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                                                                                                                          (2 class periods)

NGSS Standard(s)	3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. **Science & Engineering Practices:** Engaging in Argument from Evidence Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. **Disciplinary Core Ideas:** LS2.C: Ecosystem Dynamics, Functioning, and Resilience When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. LS4.D: Biodiversity and Humans Populations live in a variety of habitats, and change in those habitats affects the organisms living there. **Cross Cutting Concepts:** Interdependence of Engineering, Technology, and Science on Society and the Natural World Knowledge of relevant scientific concepts and research findings is important in engineering. Scientific Knowledge Assumes an Order and Consistency in Natural Systems Science assumes consistent patterns in natural systems.

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ELA & Math Connections	**Writing:** CCSS.ELA-LITERACY.W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. CCSS.ELA-LITERACY.W.3.1.A Introduce the topic or text they are writing about, state an opinion, and create an organizational structure that lists reasons. **Math:** CCSS.MATH.CONTENT.3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.
Objective:	Students will be able to use scientific evidence to support a claim about the merit of a solution to an environmental problem that affected the animal life in the area.
Materials	1:1 technology (chromebooks) - Handouts (environmental connections, white tailed deer analysis, graphic organizer, and performance task) - Environmental Connection cards - Pencils
5E Lesson Plan	Measurable Objectives and Standards:
Engage The purpose of the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.	Students will be shown an image of a white-tailed deer, which is a commonly found animal in the region where this lesson will be taught. The image and subsequent analysis of the animal population can vary by location in order to make it a relevant experience for the students. The teacher will ask students: What does this animal survive? Does it rely on other animals for survival? Does it rely on plants? What about non-living things (air, water, shelter)? The teacher will take student answers and record them on the board ensuring that they clarify any misconceptions about the white tailed deer. For example, students may think that the deer hibernate in the winter, etc. The teacher will then explain to students that the objective of the lesson will be for them to think about how living things interact with other living and nonliving things to survive in an

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	ecosystem. The teacher will define an ecosystem as: a community of plants and animals that interact with each other and their physical environment. To gauge student background knowledge of ecosystems and the interactions between them, students will be provided with a card with either an insect or animal, habitat, or nonliving part of an ecosystem on it. Each card has a group that matches. For example, the following cards would go together: Bee, tulip, soil, sun. Each student will be tasked with finding the other members of their group and sitting together. Once the students find each other, they will discuss the following questions and record their answers on the worksheet provided: How do the insect/animal and plant on your cards interact with each other? How do the living and nonliving organisms on your cards depend on each other? (Name 2 ways) Answer the question that was provided on your card below. (Ex. Could a tulip survive in a river ecosystem?). When all groups have discussed on their own, each group will share their answer to the question on their card with the class. The teacher will ask the class: What do all of your questions and answers have in common? The teacher will take student answers and explain that animals and plants rely on the nonliving parts of their ecosystems for survival. For example, the lizard in one of the groups could not survive in the snow because it needs the sun, soil, and cacti in order to get food, shelter, and regulate its body temperature. ==This section of the lesson was adapted from one provided by Generation Genius.==
Explore The purpose of the EXPLORE stage is to get students involved in the topic providing them with a chance to build their own understanding.	The teacher will tell students that they will continue to explore how the living parts of an ecosystem need the nonliving parts to survive by continuing to talk about the white tailed deer. The teacher will then explain the directions for this next section of the lesson with the class. Students will work with a group of three to analyze both a graph of the white tailed deer population and a map of the global temperature changes over time. Students will be provided with a graph of the white-tailed deer population in New Jersey and tasked with discussing the patterns they see in the graph with two other members of a group. They will describe the deer population, record the answers to the questions posed about the changing deer population and describe the conditions that the deer population needs to survive on their worksheet provided. Students will then watch the animation of the changing surface temperature on earth provided by My NASA Data. Students will record their observations about the years in which the surface temperature made the most drastic changes on their worksheets. Students will then be asked to make inferences and connections between the temperature being

