



# Calculating Biodiversity

Use math skills to investigate the species richness, species evenness, and biodiversity of a community of organisms.

Grade level	Academic Standards			
	Performance Expectation	Sci. & Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
K-2				
3-5				
6-8	<p><b>MS-LS2-1.</b> Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.</p> <p><b>MS-LS2-2.</b> Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.</p> <p><b>MS-LS2-3.</b> Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.</p> <p><b>MS-LS2-4.</b> Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.</p> <p><b>MS-LS2-5.</b> Evaluate competing design solutions for maintaining biodiversity and ecosystem services.</p>	<p><b>Developing and Using Models</b> Develop a model to describe phenomena. <b>(MS-LS2-3)</b></p> <p><b>Analyzing and Interpreting Data</b> Analyze and interpret data to provide evidence for phenomena. <b>(MS-LS2-1)</b></p> <p><b>Constructing Explanations and Designing Solutions</b></p> <ul style="list-style-type: none"> <li>Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. <b>(MS-LS2-2)</b></li> </ul> <p><b>Engaging in Argument from Evidence</b></p> <ul style="list-style-type: none"> <li>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. <b>(MS-LS2-4)</b></li> </ul> <p><b>Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5)</b></p> <p><b>Connections to Nature of Science</b> Scientific Knowledge is Based on Empirical Evidence.</p> <ul style="list-style-type: none"> <li>Science disciplines share common rules of obtaining and evaluating empirical evidence. <b>(MS-LS2-4)</b></li> </ul>	<p><b>LS2.A: INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS</b></p> <p><b>LS2.B: CYCLE OF MATTER AND ENERGY TRANSFER IN ECOSYSTEMS</b></p> <p><b>LS2.C: ECOSYSTEM DYNAMICS, FUNCTIONING, AND RESILIENCE</b></p> <p><b>ETS1.B: DEVELOPING POSSIBLE SOLUTIONS</b></p>	<p><b>PATTERNS</b> Patterns can be used to identify cause and effect relationships. <b>(MS-LS2-2)</b></p> <p><b>CAUSE AND EFFECT</b> Cause and effect relationships may be used to predict phenomena in natural or designed systems. <b>(MS-LS2-1)</b></p> <p><b>ENERGY AND MATTER</b> The transfer of energy can be tracked as energy flows through a natural system. <b>(MS-LS2-3)</b></p> <p><b>STABILITY AND CHANGE</b> Small changes in one part of a system might cause large changes in another part. <b>(MS-LS2-4),(MS-LS2-5)</b></p>

Standards for grades 9-12 are on the next page.



# Calculating Biodiversity

Use math skills to investigate the species richness, species evenness, and biodiversity of a community of organisms.

Grade level	Academic Standards			
	Performance Expectation	Sci. & Engineering Practice	Disciplinary Core Idea	Crosscutting Concept
9-12	<p><b>HS-LS2-2.</b> Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.</p>	<p>USING MATHEMATICS AND COMPUTATIONAL THINKING</p> <ul style="list-style-type: none"> <li>Use mathematical representations of phenomena or design solutions to support and revise explanations.</li> </ul> <p>CONNECTIONS TO NATURE OF SCIENCE. Scientific Knowledge is Open to Revision in Light of New Evidence</p> <ul style="list-style-type: none"> <li>Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence.</li> </ul>	<p>INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS</p> <ul style="list-style-type: none"> <li>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 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. <b>(LS2.A)</b></li> </ul> <p>ECOSYSTEM DYNAMICS, FUNCTIONING, AND RESILIENCE</p> <ul style="list-style-type: none"> <li>A 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. <b>(LS2.C)</b></li> </ul>	<p>SCALE, PROPORTION, AND QUANTITY</p> <ul style="list-style-type: none"> <li>Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale.</li> </ul>