

Into the Outdoors

CONSERVING WOOLLY

Developed by: Rachel Konkle

In This Activity ...

Students will research, debate, and develop conservation plans for North America's extinct woolly mammoth. Their plan will consider the needs of the humans, and the health of megafauna and ecosystems.

Educational Partners



GRADE LEVELS

High School - Grades 9-12

CONTENT AREALife Science, Anthropology,
Natural Resource Management,
Wildlife Ecology,**UNIT THEME**

Natural Resource Management

TOPICWildlife Ecology, Habitat Management,
Wildlife Damage Management**TIME REQUIRED**

Three, 45-minute sessions



OVERVIEW

In 10,000 BCE, one of the first humans migrated to our North American continent. They were the Clovis people, or hunter gatherers, who survived the harsh landscape conditions of the Paleo time period by foraging for plant resources and hunting megafauna from the previous ice age. For example, the Clovis people would have encountered the following unique fauna: mastodons, mammoths, short-faced bears, dire wolves, American Cheetahs, Saber-toothed cats, giant American bison, stag-moose, giant beaver, giant ground sloths, glyptodons, horses, camels, and more. However, scientists have determined almost all of the fauna listed here went extinct within 3,000 years after the Clovis people arrived. Some scientists theorize that these species died out since many of them were adapted to the specific environmental conditions from the last ice age, which disappeared due to global warming. Others believe these extinctions were the result of overhunting by Paleo people.

In the 1800s, a similar predicament arose when wildlife populations were commercially harvested for their hides or feathers. This uncontrolled harvest of wildlife pushed some species almost to the brink of extinction ... other species like the passenger pigeon were not so lucky. It was then that hunters and anglers realized there should be limits to protect and steward natural resources. Thus, they created the North American Model of Wildlife Conservation, which birthed the concept of wildlife conservation. Today, wildlife populations are public resources that are legally harvested at healthy levels and conserved for future generations to enjoy. Taxes on hunting gear and licenses also fund the conservation of habitat and wildlife across the country. Moreover, wildlife research is a tool used to make decisions in managing wildlife populations and habitats. To keep wildlife at healthy levels, wildlife managers will manage for habitat quality, such as boosting prey or food resources, restoring damaged or degraded landscapes, providing artificial nesting or breeding habitats, or controlling predation and spread of diseases. Because wildlife live in a world with shrinking habitat and increasing human populations, wildlife have difficulty finding habitat and food resources, which often cause wildlife to encounter humans and damage their property. Wildlife managers often have to use deterrence strategies, create wildlife corridors for wildlife migration, and relocate animals to new habitats to mitigate problems.

In this lesson, students will research and debate how to manage a “recently discovered” woolly mammoth herd in North America and create a conservation plan for this species. Their plans will consider the ecology and management of mammoths and their habitats, biodiversity, and human welfare.

ENDURING UNDERSTANDING:

Students will understand the challenges in managing wildlife populations for both humans and the environment.

CONTENT OBJECTIVES:

Students will be able to evaluate ecological and social factors that determine how to manage wildlife populations. They will also be able to research, debate, and develop a conservation plan that supports the management of a mammoth population in the modern world.

LEARNER OUTCOMES:

Students will use online research and group discussions to decode modern wildlife and habitat management practices. They will develop a megafauna conservation plan that uses the North American Model of Wildlife Conservation and considers human dimensions.

PROCESS OBJECTIVES:

Students will work in small and large groups to process new information and use evidence to come to conclusions.

**MATERIALS NEEDED:** (for each group, for each student)

- Access to computer and the internet
- “Hunting Megafauna with Clovis Kids” video and background information at: <http://intotheoutdoors.org/topics/hunting-megafauna-with-clovis-kids/>
- Pre-lesson Student Worksheet with questions to fill in while watching the video
- Various student worksheets
- (Optional) Art supplies: poster paper, markers, paints, construction paper, scissors, glue

PROCEDURES

Session 1:

Before watching the **Hunting Megafauna with Clovis Kids** classroom video or reading the website background information, ask students what they know about megafauna that used to roam North America. Also ask students about the fundamentals of wildlife management and conservation. Lead a short discussion on how they would conserve these megafauna if they had the chance to today.

