



Grades 9–12

3.1.9-12.X Life Science: Natural Selection and Evolution

Students who demonstrate understanding can *evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.*

Clarifying Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.

Assessment Boundary: N/A

Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
Engaging in Argument From Evidence Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current or historical episodes in science. <ul style="list-style-type: none"> Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. 	Adaptation <ul style="list-style-type: none"> Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline—and sometimes the extinction—of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. 	Cause and Effect <ul style="list-style-type: none"> Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Pennsylvania Context: N/A

PA Career Ready Skills: Evaluate a situation to identify skills and strategies to prevent and resolve conflicts.

Connections to Other Standards Content and Practices

Standard Source	Possible Connections to Other Standard(s) or Practice(s)
Agriculture (AFNR)	CS.02.02.01.a: Identify and summarize the components within AFNR systems (e.g., Animal Systems: health, nutrition, genetics, etc.; Natural Resources Systems: soil, water, etc.).



Standard Source	Possible Connections to Other Standard(s) or Practice(s)
Science, Environmental Literacy and Sustainability (NAAEE)	9-12 Strand 2.1.B. Earth's living systems: Learners describe basic population dynamics, genetic mechanisms behind biological evolution, and the importance of diversity in living systems. They explain how changes in the hydrosphere, atmosphere, and geosphere affect the biosphere. They describe how human sustainability is dependent on the biosphere. 9-12 Strand 3.1.D. Working with flexibility, creativity, and openness: Learners engage each other in evidence-based peer review and work collaboratively and cooperatively in the spirit of open deliberation, especially in contexts that bring to the surface deeply held priorities and values.
PA Core Standards: ELA	CC.3.5.9-10.H: 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. CC.3.5.11-12.H: 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. CC.3.6.9-12.H: Draw evidence from informational texts to support analysis, reflection, and research.
PA Core Standards and Practices: Math	MP.2: Reason abstractly and quantitatively. CC.2.4.HS.B.2: Summarize, represent, and interpret data on two categorical and quantitative variables. CC.2.4.HS.B.5: Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
PA Standards: Social Studies	6.1.9.A: Analyze how choices are made because of scarcity.
Educational Technology (ISTE)	1.3. Knowledge Constructor: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
Technology and Engineering (ITEEA)	STEL-10: Assess how similarities and differences among scientific, mathematical, engineering, and technological knowledge and skills contributed to the design of a product or system.