

# Dark Skies Rangers Program

## Do They “See the Light”?

**Grades:** 5 – 8

**Overview:** This is an introductory activity using prior student knowledge and simple materials to raise awareness of the possible effects artificial lights may have on animals. Students have all seen insects flying around lights at night. This activity uses that knowledge to explore if artificial night light has an effect on other living organisms and what might be consequences artificial night lighting may have on the behavior and/or health of these organisms.

**Purpose:** Students will plan and conduct a simple investigation surrounding the effect(s) artificial nighttime light has on insect behavior (animals). They will make predictions, observations, collect data and generate conclusions. They will generalize their findings to other species and do an article/on-line search to investigate if their ideas are supported in the literature.

**U.S. National Standards: (selected standards not limited to the following)**

**NS.5-8.1 SCIENCE AS INQUIRY**-all students should develop—

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

**NS5-8.5 SCIENCE AND TECHNOLOGY**...students should develop—

- Abilities of technological design
- Understandings about science and technology

**NS.5-8.6 PERSONAL AND SOCIAL PERSPECTIVES**...students should develop understanding of...

- Personal health
- Populations, resources, and environments
- Risks and benefits
- Science and technology in society

**NS.5-8.7 HISTORY AND NATURE OF SCIENCE**...students should develop understanding of

- Science as a human endeavor
- Nature of science
- History of science

**Arizona Standards: (not limited to those listed below...)**

**Grade 5,6,7**

**S1,C1,PO1.** Formulate a relevant question through observations that can be tested by an investigation.

(See M05-S2C1-01)

**S1,C2,PO2.** Participate in guided investigations in life, physical, and Earth and space sciences.

**S1,C2,PO3.** Perform simple measurements using non-standard units of measure to collect data.

**S1,C2,PO2.** Plan a simple investigation that identifies the variables to be controlled.

**S1,C3,PO1.** Organize (e.g., compare, classify, and sequence) objects, organisms, and events according to various characteristics. (See M00-S4C4-01 and M00-S4C4-03)

**S1,C3,PO5.** Identify possible relationships between variables in simple investigations (e.g. time and distance; incline and mass of object).

**S2,C2,PO1.** Provide examples that support the premise that science is an ongoing process that changes in response to new information and discoveries (e.g., space exploration, medical advances).

**S3,C1,PO3.** Evaluate the possible strengths and weaknesses of a proposed solution to a specific problem relevant to human, animal, or habitat needs.



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### Grade 8

**S1,C1,PO1.** Formulate questions based on observations that lead to the development of a hypothesis.  
(See M08-S2C1-01)

**S1,C2,PO2.** Design a controlled investigation to support or reject a hypothesis.

**S1,C3,PO3.** Interpret data that show a variety of possible relationships between two variables, including:

- positive relationship
- negative relationship
- no relationship

**S1,C4,PO3.** Communicate with other groups or individuals to compare the results of a common investigation.

**S2,C2,PO2.** Describe how scientific knowledge is subject to change as new information and/or technology challenges prevailing theories.

### Objectives:

**Content Objective:** Students will...

- Plan and conduct an investigation
- Analyze and graphically represent data
- Draw conclusions based on their investigation
- Work in a group
- Communicate results of their investigation to an audience of their peers

**Language Objective:** Students will

- write a summary of an article using correct sentence structure.
- Watch a video and sequence the story when given four story cards.
- Discuss with partner and write down a procedure for collecting data.

**Time to Do Activity:** Two sessions -- may not take the entire session either day.

*(This is a short activity that exposes students to think about the unintended consequences artificial lighting has on an ecosystem.)*

### Materials needed:

- clear sticky tape—packaging tape is best or clear contact paper, fly paper
- assortment of light bulbs/ various wattage (colors may be used as extension)

**Cautionary Note:** students will be collecting their data at home around electric sources. Depending on grade level you might think about sending home a note, to be signed by parent, alerting them of this.

**Preparation/Prerequisites:** demonstrate wrapping a light fixture making sure the sticky side of the tape is facing out!

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### Lesson Sequence:

**Hook:** Satellite image of earth at night available on Internet at <http://incredimazing.com/static/media/2008/03/07/dfe0d8c8c1036e0/EarthatNight.jpg>

### Day 1 Question

Do you think nighttime artificial light can affect animal behavior?  
Give an example to support your thought.

### **Part 1 –Introduction (grouping and pre-assessment)**

- Pass out *Student Sheet #1*. Each student completes this.
- Select a sharing technique where student have to meet up with at least 3 others to exchange ideas. (Think – Pair – Share)

### **Part 2-- Planning and conducting investigation-- (HW)**

- Group students in pairs according to like-minded answers to “light affecting animal behavior.”
- Distribute *Student Sheet #2* to each student. Have the pairs individually complete sheet agreeing on how they will support their statement. They will be collecting their evidence that night for HW.

### Day 2

### **Part 3—Communicating results**

- Students can display their evidence and a written conclusion on a large sheet of paper provided by teacher (if possible). Conduct a *gallery walk* around classroom so all students can observe what was collected. (5 mins.) In the real world some students will not complete their HM. This gallery walk will give all students experience on how light affects behavior. (Most will probably collect insects.)  
Teacher will then aid the class in processing their findings. (NOTE: There might be evidence that shows artificial light has no effect on behavior; this is fine.)
- Teacher will choose a video showing another animal, other than what students are familiar with, being affected by artificial light. (You can find videos on Google Video of hatching turtles heading toward the ocean.) This is an opportunity to talk about food webs **and** how artificial light might indirectly affect the stability of a particular food web in an ecosystem. This will broaden the discussion at the wrap up. (During this discussion some students will volunteer information on the effects artificial light has on plants. Congratulate all students for making this connection but do not pursue this because of time limitation.)

### **Part 4 –Wrap up (Depending on time)**

- Distribute readings you have found on subject (below) and have students summarize how lighting effects various types of species using a particular reading strategy appropriate to your class and needs.

**Links:** Distribute to students a list of species and have them research how artificial light might affect their behavior or provide them with specific articles, some of which are listed below.

- Scientific America, *Reflected Light Disrupts Animal Behavior* January 7, 2009.
- Effects Of Artificial Light on Wildlife <http://www.wildlandscpr.org/biblio-notes/effects-artificial-lighting-wildlife>
- Light Pollution and Animal Behavior <http://www.starlight-theatre.ca/images/LP-ANIMALS.PDF>
- Effects of Light Pollution on Deep Sea Organisms  
<http://montereybay.noaa.gov/research/techreports/trkochevar.html>

**Assessment:** [www.rubistar.com](http://www.rubistar.com) is a site where teachers can develop and print their own rubrics.

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## Do They “See the Light”?

Student Sheet #1

Name \_\_\_\_\_ Date \_\_\_\_\_ Per \_\_\_\_\_

- Do you think artificial light has any affect on animal behavior at night? \_\_\_\_\_
- Give an example to support your idea(s). Think of a time when you have seen an animal (includes insects, birds, fish, humans) react/not react to nighttime artificial light.

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## Do They “See the Light”?

Student Sheet #2

Investigation Outline

Name \_\_\_\_\_

Partner \_\_\_\_\_

We think that artificial night lighting \_\_\_\_\_ (does / does not) affect behavior.

How do you plan to support this statement with evidence?

You will have to show the class some evidence that supports your idea.  
(This investigation will be conducted overnight using artificial light.)

Have FUN!



Our Plan is to \_\_\_\_\_

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