



Oklahoma Alliance for Geographic Education

Teacher Training | Curriculum Development | Outreach Programs

Designing and Siting a Pollinator Garden



Tristan Lloyd

Asher Elementary School

Teacher

tlloyd@asher.k12.us

100 East Boyd Street, SEC 684 | Norman, OK 73019-1018
(405) 325-5832 | <https://okageweb.org/> | okage@ou.edu

Lesson Title: Designing and Siting a Pollinator Garden

Grade Level: The following lesson is adaptable to elementary, middle, and high school grade levels depending on which of the listed standards are being taught. Please note the standards listed in this document are only a sample of standards that may potentially be taught using this lesson.

Purpose/Overview:

This lesson is created as a template to design and site a pollinator garden and provide examples of how a pollinator garden may be used to enrich instruction in a variety of subjects including Science, Mathematics, English Language Arts, and Social Studies. The content presented in this lesson was selected as an illustrative example of how all subjects are used to understand a particular issue which impacts communities differently around the world and in Oklahoma. These lesson materials are developed in support of OKAGE's Geo-Inquiry project efforts. To sign up to participate in a dark sky Geo-Inquiry project with OKAGE, contact them at okage@ou.edu.

Standards:

Click [here](#) to view the applicable National Geography and Oklahoma Academic Standards.

Objectives:

1. What **key topic/issue(s)** is/are associated with this lesson/unit? The focus of this lesson is upon the basics of light pollution and how this pollution affects humans, pollinators, and nocturnal species.
2. **What should students know** after this lesson/unit?
Students should understand why light pollution exists, how it impacts pollinators and nocturnal species, and effective ways humans can combat light pollution.
3. **How will students apply** this lesson/unit **content**?
The application methods differ depending on the subject area in which this lesson is being taught.

Materials: List all tangible items needed for the lesson (e.g., handouts, atlases, calculators, colored pencils, construction paper, PowerPoint, computer/LCD projector).

Projector

Internet access

Chromebooks or other computer

Handouts linked in the “Procedures” portion of the lesson plan

Time Frame: 2-4 Weeks

Procedures:

Engage: Use the [“Using the Oklahoma Giant Map to Understand the Heavy Consequences of Light Pollution”](#) lesson from the Oklahoma Alliance for Geographic Education to engage students and introduce them to the concept of light pollution. This lesson can be completed in 1-2 class periods.

Explore: Have students research the impacts of light pollution on pollinators and nocturnal species in their region of Oklahoma.

The following resources are a helpful place to start:

- [Animals Need the Dark \(U.S. National Park Service\)](#)
- [Wild about Bats at WildCare](#)
- [The Nature Conservancy in Oklahoma](#)
- [Oklahoma Biological Survey](#)
- [Native Plants for Native Pollinators in Oklahoma](#)
- [Great Pollinator Plants for Oklahoma](#)
- [A Recipe for Pollinator Garden Success | Oklahoma Department of Wildlife Conservation](#)
- [Why Monarchs?](#)

In addition to their research on pollinators and nocturnal species, students, along with their teacher, will conduct a lighting audit of their school campus to determine an appropriate location for a pollinator garden on their school campus. Ideally, this would be conducted at night in coordination with the Oklahoma Alliance for Geographic Education (OKAGE). DarkSky International has great resources for completing this part of the project:

[DarkSky International](#)

[Five Principles for Responsible Outdoor Lighting | DarkSky International](#)

[Outdoor Lighting Assessment](#)

Explain: Students collaboratively create a presentation outlining the ideal pollinator garden for their region in Oklahoma. Students should include what types of plants are

suitable for pollinators in their region. Additionally, they should include examples of an optimal location for the garden on their school campus (6-8 hours of sunlight, moderate protection from the wind, and little to no artificial lighting at night).

Extend: Students site and plant a pollinator garden at their school.

Evaluate/Assessment: Students write a claim and three supporting pieces of evidence describing how light pollution affects pollinators and nocturnal species in their region of Oklahoma.

Resources:

National Geography Standards

[National Geography Standards Index](#)

Oklahoma Academic Standards

<https://oklahoma.gov/education/services/standards-learning/oklahoma-academic-standards.html>

Additional Educational Resources about Light Pollution

[DarkSky International](#)

Light Pollution Map

<https://www.lightpollutionmap.info/>

Monarch Butterfly Migration Pattern Map

[Monarch Butterfly Migration and Overwintering](#)

Information about Impacts of Light Pollution on Monarch Butterflies

[5 Species Threatened by Light Pollution | DarkSky International](#)

[Why butterflies matter](#)

Extension and Enrichment/Simplification:

In order to reduce the amount of time needed for this lesson, the teacher may conclude the assignment after the “**Explain**” portion of the lesson.

