Lesson Title: *Population Ecology*

Author: *Shartzer, Donna*

Topic: Construct an argument based on evidence about how physical and biological changes can affect populations of various species.

Targeted Grade Level: *Eighth Grade*

Time Needed: *Multiple class periods*

Subject Integration: *Science and Technology*

Justification: Students will create some visual representation of how physical and biological changes affect the population of a particular species. Students will be able to do this using technology and/or various forms of media. Students who are more comfortable will be able to use technology apps and/or programs to create a visual model of species affected by changes in their environment. Students could also choose to represent either a drawing or a diorama of physical and biological changes that affect a species population.

Standards:

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

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

8th VA:Cr2.1.8. Demonstrate willingness to experiment, innovate, and take risks to pursue ideas, forms, and meanings that emerge in the process of artmaking or designing.

NGSS Performance Expectations

08-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

06-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

08-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services. [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (06-	*LS2.A: Interdependent Relationships in Ecosystems Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of*	*Patterns* *Patterns can be used to identify cause and effect relationships. (06-LS2-2) Stability and Change Small changes in one part of a system might cause large changes in another part. (08-LS2-5)* *Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (08-LS2-5)* *Connections to Nature of Science Science Addresses Questions About the Natural and Material World Scientific knowledge can*

LS2-2) Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). *Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (08-LS2-5)*	*organisms with their environments, both living and nonliving, are shared. (06-LS2-2)* *LS2.C: Ecosystem Dynamics, Functioning, and Resilience Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (08-LS2-5) LS4.D: Biodiversity and Humans Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to 08-LS2-5) ETS1.B: Developing Possible Solutions There are systematic processes for evaluating solutions with respect to how well they meet the criteria*	*describe the consequence of actions but does not necessarily prescribe the decisions that society takes. (08-LS2-5)*
Common Core State Standards: Math: *If applicable* ELA: *If applicable*		
ITEEA Standards *(If applicable)*		

National Art Standards *(Required)*

Measurable Student Learning Objectives: *Write the learning objectives as "students will be able to" statements. Be sure that your objectives are measurable and connect to the standards listed above.*

You are encouraged to use Webb's Depth of Knowledge to create action-oriented objectives.

Nature of STEM: *Summarize how your lesson addresses the "nature of" science, technology, engineering, math, etc. as discussed in the Methods of STEM course.*

Engaging Context/Phenomena: *What are your engaging phenomena or your "hook" for the lesson? Be sure whatever you choose is appropriate for the subject area and grade level you are addressing.* Several example phenomena are shared in course. Consider how observations of the natural world serve as phenomena to engage students in the content. *You must utilize a NASA resource in your lesson (please discuss with your instructors if you need assistance).*

Data Integration: *What data is being used in this lesson? Are students analyzing or collecting data? What are they doing with the data? This would be a great place to include all the different NASA data made available to you. If NASA data is not appropriate for your lesson, speak to your course instructor to identify another source of data that is appropriate. It may be publicly available, collected by students, or accessible to you with permission through other projects.*

Differentiation of Instruction: *How can you adjust this lesson to meet the unique needs of students in your classes? What needs should be addressed? Think about and make these modifications PRIOR to the lesson so all students have the greatest ability to participate.*

Real-life Connection: *Is there a real-life connection to this lesson? If so, what is it? How have you considered culturally responsive teaching practices? How will students connect to the lesson in their everyday lives?*

Possible Misconceptions: *Are there any previous ideas or thoughts you anticipate students having about this concept? List them here as it will help you consider ideas to include in your lesson.*

Lesson Procedure: *This is where you include each phase of the 5E. They should be extremely clear, well organized, and ready to be used by another educator. Be sure that each learning experience meets the guidelines for each "E". The template below will help you.*

5E Model	5E Objectives
Engage *Introduce the lesson with an anchoring phenomenon. Facilitate student questions, discussion, etc. as appropriate. Learn about what students already know and want to know.*	**Procedure:** *(What happens during this phase? What is the teacher doing? What is the student doing?)* **Modifications** *(What student needs must be addressed? How can you make each experience accessible for ALL learners?)* **Standards Addressed** *(Which standards are being explicitly taught in this section?)* **Formative/Summative Assessments** *(How will you assess in each phase?)* **Resources** *(List all resources and materials used in this part of the lesson.)*
Explore *Plan for students to engage in hands-on activities that are designed to facilitate conceptual change.*	**Procedure:** *(What happens during this phase? What is the teacher doing? What is the student doing?)* **Modifications** *(What student needs must be addressed? How can you make each experience accessible for ALL learners?)* **Standards Addressed** *(Which standards are being explicitly taught in this section?)* **Formative/Summative Assessments** *(How will you assess in each phase?)*

	Resources *(List all resources and materials used in this part of the lesson.)*
Explain *Facilitate opportunities for students to explain their understanding of concepts and processes and make sense of new concepts.*	**Procedure:** *(What happens during this phase? What is the teacher doing? What is the student doing?)* **Modifications** *(What student needs must be addressed? How can you make each experience accessible for ALL learners?)* **Standards Addressed** *(Which standards are being explicitly taught in this section?)* **Formative/Summative Assessments** *(How will you assess in each phase?)* **Resources** *(List all resources and materials used in this part of the lesson.)*
Elaborate *Provide applications of concepts and opportunities to challenge and deep ideas; build on or extend understanding and skills.*	**Procedure:** *(What happens during this phase? What is the teacher doing? What is the student doing?)* **Modifications** *(What student needs must be addressed? How can you make each experience accessible for ALL learners?)* **Standards Addressed** *(Which standards are being explicitly taught in this section?)* **Formative/Summative Assessments** *(How will you assess in each phase?)* **Resources** *(List all resources and materials used in this part of the lesson.)*

Evaluate *Assess students knowledge, skills and abilities.*	**Procedure:** *(What happens during this phase? What is the teacher doing? What is the student doing?)* **Modifications** *(What student needs must be addressed? How can you make each experience accessible for ALL learners?)* **Standards Addressed** *(Which standards are being explicitly taught in this section?)* **Formative/Summative Assessments** *(How will you assess in each phase?)* **Resources** *(List all resources and materials used in this part of the lesson.)*

Teacher Background: *What background information does the teacher need to effectively teach this lesson? If you can provide links to resources, please do so.*