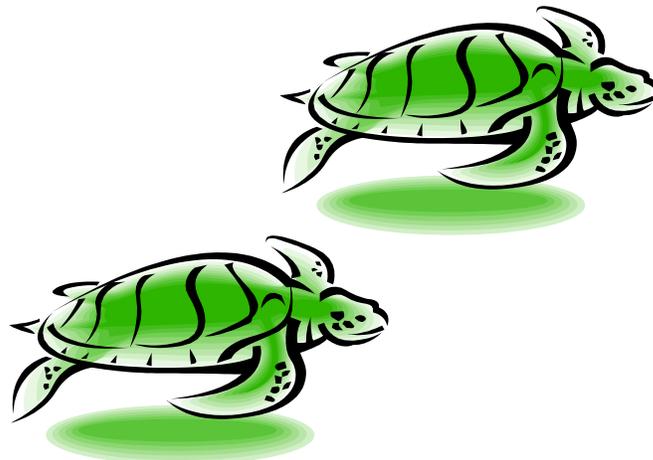
5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:
- a. Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
  - b. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
  - c. Students know populations of organisms can be categorized by the functions they serve in an ecosystem.
  - d. Students know different kinds of organisms may play similar ecological roles in similar biomes.
  - e. Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

### Resources

6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept:
- Students know the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.
  - Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.
  - Students know the natural origin of the materials used to make common objects.

### Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
- Develop a hypothesis.
  - Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
  - Construct appropriate graphs from data and develop qualitative statements about the relationships between variables.
  - Communicate the steps and results from an investigation in written reports and oral presentations.
  - Recognize whether evidence is consistent with a proposed explanation.
  - Interpret events by sequence and time from natural phenomena (e.g., the relative ages of rocks and intrusions).
  - Identify changes in natural phenomena over time without manipulating the phenomena (e.g., a tree limb, a grove of trees, a stream, a hillslope).



## Sea Turtle Resource List – Credits



### General Information:

<http://www.seaturtle.org/>

<http://www.nmfs.noaa.gov/pr/species/turtles/green.htm>

<http://www.seaturtles.org/>

<http://oceanservice.noaa.gov/education/>

<http://www.cccturtle.org>

<http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?sPCODE=C00S>

<http://accstr.ufl.edu/>

[http://www.wildcoast.net/site/index.php?option=com\\_content&task=view&id=228&Itemid=136](http://www.wildcoast.net/site/index.php?option=com_content&task=view&id=228&Itemid=136)

<http://swfsc.noaa.gov/textblock.aspx?Division=PRD&id=1226&ParentMenuId=212>

<http://earthtrust.org/wlcurric/turtles.html>

<http://www.bbc.co.uk/nature/animals/conservation/turtles/>

### Adoption:

<http://www.seaturtle.org/adopt/>

<https://www.propeninsula.org/adopt/1.html>

### Children's Books:

*The Book of Honu: Enjoying and Learning About Hawaii's Sea Turtles (A Latitude 20 Book)* by Peter Bennett and Ursula Keuper-Bennett

*Carolina's Story* by Donna Rathmell

*Do You Know Where Sea Turtles Go?* By Paul Lowery

*Endangered Sea Turtles (Earth's Endangered Animals)* by Bobbie Kalman

*Interrupted Journey: Saving Endangered Sea Turtles* by Kathryn Lasky

*Into the Sea* by Brenda Z. Guiberson and Alix Berenzy

*The Life Cycle of a Sea Turtle* by Bobbie Kalman

*One Tiny Turtle: Read and Wonder* by Nicola Davies

*Saving Sea Turtles (Leveled Readers)* by Amy Edgar

*Sea Turtle Journey: The Story of a Loggerhead Turtle (Smithsonian Oceanic Collection)* by Lorraine A. Jay and Katie Lee

*Sea Turtles* by Gail Gibbons

*Sea Turtles* by Margaret Rustad

*Sea Turtles (Bridgestone Books, World of Reptiles)* by Glaser, Jason, Collins, and Tami

*Sea Turtles: A Complete Guide to Their Biology, Behavior, and Conservation* by James R. Spotila

*Sea Turtles (Early Bird Nature Books)* by Frank L. Staub

*Sea Turtles (Naturebooks Underwater Life)* by Don Patton

*Sea Turtles (Our Wild World)* by Lorraine Jay

*Sea Turtles (True Book)* by Emilie U. Lepthien

*Sea Turtles (Undersea Encounters)* by Mary Jo Rhodes

*So excellent a fish: A natural history of sea turtles (Doubleday Anchor natural history book)* by Archie Fairly Carr