Subject-specific extension options:

English Language Arts and Social Studies:

Have your students compose a letter to city officials about the social, economic, and environmental benefits of reducing light pollution to save money, benefit pollinators and nocturnal species, and restore the natural night sky.

Mathematics:

Students can use online resources to find the cost of items that will be required for their pollinator garden. The goal is to keep the cost of the pollinator garden to no more than \$600.

Science:

In order to extend this activity, consider having your class participate in a Geo-Inquiry experience with OKAGE. OKAGE will work with you and your class (on site and/or virtually) to use the Geo-Inquiry process (<https://education.nationalgeographic.org/resource/geo-inquiry-educator-resources/>) to create a dark sky-friendly pollinator habitat at your school. Educators who decide to participate are eligible for a stipend upon completion of the Geo-Inquiry project. Please contact us at okage@ou.edu for more information.

National Geography Standards from *Geography for Life*

Geographic Elements & Standards:

<https://www.nationalgeographic.org/standards/national-geography-standards/>

1. How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information
3. How to analyze the spatial organization of people, places, and environments on Earth's surface
8. The characteristics and spatial distribution of ecosystems and biomes on Earth's surface
14. How human actions modify the physical environment
18. How to apply geography to interpret the present and plan for the future

Oklahoma Academic Standards for English Language Arts

Elementary

4.1.S.1 Students will work effectively and respectfully in diverse groups by sharing responsibility for collaborative work and recognizing individual contributions made by each group member.

4.1.S.2 Students will engage in collaborative discussions about what they are reading and writing, expressing their own ideas clearly in pairs, diverse groups, and whole-class settings.

4.1.S.3 Students will give informal presentations in a group or individually, organizing information and determining content for the audience, speaking audibly and clearly in coherent sentences.

4.2.R.4 Students will summarize facts and details from an informational text.

4.3.R.5 Students will answer inferential questions using evidence from one or more texts to support answers.

4.4.R.4 Students will consult reference materials (e.g., dictionaries, glossaries, thesauruses) to comprehend the words in a text.

4.4.R.5 Students will acquire new grade-level vocabulary, relate new words to prior knowledge, and apply vocabulary in various contexts.

4.4.W.1 Students will use grade-level vocabulary in writing to clearly communicate ideas.

4.6.R.1 Students will conduct research to answer questions, including self-generated questions, and to build knowledge, using multiple sources (e.g., visual and text reference sources, electronic resources, and/or interviews).

4.6.R.2 Students will identify and use text features (e.g., graphics, captions, headings/subheadings, bold/italicized words, charts, tables, legends) to comprehend informational texts.

4.7.R Students will locate and use information from a variety of alphabetic, aural, visual, spatial, and/or gestural content to compare and contrast perspectives about ideas and topics.

4.7.W Students will communicate their ideas, thoughts, and feelings by combining two or more kinds of content: • writing/alphabetic • sound, visual, and/or spatial • movement

Middle School

7.1.S.1 Students will work effectively and respectfully in diverse groups by showing willingness to make necessary compromises to accomplish a goal, sharing responsibility for collaborative work, and recognizing individual contributions.

7.1.S.2 Students will engage in collaborative discussions about what they are reading and writing, expressing their own ideas clearly while building on the ideas of others in pairs, diverse groups, and whole-class settings.

7.1.S.3 Students will give formal and informal presentations in a group or individually, providing evidence to support a main idea while determining the purpose, content, and form to suit the audience.

7.3.R.1 Students will read works written on the same topic from a variety of historical, cultural, ethnic, and global perspectives and compare the methods the authors use to achieve their purposes.

7.4.W.1 Students will use precise, grade-level vocabulary in writing to clearly communicate ideas.

7.4.W.2 Students will select language in writing to create a specific effect according to purpose.

7.6.R.2 Students will find, record, and organize information from a variety of primary and secondary sources, following ethical and legal guidelines.

7.6.R.3 Students will determine the relevance, reliability, and validity of the information gathered.

7.6.W.4 Students will create research papers and/or projects independently for shorter timeframes (e.g., two or three days) and over extended periods of time (e.g., one week).

7.7.W Students will create multimodal content (i.e., alphabetic, aural, visual, gestural and/or spatial) that effectively communicates ideas for an intended audience.

7.8.W Students will write independently using print, cursive, and/or typing for various lengths of time, choosing and combining modes and genres to suit their audience and purpose.

