SUBJECT: SCIENCE/Life Science

BOE APPROVAL: August 2016

Cliffside Park Public Schools

GRADE: 6

Unit 3: Interdependent Relationships in Ecosystems

CONTENT AREA: General Life Science & Earth Science	GRADES: 6	UNIT: 3 of 7
Pacing: Approx. 25 Days		

Engaging in Argument from Evidence

Developing and Using Models -
Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4) • Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5)

Asking Questions and Defining Problems
• Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)

Developing and Using Models
• Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)
Analyzing and Interpreting Data
• Analyze and interpret data to determine similarities and differences in findings. (MSETS1-3)

Disciplinary Core Ideas

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

• Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)
• 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. (MS-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 MS-LS2-5)

ETS1.B: Developing Possible Solutions

• There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.(secondary to MS-LS2-5) ETS1.A: Defining and Delimiting Engineering Problems
• The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) ETS1.B: Developing Possible Solutions

Crosscutting Concepts

Stability and Change

• Small changes in one part of a system might cause large changes in another part. (MS-LS2-4),(MS-LS2-5)

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• 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. (MS-LS2-5)

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•Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems

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	• A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1- 2), (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) • Models of all kinds are important for testing solutions. (MS-ETS1-4) ETS1.C: Optimizing the Design Solution • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MSETS1-3)	• Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3) Scientific Knowledge is Based on Empirical Evidence • Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4) Science Addresses Questions About the Natural and Material World • Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5)

Performance Expectations: MS-LS2-4, MS-LS2-5, MS-ETS1-1, and MS-ETS1-3

Evidence Statement(s): MS-LS2-4, MS-LS2-5, MS-ETS1-1, and MS-ETS1-3

Essential Question: What happens to ecosystems when the environment changes?

21st Century Skills: CRP2, CRP4, CRP5, CRP 6, CRP7, CRP8 ,CRP11,CRP12

Career Ready Practices: 8.1.8.A.1, 8.1.8.A.2, 8.1.8.A.3, 8.1.8.A.4, 8.1.8.A.5, 8.1.8.D.4, 8.1.8.D.5, 8.1.8.E.1, 8.1.8.F.1, 8.2.8.A.2, 8.2.8.A.3, 8.2.8.B.1, 8.2.8.D.1

Technical Terms (Suggested)	Core Instructional Materials	Assessment Statement
The terms are located in the corresponding chapter of the students text. All terms will be addressed before the beginning of the unit. ** All terms should be taught in context rather than in isolation. These terms should be addressed after conceptual understanding.**	MS-LS2-4 & 5 - Chromebook, internet access, smartboard, notebook, pen, pencil, whiteboard. MS-ETS1-1; MS-ETS1-3- Computer, Internet access, smartboard, notebook, pen, pencil, whiteboard.	Students who understand the concepts are able to: • Construct an argument to support or refute an explanation for the changes to populations in an ecosystem caused by disruptions to a physical or biological component of that ecosystem. Empirical evidence and scientific reasoning must support the argument. • Use scientific rules for obtaining and evaluating empirical evidence.

		• Recognize patterns in data and make warranted inferences about changes in populations. • Evaluate empirical evidence supporting arguments about changes to ecosystems. •Construct a convincing argument that supports or refutes claims for solutions about the natural and designed world(s). • Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. • Create design criteria for design solutions for maintaining biodiversity and ecosystem services. • Evaluate competing design solutions based on jointly developed and agreed upon design criteria.

Modifications

English Language Learners	Special Education	At Risk	Gifted & Talented
Scaffolding	Word walls	Teacher tutoring	Curriculum compacting
Word walls	Visual aides	Peer tutoring	Challenge assignments
Sentence/paragraph frames	Graphic organizers	Study guides	Enrichment activities
Bilingual dictionaries/translation	Multimedia	Graphic organizers	Tiered activities
Think alouds	Leveled readers	Extended time	Independent research/inquiry
Read alouds	Assistive technology	Parent communication	Collaborative teamwork
Highlight key vocabulary	Notes/summaries	Modified assignments	Higher level questioning
Annotation guides	Extended time	Counseling	Critical/Analytical thinking tasks
Think-pair-share	Answer masking		Self-directed activities
Visual aides	Answer eliminator		
Modeling	Highlighter		
Cognates	Color contrast		

5E Model	
Performance Expectation: MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics **Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.**	
Engage: Anticipatory Set	Endangered Species Introductory Video- Here Today, Gone Tomorrow http://mariana68.wix.com/biodiversityproject