Climate Change:

<http://www.pbs.org/kqed/oceanadventures/educators/amazon/climateconundrum.html>

Cold Stunning:

[http://www.riverheadfoundation.org/mediacenter/detail.asp?briefing\\_id=46](http://www.riverheadfoundation.org/mediacenter/detail.asp?briefing_id=46)

Coloring Book:

<http://www.oceanconservancy.org/site/DocServer/seaTurtleColoringBook.pdf?docID=481>

<http://galveston.ssp.nmfs.gov/kidstuff/ColorBook.pdf>

[http://www.oceana.org/fileadmin/oceana/uploads/reports/TurtleTalks\\_en.pdf](http://www.oceana.org/fileadmin/oceana/uploads/reports/TurtleTalks_en.pdf)

Computer screen wallpaper/photo images:

<http://www.snap-shot.com/wallpaper/ocean.htm>

[http://animals.nationalgeographic.com/animals/photos/sea-turtles/hawksbill-turtle\\_image.html](http://animals.nationalgeographic.com/animals/photos/sea-turtles/hawksbill-turtle_image.html)

<http://www.myxer.com/wallpaper:1493059/>

[http://pulsarmedia.eu/r\\_life\\_in\\_ocean\\_&\\_sea\\_wallpapers\\_1\\_sea\\_turtle\\_1024x768\\_wallpaper\\_12362.html](http://pulsarmedia.eu/r_life_in_ocean_&_sea_wallpapers_1_sea_turtle_1024x768_wallpaper_12362.html)

<http://www.montereybayaquarium.org/newsletter/wallpaper.aspx>

<http://usasearch.gov/search?v%3Aproject=firstgov-noaa-images&query=sea+turtle>

Conservation:

<http://nationalzoo.si.edu/ConservationAndScience/AquaticEcosystems/SeaTurtles/>

[http://marinediscovery.arizona.edu/lessonsF00/brittle\\_stars/2.html](http://marinediscovery.arizona.edu/lessonsF00/brittle_stars/2.html)

Fact Sheets:

<http://www.nmfs.noaa.gov/pr/education/turtles.htm>

<http://seaturtles.org/article.php?list=type&type=14>

[http://assets.panda.org/downloads/marine\\_turtles\\_factsheet2006.pdf](http://assets.panda.org/downloads/marine_turtles_factsheet2006.pdf)

<http://animals.nationalgeographic.com/animals/reptiles/green-turtle.html>

<http://www.fws.gov/northflorida/SeaTurtles/turtle-facts-index.htm>

Fibropapilloma tumors:

<http://www.turtles.org/sickbay.htm>

<http://www.turtles.org/tumour.htm>

Games:

[http://seaturtles.live.radicaldesigns.org/downloads/pg\\_16-17\\_TURLE\\_GAME.pdf](http://seaturtles.live.radicaldesigns.org/downloads/pg_16-17_TURLE_GAME.pdf)

<http://www.euroturtle.org/game/gboard.htm>

Guides:

<http://www.seaworld.org/animal-info/info-books/sea-turtle/index.htm>

[http://www.seaturtle.org/documents/Educators\\_Guide.pdf](http://www.seaturtle.org/documents/Educators_Guide.pdf)  
[http://www.sprep.org/att/publication/00547\\_SeaTurtleKitWeb.pdf](http://www.sprep.org/att/publication/00547_SeaTurtleKitWeb.pdf)  
[http://www.tourdeturtles.org/registration/Ed\\_Guide\\_Download.php](http://www.tourdeturtles.org/registration/Ed_Guide_Download.php)  
<http://www.marine-ed.org/bridge/wildcoastenglish1.pdf>

History: *Fire in the Turtle House* by Osha Gray Davidson ©2001, PublicAffairs,  
ISBN I-58648-000-6

How to Draw a Turtle:

<http://drawsketch.about.com/library/bl-step-turtle.htm>  
[http://www.oceana.org/fileadmin/oceana/uploads/reports/TurtleTalks\\_en.pdf](http://www.oceana.org/fileadmin/oceana/uploads/reports/TurtleTalks_en.pdf) (page 8)

Online Interactive Lessons:

[http://www.euroturtle.org/ed\\_welcome.htm](http://www.euroturtle.org/ed_welcome.htm)

Origami Sea Turtle:

<http://oceanservice.noaa.gov/education/yos/activities/endangeredspeciesorigami.pdf>