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	consistently warmer and the deer population in New Jersey. Once each group has completed their analysis worksheets, we will come together to discuss their findings as a class. ==This graphic organizer and sample were adapted from the ones provided on The Wonder of Science.==
Explain The purpose of the EXPLAIN stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.	The teacher will ask students in each group to share their answers to the questions posed on their worksheets. The teacher will record the answers to the final question on the board which challenged students to make connections between the global population and the white tailed deer population. The teacher will ask the class to turn and talk to a partner to answer the following question: How could the nonliving factors of our ecosystem (increase in temperature) be affecting the deer population? The teacher will ask some students to explain their answers using evidence from the graph and the map that they were provided. Then, the teacher will show the two graphs side by side, like on their worksheet, and explain the connection between the global temperature increase and the deer population increase. Explain to students that global temperature increases change the patterns that all animals, including white tailed deer, breed and are active. White tailed deer are more active in the warmer months and therefore have more opportunity to breed when it is consistently warmer. During this section of the lesson, be sure to answer all student questions and consider misconceptions that students may have. This would be the ideal place for the ending of "day 1" of the lesson.
Elaborate/ Extend The purpose of the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.	The teacher will provide students with directions for accomplishing the following tasks. During this section of the lesson, students will be provided with a [graphic organizer](#) that will aid them in coming up with a solution to the excessive white-tailed deer population. They will complete this activity independently. In their graphic organizer, they will describe the problem, the environmental factor that is exacerbating the problem, and come up with a solution to address it. Students will be provided with two articles ([Students ask Congress](#) and [10 Things You Can Do](#)) one video ([Climate Change 101](#)), to be posted on the Google Classroom, on the strategies that can be used to decrease the global temperature and decide which solution holds the most merit. To aid students in their completion of this task, the teacher will review the [sample graphic organizer](#) and the class will discuss what they notice about it and how it can help them in coming up with their own solution to the problem. When students have completed their graphic organizer, they will discuss their chosen solutions as a class. Together as a class, we will choose the solution we feel holds the most merit. As a class, we will

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	describe our reasoning using the CER model (Claim, Evidence, Reasoning). This CER model will be used as a practice for students before they take their assessment. During this whole class practice, the teacher will ensure that all students are understanding the exercise and can independently use the CER model to support the merit of a solution. The graphic organizers were provided by The Wonder of Science.
Evaluate The purpose of the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.	Students will be provided with a performance task wherein they will need to decide what the best solution is for the impact on cars on an ecosystem. Review the provided rubrics with the class before the assessment is given so students understand the criteria being used to grade the assessment. The teacher will review the problem that is affecting the ecosystem, which is that addition of roads and an increase of cars can impact the plants and animals in that area. Students will be asked how they think that the addition of the road is impacting the environment and will be provided with several solutions to the problem wherein students need to evaluate their merit. After students have weighed all of the options for addressing the problem, they will be asked to defend their chosen solution using the CER model previously reviewed in class. Students will be provided with 30 minutes to complete their assessment. Once the assessment has been completed the teacher will review the assessment with students and ask students to share their claims, evidence, and explanations with the class to review how to assess whether or not a solution has merit. This assessment was adapted from the one provided by The Wonder of Science.
References & Citations The purpose this section is to provide adequate information such that another teacher could implement this lesson plan. This includes essential resources in APA format.	*Climate Change 101*. (2020). *The Kid Should See This*. Retrieved November 5, 2021, from https://thekidshouldseethis.com/post/climate-change-101-bill-nye-solutions. Creative Commons Attribution-NonCommercial-ShareAlike. (2018). *3-LS4-4*. The Wonder of Science. Retrieved November 5, 2021, from https://thewonderofscience.com/3ls44. Generation Genius. (2018). Ecosystems Lesson Plan. GenerationGenius.com. How Stuff Works, adapted by Newsela staff. (2020). *10 things you can do to help save the Earth*. Newsela. Retrieved November 5, 2021, from https://newsela.com/read/lib-10-things-to-help-save-Earth/id/2001007468/.

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