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Exploration: Student Inquiry	Endangered Species- A Multiday Project http://betterlesson.com/lesson/639346/endangered-species-a-multiday-project
Explanation: Concepts & Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS2.C: Ecosystem Dynamics, Functioning, and Resilience Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
Elaboration: Extension Activity	Mini-Lessons http://participatoryscience.org/standard/ms-ls2-4
Evaluation: Assessment	Assessment Task A: Endangered Species- Recovery Plan Presentation =HYPERLINK("http://www.nap.edu/read/13165/chapter/7#71","Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.") Students will work in teams to develop a plan to bring their chosen species back from the brink of extinction. Students will develop and share a brief presentation of their recovery plan. Recovery plans must address specific questions and are aimed at convincing listeners that their species deserves special attention. =HYPERLINK("https://docs.google.com/document/d/1yA5GHafeuXntwjbs6gbWxh6OcicqTzDIUAG-UBJ5cN4/pub","Persuasive Plan Rubric ") =HYPERLINK("https://docs.google.com/document/d/13cWujvacXx4KjWRV6kR5Atbi1Rp89_2tYWuypH8qh6s/pub","Infographic Rubric")

5E Model
Performance Expectation: MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

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Engage: Anticipatory Set	Why Is Biodiversity So Important? https://www.youtube.com/watch?v=GK_vRtHJZu4
Exploration: Student Inquiry	Saving the World- One Ecosystem at a Time Elaborate: Each group takes their top-ranked idea from their chart and draws a "to scale" diagram depicting their idea. http://www.nsta.org/docs/DoingGoodScienceChapter15.pdf
Explanation: Concepts & Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): 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. 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) ETS1.B: Developing Possible Solutions There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary)
Elaboration: Extension Activity	Disturbances in Ecosystems http://wyobio.org/files/3814/2971/8811/MiddleSchool_Lesson8.pdf http://wyobio.org/files/2914/1885/4938/MiddleSchool_Lesson8.2.pdf After identifying ecosystem disturbances, work to determine possible solutions. Evaluate the solutions of other groups based on criteria. Write criteria as a class.
Evaluation: Assessment	Assessment Task A: Solutions Presentation =HYPERLINK("http://www.nap.edu/read/13165/chapter/7#71","Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. ") After researching their ecosystem, students will develop design solutions for maintaining the ecosystem's health and biodiversity. Students will record solutions on a chart and rank them, with "1" being the most important solution to maintain the ecosystem services. Groups will present their solutions and explain the reasoning behind their rankings. (MS-ETS1-1)

	Assessment Task B: Solutions Diagram Each group takes their top-ranked idea from their chart and draws a "to scale" diagram depicting their idea. Assessment Task C: Designing a New Solution After determining the top solution for each group, students will work as a class to determine similarities and differences among the different design solutions. The students will identify the best characteristics of each to combine into a new solution that could potentially be applicable to maintaining biodiversity in all ecosystems. (MS-ETS-1-3)

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#	STUDENT LEARNING OBJECTIVES	CORRESPONDING PEs and DCIs
1	**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.]	LS2.4
2	**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.]	LS2.5

The Student Learning Objectives above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

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).

Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

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.

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)

ETS1.B: Developing Possible Solutions

There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary)

Stability and Change

Small changes in one part of a system might cause large changes in another part.

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

Science disciplines share common rules of obtaining and evaluating empirical evidence.		varies from region to region and over time. **Connections to Nature of Science** **Science Addresses Questions About the Natural and Material World** **Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.**

Connections to other DCIs in this grade-band:

MS.LS4.C ; MS.LS4.D ; MS.ESS2.A ; MS.ESS3.A ; MS.ESS3.C

Articulation of DCIs across grade-bands:

3.LS2.C ; 3.LS4.D ; HS.LS2.C ; HS.LS4.C ; HS.LS4.D ; HS.ESS2.E ; HS.ESS3.B ; HS.ESS3.C

Common Core State Standards Connections:

ELA/Literacy - ELA: RST.6-8.1, RI.8.8, WHST.6-8.1, WHST.6-8.9

- *Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-4) RST.6-8.1*
- *Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5) RST.6-8.8*
- *Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS2-5) RI.8.8*
- *Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4),(MS-ETS1-1),(MS-ETS1-3) WHST.6-8.1*
- *Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2) WHST.6-8.2*
- *Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3) RST.6-8.7*

- *Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ETS1-1) WHST.6-8.8*
- *Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2),(MS-LS2-4),(MS-ETS1-3), (MS-ETS1-2) WHST.6-8.9*
- *Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ETS1-4) SL.8.5*

Mathematics -

- Reason abstractly and quantitatively. (MS-ETS1-1),(MS-ETS1-3) MP.2
- Model with mathematics. (MS-LS2-5) MP.4
- Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. (MS-ETS1-1),(MS-ETS1-3) 7.EE.3
- Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5) 6.RP.A.3