Poster:

<http://seaturtles.live.radicaldesigns.org/downloads/gulfturtlesposter.pdf>  
[http://wildcoast.net/site/gallery/main.php?g2\\_view=core.DownloadItem&g2\\_itemId=437&g2\\_serialNumber=2](http://wildcoast.net/site/gallery/main.php?g2_view=core.DownloadItem&g2_itemId=437&g2_serialNumber=2)

Power Point: Life Cycle

[http://www.arkiveeducation.org/resource\\_list\\_sci11-14.html](http://www.arkiveeducation.org/resource_list_sci11-14.html)

Project WILD (lessons: "Turtle Hurdles," "Sea Turtles International"):

<http://www.projectwild.org/index.htm>

Rescue:

<http://www.seaturtlehospital.org/>

San Diego Bay green turtles:

<http://swfsc.noaa.gov/textblock.aspx?Division=PRD&ParentMenuId=212&id=4378>  
[http://www.signonsandiego.com/uniontrib/20060530/news\\_1n30turtle.html](http://www.signonsandiego.com/uniontrib/20060530/news_1n30turtle.html)  
<http://www.portofsandiego.org/environment/turtle-tracks/832-turtle-tracks.html>

Satellite Tracking:

<http://www.topp.org/>  
<http://www.seaturtle.org/tracking/>  
<http://www.seaturtle.org/tracking/images/turtletrax2.jpg>  
<http://stort.unep-wcmc.org/imaps/indturtles/viewer.htm>  
<http://www.tourdeturtles.org/alt-index.html>  
<http://cccturtle.org/satelliteturtles.php>  
<http://seamap.env.duke.edu/>

<http://web.vims.edu/bridge/mansfield.html?svr=www>

Saving turtles:

<http://www.bajainsider.com/environment/teachersavingturtles.htm>

Seafood Watch Pocket Guides:

[http://www.montereybayaquarium.org/cr/cr\\_seafoodwatch/download.aspx](http://www.montereybayaquarium.org/cr/cr_seafoodwatch/download.aspx)

Jeff Seminoff, PhD.:

<http://web.mac.com/jeffrey.seminoff/iWeb/Site/Home.html>

Threats:

<http://www.seaturtles.org/article.php?list=type&type=104>

<http://www.cccturtle.org/sea-turtle-information.php>

<http://www.turtles.org/threats.htm>

## Sea Turtle Videos



From Discovery Education <http://www.discoveryeducation.com/>  
Streaming video segments: (length)

- Welcome to Borneo (Jeff Corwin)
  - Sea Turtle (4:13)
  - At the Hatchery (2:47)
- Beneath: The South Pacific
  - Sea Turtles (:41)
- Animal Classifications: If You Were a Reptile
  - Sea Turtles (1:53)
- The Jeff Corwin Experience
  - Working with Sea Turtles (3:06)
- Discovering Math: Grades 3-5: Probability [good with the Threats lesson]
  - Group predictions based on historical data—turtles (1:19)
- Enviro-Tacklebox: Module 03:Topics....
  - Turtle Extruder Device (:39)
- Animal Alphabet: U & V [good for Life Cycle lesson]
  - U is for Underwater sea turtle (4:42)
- Beneath: The Caribbean [good for Life Cycle lesson]
  - Marine turtles (2:55)
- Reproduction in organisms
  - Reproduction of green sea turtles (1:31) [good for Life Cycle lesson]
- Essential & Endangered: Coral Reef biomes
  - Garbage (:24) [good with the Threats lesson]

NOAA videos (Observer Training, Removing Fishing Gear, TEDs, Anatomy):  
<http://www.sefsc.noaa.gov/seaturtlevideos.jsp>

National Geographic: several videos on different sea turtle species  
[http://video.nationalgeographic.com/video/player/animals/reptiles-animals/turtles-and-tortoises/shark\\_tiger\\_turtles.html?source=sem\\_G2114&s\\_kwcid=turtle%20video|2681297807&kwid=turtle%20video|2681297807&gclid=CPO5mdaugJwCFRBbagodCG3D-A](http://video.nationalgeographic.com/video/player/animals/reptiles-animals/turtles-and-tortoises/shark_tiger_turtles.html?source=sem_G2114&s_kwcid=turtle%20video|2681297807&kwid=turtle%20video|2681297807&gclid=CPO5mdaugJwCFRBbagodCG3D-A)

Schooltube:

The Turtle Hospital: <http://www.schooltube.com/video/5520/ISMF-A-Haven-for-Turtles>

Arhive: many videos on different sea turtle species

<http://www.arkive.org/green-turtle/chelonia-mydas/video-09e.html>

National Wildlife Federation: baby turtle release

[http://blogs.nwf.org/arctic\\_promise/2009/07/minute-and-half-film-baby-sea-turtles-released-in-mexico.html](http://blogs.nwf.org/arctic_promise/2009/07/minute-and-half-film-baby-sea-turtles-released-in-mexico.html)

Teacher's Domain: (need to register)

<http://www.teachersdomain.org/resource/tdc02.sci.life.reg.seaturtles/> (1:43)

Sea Turtle Assessment      Name \_\_\_\_\_

Time to show all you know!

Matching: Put the letter of the best response below on the line. (4 points each = 60)

- \_\_\_\_\_ 1. when there are no more of a species left on earth
- \_\_\_\_\_ 2. sea turtles are classified in this Class
- \_\_\_\_\_ 3. adult female sea turtles must go to this place to lay eggs
- \_\_\_\_\_ 4. what sea turtles do from their feeding grounds to their nesting site
- \_\_\_\_\_ 5. what fishermen can put in their nets to allow turtles to escape
- \_\_\_\_\_ 6. the federal law that makes it illegal to harm, harass, or kill sea turtles, their eggs or hatchlings
- \_\_\_\_\_ 7. a disease affecting many sea turtles
- \_\_\_\_\_ 8. sea turtle ancestors were on earth prior to these
- \_\_\_\_\_ 9. green sea turtles eat this, making them herbivorous
- \_\_\_\_\_ 10. a sea turtle's back, easily injured by a boat's propeller
- \_\_\_\_\_ 11. the underside of a sea turtle
- \_\_\_\_\_ 12. the plates on a sea turtle's back, individual to each species
- \_\_\_\_\_ 13. the technology used by scientists to track sea turtle migration
- \_\_\_\_\_ 14. what determines the gender of a sea turtle egg once it's buried
- \_\_\_\_\_ 15. the largest threats to sea turtles come from these

- A. carapace
- B. dinosaurs
- C. Endangered Species Act
- D. extinct
- E. FP or fibropapilloma
- F. human beings' activities
- G. migrate
- H. nesting beach
- I. plastron
- J. Reptilia
- K. satellite telemetry
- L. scutes
- M. sea grass and/or algae
- N. temperature
- O. Turtle Excluder Devices

Answer the following on another piece of paper in essay format. (40 points)

What are at least three things that you, as a student, can do to help sea turtles survive? Be sure to include why you would do these things, how it will affect the turtles, and what other consequences (economic, biological, social, etc.) there are to these actions.

Sea Turtle Assessment Name \_\_\_\_\_ **KEY**

Time to show all you know!

Matching: Put the letter of the best response below on the line. (4 points each = 60)

- D   1. when there are no more of a species left on earth
- J   2. sea turtles are classified in this Class
- H   3. adult female sea turtles must go to this place to lay eggs
- G   4. what sea turtles do from their feeding grounds to their nesting site
- O   5. what fishermen can put in their nets to allow turtles to escape
- C   6. the federal law that makes it illegal to harm, harass, or kill sea turtles, their eggs or hatchlings
- E   7. a disease affecting many sea turtles
- B   8. sea turtle ancestors were on earth prior to these
- M   9. green sea turtles eat this, making them herbivorous
- A   10. a sea turtle's back, easily injured by a boat's propeller
- I   11. the underside of a sea turtle
- L   12. the plates on a sea turtle's back, individual to each species
- K   13. the technology used by scientists to track sea turtle migration
- N   14. what determines the gender of a sea turtle egg once it's buried
- F   15. the largest threats to sea turtles come from these

- A. carapace
- B. dinosaurs
- C. Endangered Species Act
- D. extinct
- E. FP or fibropapilloma
- F. human beings' activities
- G. migrate
- H. nesting beach
- I. plastron
- J. Reptilia
- K. satellite telemetry
- L. scutes
- M. sea grass and/or algae
- N. temperature
- O. Turtle Excluder Devices

Answer the following on another piece of paper in essay format. (40 points)

What are at least three things that you, as a student, can do to help sea turtles survive? Be sure to include why you would do these things, how it will affect the turtles, and what other consequences (economic, biological, social, etc.) there are to these actions. **See the handout "How Students Can Help Sea Turtle Conservation"**