



Lesson: Which Way to the Ocean?

OVERVIEW

In this lesson, students will study the nesting process of the endangered loggerhead turtle species and watch a video clip that illustrates how artificial lighting along nesting beaches disorients turtle hatchlings and hinders their ability to reach the ocean successfully. Students will then identify ways that humans can reduce the threat of such lighting to natural habitat.

The video clips provided with this lesson are from the film **The City Dark**, a documentary about light pollution and the disappearing night sky. The film asks viewers to stop and ponder what light, darkness and the stars mean to us, spiritually, physically, intellectually, socially and economically. For more information on loggerhead turtles and light pollution, please see the [Resources](#) section of this lesson.

POV documentaries can be recorded off-the-air and used for educational purposes for up to one year from the initial broadcast. In addition, POV offers a lending library of DVDs and VHS tapes that you can borrow anytime during the school year—FOR FREE! Get started by joining our [Community Network](#).

OBJECTIVES

By the end of this lesson, students will:

- Explain the nesting process of loggerhead turtles.
- Describe the role that light plays in how turtle hatchlings find their way to the ocean.
- Identify manmade and natural threats to the survival of turtle hatchlings.
- Determine how artificial light could affect the survival of natural habitat.
- Identify how humans can reduce the potential for light to disrupt habitat.

GRADE LEVELS

6-12

SUBJECT AREAS

Biology, Environmental Studies, Geography, Current Events

MATERIALS

- Internet access and equipment to show the class online video, display pages and allow students to conduct research
- Handout: [Which Way to the Ocean?](#) (PDF file)
- Handout: IDA Practical Guide (PDF file)

ESTIMATED TIME NEEDED

One 50-minute class period

FILM CLIPS

Clip 1: "How Lights Can Confuse Baby Sea Turtles" (length 4:31)

This clip starts at 21:24 with a shot of the beach. It ends at 25:55 with the narrator saying, "...are lost to disorientation."

Clip 2: "The Potential Impact of Light and Darkness on Health" (length 8:40)

This clip starts at 31:05 with an upward shot underneath a spotlight. It ends at 39:45 with the line "...what time of night is most problematic."

Clip 3: "Addressing Light Pollution" (length 3:52)

This clip begins at 44:40 with a man getting out of a car. It ends at 48:32 after the narrator says, "...all that we gained when the stars came back," and there is a shot of the starry sky.

ACTIVITY

1. Show the class the page "[Loggerheads Get New Category](http://www.gpb.org/news/2011/09/16/loggerheads-get-new-category)" (<http://www.gpb.org/news/2011/09/16/loggerheads-get-new-category>) and point out that in 2011, loggerhead turtles went from being ranked as "threatened" to being considered "endangered." Explain that "threatened" means that a species is likely to be at the brink of extinction in the near future, and "endangered" is a more extreme category that labels a species in danger of extinction now. In order to determine whether or not loggerheads are close to extinction, scientists monitor factors such as nesting behaviors and threats to turtle hatchlings.
2. Display the page, "[Loggerhead Nesting in Florida](http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/)" (<http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/>) and tell students that in the United States, 90 percent of all loggerhead nesting occurs in the areas shown in color on the map. The areas shaded red are counties with the highest number of nests. Explain that these nesting beaches are also popular tourist and recreation areas, so they are typically lined with hotels, restaurants, apartment buildings and private homes.
3. Give each student a handout. Have students work in pairs to research and complete number one on the handout, which asks them to describe the nesting process for loggerhead turtles. Some recommended sources of information for their research include the books in the [Resources](#) section of this lesson plan and these websites:

National Academy of Sciences: Sea Turtle Status and Trends
<http://dels-old.nas.edu/osb/enhancedbriefs/seaturtles.html>

Sea World: Sea Turtle Nesting Behavior
<http://www.seaworld.org/infobooks/seaturtle/strepro.html>

See Turtles: Baby Sea Turtles
<http://www.seeturtles.org/1403/baby-sea-turtles.html>

Florida Department of Environmental Protection: Understanding, Assessing and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches
http://www.nofs.navy.mil/about_NOFS/staff/cbl/LPSnet/FMRI-TR2.pdf

4. When students have completed the first part of the handout and are familiar with the nesting process for loggerhead turtles, review questions 2 and 3 on the handout and ask students to note answers to these questions as they watch Clip 1: “How Lights Can Confuse Baby Sea Turtles” (length 4:31).

5. Tell students that baby sea turtles are not the only creatures affected by artificial light at night. Explain that artificial light at night contributes to disruption of many animals’ natural behaviors, such as reproduction, foraging and inter-species communication. These all follow light-sensitive cycles.