High School

11.1.S.1 Students will work effectively and respectfully in diverse groups by showing willingness to make necessary compromises to accomplish a goal, sharing responsibility for collaborative work, and recognizing individual contributions.

11.1.S.2 Students will follow agreed-upon rules as they engage in collaborative discussions about what they are reading and writing, expressing their own ideas clearly, building on the ideas of others, and respectfully disagreeing when necessary in pairs, diverse groups, and whole-class settings.

11.1.S.3 Students will conduct formal and informal presentations in a variety of contexts supporting their message with evidence and using verbal and nonverbal cues.

11.4.W.1 Students will use precise, grade-level vocabulary in writing to clearly communicate complex ideas.

11.4.W.2 Students will select language to create a specific effect in writing according to purpose and audience.

11.5.W.1 Students will add clarity, variety, and/or style to their writing and presentations with parts of speech and various types of phrases and clauses, intentionally breaking the rules for effect when appropriate.

11.5.W.2 Students will demonstrate command of Standard American English (i.e., grammar, mechanics, and usage) in writing, presentations, and/or multimodal literacies to convey specific meanings and ideas, intentionally departing from standard usage to achieve a specific effect.

11.6.R.1 Students will find and comprehend information about a topic, using their own viable research questions.

11.6.R.2 Students will synthesize relevant information from a variety of primary and secondary sources, following ethical and legal citation guidelines.

11.6.R.3 Students will evaluate the relevance, reliability, and validity of the information gathered.

11.6.W.4 Students will present research in longer formats (e.g., sustained research projects, process essays) and shorter, informal formats (e.g., single-day research

projects, informal discussion) to a variety of audiences.

11.7.W Students will create engaging multimodal content that intentionally enhances understanding of findings, reasoning, and evidence for diverse audiences.

[Oklahoma Academic Standards for Mathematics](#)

Elementary

4.N.2 Solve real-world and mathematical problems using multiplication and division.

4.N.4 Determine the value of bills and coins in order to solve monetary transactions.

4.GM.2 Recognize and measure attributes in real-world and mathematical situations using various tools.

4.D.1 Summarize, construct, and analyze data.

Middle School

7.N.2.5 Model and solve problems using rational numbers involving addition, subtraction, multiplication, division, and positive integer exponents.

7.D.1 Interpret and analyze data, creating the most appropriate display, using a variety of tools.

High School

A1.D.1 Display, describe, and compare data. For linear relationships, make predictions, and assess the reliability of those predictions.

[Oklahoma Academic Standards for Science](#)

Any standards **highlighted** emphasize engineering and can be used as possible project extensions for older students. Examples of projects are outlined in the [Oklahoma Academic Standards for Science](#).

Elementary

4.LS1.2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the

information in different ways.

Middle School

7.LS2.1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

7.LS2.4 Construct an argument supported by empirical evidence that changes to physical or biological components in an ecosystem affect populations.

7.LS2.5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

7.ESS3.3 Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.

High School

B.LS2.2 Use mathematical representations as evidence to support and revise explanations about factors affecting biodiversity and populations in ecosystems.

B.LS2.6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

B.LS4.5 Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

ES.ESS2.2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedback and interactions that cause changes to other Earth systems.

ES.ESS3.2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios on large and small scales.*

EN.LS2.7 Design, evaluate, and refine a solution for reducing the impact of human activities on the environment and biodiversity.*

EN.ESS3.4 Evaluate design solutions for a major global or local environmental problem that reduces or stabilizes the impacts of human activities on natural systems.*

Oklahoma Academic Standards for Social Studies

Elementary

- 4.C.1.3: Explain the concept of civic virtue and responsibilities of the American citizen.
F. Summarize ways in which citizens are stewards of the nation's environment by examining how natural resources can be managed wisely (e.g., recycling and anti-littering efforts, water conservation, development of renewable energy sources).
- 4.C.2.1: Use geographic tools to acquire and process information from a spatial perspective.

Middle School

- 7.C.1.1: Describe the role of geographic factors on events, explaining the importance of spatial perspective and integrating specific geographic information to support analysis from primary and secondary sources.
- 7.C.1.2: Reinforce geographic skills through the routine practice and use of geographic tools (e.g., thematic maps, graphs, charts, satellite imagery, GIS technologies) in order to draw conclusions and make predictions from geographic data.

Oklahoma Academic Standards for Personal Financial Literacy

- PFL 4. The student will demonstrate the ability to manage a bank account and reconcile financial accounts.