Zoology: Interdependent Relationships in Ecosystems

Stage 1 Desired Results

ESTABLISHED GOALS:

Competencies:

- ***Cause & Effect Students will demonstrate the ability to investigate, explain, and evaluate potential causal relationships by using evidence to support claims and predictions about the mechanisms that drive those relationships.***
- ***Scale, Proportion, & Quantity Students will demonstrate the ability to describe and represent the significance of changes in observable and non-observable phenomena in terms of relative scale, proportion, and quantity.***
- ***Systems & System Models Students will demonstrate the ability to investigate and analyze a natural or human designed system in terms of its boundaries, inputs, outputs, interactions, and behaviors and use this information to develop a system model that can be used to understand and empirically evaluate the accuracy of models in terms of representing the underlying system.***
- ***Energy & Matter in Systems Students will demonstrate the ability to analyze evidence from a variety of sources (investigations, models) to predict, connect and/or evaluate the cycling of matter and flow of energy within and between systems in order to understand, describe, or predict possibilities and limitations of systems.***
- ***Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials.***
- ***Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences.***
- ***Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style.***

Content Standards:

- HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- 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.
- HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in

Transfer

*Students will be able to independently use their learning to **make informed ecological decisions based upon their knowledge of interdependent relationships in ecosystems.***

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- *empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.*
- *the significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.*
- *using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.*
- *much of science deals with constructing explanations of how things change and how they remain stable.*
- *change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.*
- *new technologies can have deep impacts on society and the environment, including some that were not anticipated.*

ESSENTIAL QUESTIONS

- *Should organisms that are not keystone species still be protected?*
- *Should the government fund wildlife and environmental conservation?*
- *Should (traditional, medicinal, or foraging) human behavior be forced to cease in order to protect organisms or ecosystems?*

Acquisition

Students will know…

- that ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of

Students will be skilled at…

- using mathematical and/or computational representations to support and revise explanations.
- evaluating claims, evidence, and reasoning.
- designing, evaluating, and refining solutions.

stable conditions, but changing conditions may result in a new ecosystem. ● HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. ● HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.	great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. ● that complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. ● that biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). ● that humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. ● that, when evaluating solutions, it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social,	

	cultural and environmental impacts. ● that both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. ● that the sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. <u>*vocabulary*</u>: carrying capacity, biodiversity, ecosystem, correlation, human impact, evolution, inheritance of acquired characteristics, phylogeny, lineage, speciation, reproductive barriers, allopatric speciation, adaptive radiation, species adaptation, genetic drift, natural selection, sexual selection, fitness, migration, radial symmetry, bilaterial symmetry, anterior, posterior, cephalization, proximal, distal, pectoral, pelvic, frontal plane, ventral, lateral, dorsal, medial, sagittal plane, systematization, hierchical system, taxa/taxon, systematization, binomial nomenclature, cladogram, phylogenic tree, comparative anatomy, domain, kingdom, phylum, class, order, family, genus, species, commensulasim, symbiotic relationship, mutualistic, parasitic, consumer, herbivore, carnivore, heterotrophic, chordate, notochord, dorsal hollow nerve cord, pharyngeal pouches/slits, postanal tail, segmentation, gnathostomes, agnathan, hagfish, lampreys, fishes, cartilaginous and bony fishes, lateral line system, clasper, oviparious, oviviparous, viviparous, placenta, monotreme, marsupial, operculum, endothermic, ectothermic, osmotic regulation, swim bladder, tetrapod, salamander, reptile, amniote, pneumatized, air sacs, gizzard, crop, archaeopteryx,	

	diaphragm, mammary glands, hominids, ethology, innate, habituation, imprinting, cooperative behavior, social, territorial, courtship, homing, playing, insight, altruism, reciprocity, communication, niche, population, predation, carrying capacity, invasaive species, limiting resources, competition	

Content Area Literacy Standards	***21st Century Skills***
• 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. • 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. • RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. • 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*. • RST.11-12.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. • 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. • 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. • 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. • 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. • WHST.11-12.1 Write arguments focused on *discipline-specific content*. • WHST.11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. • WHST.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. • 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. • 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. • 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. • WHST.11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.	• *reason effectively* • *make judgments and decisions* • *think creatively* • *collaborate with others* • *communicate clearly* • *implement innovations*

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan	
Summary of Key Learning Events and Instruction	
Language Arts Integration	***Mathematics Integration***
● 1.OA.1 Use	• HSN-Q.A.1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays • HSN-Q.A.2 - Define appropriate quantities for the purpose of descriptive modeling. • HSN-Q.A.3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. • HSS-IC.A.1 - Understand statistics as a process for making inferences about population parameters based on a random sample from that population • HSS-IC.B.6 - Evaluate reports based on data. • HSS-ID.A.1 - Represent data with plots on the real number line (dot plots, histograms, and box plots) • MP.2 - Reason abstractly and quantitatively. • MP.4 - Model with mathematics.
Technology Integration	***District Materials***
● 1.OA.1 Use	
Science and Engineering Practices	
S&EP 1. Asking questions and defining problems	

S&EP 2. Developing and using models S&EP 4. Analyzing and interpreting data S&EP 6. Constructing explanations (for science) and designing solutions (for engineering) S&EP 7. Engaging in argument from evidence S&EP 8. Obtaining, evaluating, and communicating information	