6. Have students review questions 4 to 6 on the handout. Distribute the IDA Practical Guide and break them up into pairs again. After they have answered the remaining questions, lead a discussion about lighting and its impact on the survival of various species and habitats. Ask students which of the IDA “Practical Actions” they think would be most helpful for better managing artificial light.

EXTENSIONS

- Track the movements of sea turtles in the ocean via satellite. [Seaturtle.org](http://www.seaturtle.org/tracking/) (<http://www.seaturtle.org/tracking/>) tracks a number of turtles, and the [Sea Turtle Conservancy](http://www.conserveturtles.org/educators.php?page=activities) (<http://www.conserveturtles.org/educators.php?page=activities>) provides maps and data sets for plotting approximate turtle locations over time. The class can then use the map scale or [latitude and longitude points](http://www2.nau.edu/~cvm/latlongdist.html) (<http://www2.nau.edu/~cvm/latlongdist.html>) to plot and calculate the total distance traveled by a turtle, as well as average daily distance traveled and average daily speed. By studying a turtle’s movements, can students tell whether it is feeding, migrating or nesting? What conclusions can students draw from the behavior and the physical characteristics of turtles based on total distance traveled? Have students record their findings and analysis in observation journals.
- Analyze statistics related to turtle nests in Florida. The Florida Fish and Wildlife Conservation Commission provides [statewide nesting totals](http://myfwc.com/research/wildlife/sea-turtles/nesting/statewide/) (<http://myfwc.com/research/wildlife/sea-turtles/nesting/statewide/>) broken down by county and turtle species. Students can use the data to create graphs and identify any patterns or trends. You can also assign students to use a [map of Florida counties](http://www.mapwise.com/maps/florida/florida-counties-map.php) (<http://www.mapwise.com/maps/florida/florida-counties-map.php>) to show the geographic distribution of the columns of data for green turtles and leatherbacks (as was done with the [map of loggerhead nesting](http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/) (<http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead/>) shown in Step 2 of the main lesson activity). How does illustrating the data from the table on a map help scientists interpret the information? How could such maps help with turtle conservation efforts?
- Examine the potential impact of light and darkness on health. Ask students to estimate how many hours they sleep each night, on average, and the amount of light to which they are typically exposed at night. Have students keep these

factors in mind as they watch Clip 2: "[The Potential Impact of Light and Darkness on Health](#)" (length 8:40). Students should also read the article, "[Lack of Sleep, Light at Night Can Raise Cancer Risk](#)"

(<http://www.medicaldaily.com/news/20111011/7369/cancer-sleep-cancer-epidemiologist-steve-jobs-antioxidant-melatonin-cortisol-hydrocortisone.htm>).

Discuss: What is melatonin? What does it do? How is it affected by light and darkness? How might working overnight affect levels of melatonin in the body? What has research on lab rats suggested about the possible connection between night-shift work and cancer risk? What further research needs to be done? What could be the economic, social and political effects if scientists find conclusive evidence that working the night shift poses major health risks? Have students write paragraphs that explain how they think individuals, families, communities, employers or government officials should respond if researchers prove that there is a link between cancer risk and night-shift work.

- Explore other aspects of "light pollution." Have small student groups first read about and define [light pollution](#) (<http://www.pbs.org/seeinginthedark/astronomy-topics/light-pollution.html>). Discuss what issues it causes and potential solutions. Then watch Clip 3: "[Addressing Light Pollution](#)" (length 3:52) and talk about how the presence or absence of light affects both urban and rural settings. Why would the residents of Bar Harbor, Maine pass a law to limit the use of artificial lights to only those that are absolutely needed? What impact do students think such a law will have on life in Bar Harbor? How do the lights in your city or town affect local wildlife and human interaction with the environment and each other? Have student groups also [experiment](#) (<http://analyzer.depaul.edu/paperplate/lights.htm>) with how shielding light can minimize wasted light and glare. Finally, ask students to consider various types of "[friendly sky lighting](#)" (<http://www.elights.com/darksky.html>) and develop designs to light a specific location in a way that creates minimal light pollution.
- Investigate further the impact of light on daily life. Watch the entire film **The City Dark** and take notes on positive uses of light (e.g., for celebration, to give tribute, to increase safety, as art, to increase visibility) and negative ones (e.g., light pollution, increasing threats to wildlife). Instruct students to keep observation journals for one week in which they record how light is used in the world around them and analyze whether or not such uses are helpful or harmful.
- Help students explore the night sky first-hand with resources from the [Seeing in the Dark](#) (<http://www.pbs.org/seeinginthedark/>) website. Features include observation guides for beginners, videos that explain how to use a star chart and telescope, a special section for educators and much more. Host a stargazing event for students in partnership with your local astronomical society or, if light pollution is an issue in your area, go on a field trip to a planetarium.
- Develop greater awareness of the night sky by studying constellations. Students can use a [star chart](#) (<http://www.fourmilab.ch/yoursky/>) to select a constellation. They should then research more about who or what it represents. Next, ask students to create their own constellations using the star chart or the interactive PBS feature [Stars](#) (<http://www.pbs.org/parents/creativity/ideas/stars.html>) as a reference. Finally, have students [write myths](#) (

and-activities.com/how-to-write-a-myth.html) about their constellations and share their work with the class.