Have students download, or print and distribute the **Pre-Lesson Student Worksheet** (copy contained on the web link). Instruct students to fill in the worksheet while watching the video. Go over the questions with the students before viewing so they know what to look and listen for.

Next, divide the class into four large groups:

- Habitat Managers
- Hunters
- Mammoth Relocators
- Mother Earth Advocates

Have students download and print, or hand out to each student their respective Student Worksheets (copies contained on the web link). Ask them to review the details and assignments of the worksheet in preparation for Session 2.

Session 2: Group Research and Conservation Plan Development

In their assigned groups, have students perform online research from links provided and from other sources they discover. The worksheets give instructions and research options that will guide students in their information gathering. Then, have the large groups discuss and create their conservation plan. Inform each team they must prepare to give a presentation of their conservation plan to the class. Their presentation should be supported by research and some form of media (either video, poster, graphs, charts, images).



Session 3: Group Presentations and Class Debate

Have each group present their conservation plan with supporting research and media. Limit each group to 5-minute presentations followed by 3 minutes of questions from other groups. During presentations, ask all the students to write down key conservation practices or problems other groups may have missed. After all groups have presented, lead a group discussion on other conservation practices groups could use and how to resolve issues the “Mother Earth Advocates” brought up. The class should then produce a final conservation plan together, which should balance human and wildlife interests.

Conclude the discussion with a sampling of students who are still dissatisfied with the overall plan and explore what options might be available to fulfill their goals.

ASSESSMENT

- Students will be informally assessed based on their participation within their groups and during class presentations and discussions.
- Teachers could collect the Pre-Lesson Student Worksheets and formally assess the discussion notes students took during the video to check for completion.
- Students can be assessed on meeting the formal learning objectives based on how thoroughly students completed their group worksheets and presentations.
- Students can be evaluated on their presentations during Session 3.

EXTENSION ACTIVITY

Challenge students interested in wildlife management to create a management plan for a landowner. The student may visit the property and scout for wildlife and habitat features in the area. Then the student asks the landowner what goals they have for wildlife on their land (such as increasing or decreasing wildlife species on the property). The student will research and then offer management suggestions that improve habitat or include wildlife deterrence strategies.



RESOURCES FOR TEACHERS & STUDENT RESEARCH

<http://kids.nceas.ucsb.edu/biomes/tundra.html>

<https://www.nationalgeographic.org/encyclopedia/speciation/>

<https://www.washingtonpost.com/news/animalia/wp/2016/08/18/saving-elephants-may-depend-on-scaring-them-with-chili-powder-filled-condoms/>

<https://www.fws.gov/hunting/north-american-model-of-wildlife-conservation.html>

<https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/SWAP/Terrestrial%20Habitat%20Types/Mountain-Grasslands-and-Alpine-Tundra.pdf>

<https://royalsocietypublishing.org/doi/pdf/10.1098/rstb.2017.0437>

https://efotg.sc.egov.usda.gov/references/public/MN/jobsheet-3_grassland_management_for_wildlife_habitat_647.pdf

STANDARDS

The following **National Common Core Standards** can be met teaching:

CONSERVING WOOLLY

Grades 9-10:

CCSS.ELA-LITERACY.RI.9-10.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RI.9-10.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
CCSS.ELA-LITERACY.RI.9-10.7	Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.
CCSS.ELA-LITERACY.W.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
CCSS.ELA-LITERACY.W.9-10.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
CCSS.ELA-LITERACY.W.9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.W.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
CCSS.ELA-LITERACY.W.9-10.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