RESOURCES

Books

One Tiny Turtle

By Nicola Davies

This non-fiction picture book provides beautiful illustrations and simple, poetic text to explain the life cycle of loggerhead turtles.

Sea Turtles: An Ecological Guide

By David Gulko and Karen Eckert

This guide uses photos and text to describe the life cycle and habitat of and threats to sea turtles.

Sea Turtles: The Watcher's Guide

By M. Timothy O'Keefe

This book describes the nesting process in detail and explains how to identify different species of turtles.

Websites

Florida Department of Environmental Protection: Understanding, Assessing and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches

http://www.nofs.navy.mil/about_NOFS/staff/cbl/LPSnet/FMRI-TR2.pdf

This technical report summarizes research that supports the conclusion that turtles rely on sight to find the ocean and are attracted to brightness. It also discusses strategies for inspecting lighting along beaches and monitoring turtle nesting behavior.

Florida Fish and Wildlife Conservation Commission: Artificial Lighting and Sea Turtle Hatchling Behavior

<http://myfwc.com/research/wildlife/sea-turtles/threats/artificial-lighting/>

This article provides answers to commonly asked questions related to managing light alongside turtle nesting beaches.

International Dark-Sky Association

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

This organization is dedicated to preserving the night sky by limiting light pollution. Its website includes resources about lighting laws, residential lighting, reports and studies on light pollution, night sky conservation efforts and more.

National Academy of Sciences: Sea Turtle Status and Trends

<http://dels-old.nas.edu/osb/enhancedbriefs/seaturtles.html>

This resource includes brief video clips related to nesting behaviors and describes challenges related to tracking and gathering data about sea turtles.

NOAA Fisheries: Loggerhead Turtle

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

This site provides some basic facts about loggerheads, their habitat, distribution, population trends, threats, related conservation efforts and legal status as an endangered species.

Seaturtle.org: Nest Monitoring System

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

This tool provides preliminary data for the most recent turtle nesting behavior on select Florida beaches and around the world.

State of the World's Sea Turtles: Lifecycle of a Turtle

<http://seaturtlestatus.org/learn/lifecycle>

This resource provides a succinct description and illustration of the lifecycle of sea turtles.

STANDARDS

Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects

(http://www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf)

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

RST.9-10.2. Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon or concept; provide an accurate summary of the text.

RST.11-12.2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes or information presented in a text by paraphrasing them in simpler but still accurate terms.

RST.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

RST.11-12.5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings and speculation in a text.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video or multimedia sources with that gained from reading a text on the same topic.

RST.9-10.9. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

RST.11-12.9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon or concept, resolving conflicting information when possible.

SL.6-8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on [grade-appropriate] topics, texts and issues, building on others' ideas and expressing their own clearly.

SL.6-8.2. Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text or issue under study.

SL. 9-12.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on [grade-appropriate] topics, text and issues, building on others' ideas and expressing their own clearly and persuasively.

WHST.6-10.2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments or technical processes.

WHST.6-12.4. Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.

Content Knowledge: (<http://www.mcrel.org/standards-benchmarks/>) a compilation of content standards and benchmarks for K-12 curriculum by McRel (Mid-continent Research for Education and Learning).

Geography, Standard 2: Knows the location of places, geographic features and patterns of the environment.

Geography, Standard 8: Standard 8: Understands the characteristics of ecosystems on Earth's surface.

Geography, Standard 14: Understands how human actions modify the physical environment.

Language Arts, Standard 7: Uses skills and strategies to read a variety of informational texts.

Language Arts, Standard 9: Uses viewing skills and strategies to understand and interpret visual media.

Science, Standard 6: Understands relationships among organisms and their physical environment.

ABOUT THE AUTHOR

Cari Ladd, M.Ed., is an educational writer with a background in secondary education and media development. Previously, she served as PBS Interactive's director of education, overseeing the development of curricular resources tied to PBS programs, the PBS TeacherSource website (now PBS Teachers) and online teacher professional development services. She has also taught in Maryland and Northern Virginia.