CCSS.ELA-LITERACY.W.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.W.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.W.9-10.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
CCSS.ELA-LITERACY.SL.9-10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.9-10.2	Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
CCSS.ELA-LITERACY.SL.9-10.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
CCSS.ELA-LITERACY.SL.9-10.4	Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
CCSS.ELA-LITERACY.SL.9-10.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
CCSS.ELA-LITERACY.SL.9-10.6	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
CCSS.ELA-LITERACY.L.9-10.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CCSS.ELA-LITERACY.L.9-10.2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
CCSS.ELA-LITERACY.L.9-10.3	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
CCSS.ELA-LITERACY.L.9-10.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9-10 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.L.9-10.5	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
CCSS.ELA-LITERACY.L.9-10.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
CCSS.ELA-LITERACY.RST.9-10.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
CCSS.ELA-LITERACY.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.
CCSS.ELA-LITERACY.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
CCSS.ELA-LITERACY.RST.9-10.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

CCSS.ELA-LITERACY.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
CCSS.ELA-LITERACY.RST.9-10.8	Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.
CCSS.ELA-LITERACY.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.
CCSS.ELA-LITERACY.RST.9-10.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
CCSS.ELA-LITERACY.WHST.9-10.1	Write arguments focused on discipline-specific content.
CCSS.ELA-LITERACY.WHST.9-10.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
CCSS.ELA-LITERACY.WHST.9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.WHST.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
CCSS.ELA-LITERACY.WHST.9-10.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.
CCSS.ELA-LITERACY.WHST.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-LITERACY.WHST.9-10.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Grades 11-12:

CCSS.ELA-LITERACY.RI.11-12.1	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
CCSS.ELA-LITERACY.RI.11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
CCSS.ELA-LITERACY.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
CCSS.ELA-LITERACY.W.11-12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
CCSS.ELA-LITERACY.W.11-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

CCSS.ELA-LITERACY.W.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.W.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
CCSS.ELA-LITERACY.W.11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
CCSS.ELA-LITERACY.W.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.W.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CCSS.ELA-LITERACY.W.11-12.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
CCSS.ELA-LITERACY.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.11-12.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
CCSS.ELA-LITERACY.SL.11-12.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
CCSS.ELA-LITERACY.SL.11-12.4	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
CCSS.ELA-LITERACY.SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
CCSS.ELA-LITERACY.SL.11-12.6	Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
CCSS.ELA-LITERACY.L.11-12.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CCSS.ELA-LITERACY.L.11-12.2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
CCSS.ELA-LITERACY.L.11-12.3	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
CCSS.ELA-LITERACY.L.11-12.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11-12 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.L.11-12.5	Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.
CCSS.ELA-LITERACY.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.



CCSS.ELA-LITERACY.RST.11-12.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
CCSS.ELA-LITERACY.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.
CCSS.ELA-LITERACY.RST.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
CCSS.ELA-LITERACY.RST.11-12.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
CCSS.ELA-LITERACY.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.
CCSS.ELA-LITERACY.RST.11-12.8	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
CCSS.ELA-LITERACY.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.
CCSS.ELA-LITERACY.RST.11-12.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
CCSS.ELA-LITERACY.WHST.11-12.1	Write arguments focused on discipline-specific content.
CCSS.ELA-LITERACY.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
CCSS.ELA-LITERACY.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
CCSS.ELA-LITERACY.WHST.11-12.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
CCSS.ELA-LITERACY.WHST.11-12.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
CCSS.ELA-LITERACY.WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CCSS.ELA-LITERACY.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
CCSS.ELA-LITERACY.WHST.11-12.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Next Generation Science Standards for ...

CLOVIS KID SURVIVAL STRATEGIES

- HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]
- HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]
- HS-LS2-6. Evaluate 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. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]
- HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]
- HS-LS2-8. Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce. [Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]
- HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.* [Clarification Statement: Emphasis is on testing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]
- HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]

HS-ESS3-5.

Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]

