



## Hydrosphere Learning Progression

### Grades 3-5: GLOBE Protocols Aligned with NASA and NGSS

**NGSS Disciplinary Core Ideas Learning Progression:** Building on concepts developed in grades K-2 that focused on how water can change the shape of the land and where water is located, students in grades 3-5 will continue to explore how rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, organisms, and gravity break rocks, soils, and sediments into smaller pieces and move them around. Most of Earth's water is in the ocean and much of the Earth's freshwater is in glaciers or underground. Through a series of learning activities, GLOBE protocols and NASA classroom resources, teachers can bring authentic science data collection into their classrooms.



<p><b>NGSS Performance Expectations:</b></p> <p>4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.</p> <p>5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.</p> <p>5-ESS2-2 Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.</p>		
<p><b>NGSS Science Practices:</b></p> <ul style="list-style-type: none"> <li>• <b>Planning and Carrying Out Investigations:</b> Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of phenomenon.</li> <li>• <b>Developing and Using Models:</b> Develop a model using an example to describe a scientific principle.</li> <li>• <b>Using Mathematics and Computational Thinking:</b> Describe and graph quantities such as area and volume to address scientific questions.</li> </ul>	<p><b>NGSS Disciplinary Core Idea:</b></p> <p><b>ESS2.A: Earth Materials and Systems:</b></p> <ul style="list-style-type: none"> <li>• Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.</li> <li>• Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. Winds and clouds in the atmosphere interact with the landform to determine patterns of weather.</li> </ul> <p><b>ESS2.C: The Roles of Water in Earth's Surface Processes</b></p> <ul style="list-style-type: none"> <li>• Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.</li> </ul>	<p><b>NGSS Crosscutting Concepts:</b></p> <p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>• Cause and effect relationships are routinely identified, tested, and used to explain change.</li> </ul> <p><b>Systems and System Models</b></p> <ul style="list-style-type: none"> <li>• A system can be described in terms of its components and their interactions.</li> </ul> <p><b>Scale, Proportion, and Quantity</b></p> <ul style="list-style-type: none"> <li>• Standard units are used to measure and describe physical quantities such as weight and volume.</li> </ul>
<b>GLOBE Application</b>		
<p><b>Hydrosphere Protocols</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Water Temperature</a></li> <li>• <a href="#">Water Transparency</a></li> </ul> <p><b>Atmosphere Protocols</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Air Temperature</a></li> <li>• <a href="#">Clouds</a></li> <li>• <a href="#">Precipitation</a></li> <li>• <a href="#">Surface Temperature</a></li> </ul>	<p><b>GLOBE Data Sheets</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Hydrology Investigation Data Sheet</a></li> <li>• <a href="#">Atmosphere Investigation Clouds 1-Day Data Sheet</a></li> </ul> <p><b>GLOBE Learning Activities:</b></p> <ol style="list-style-type: none"> <li>1. <a href="#">Just Passing Through for Beginners</a> (4-ESS2-1, 5-ESS2-1)</li> <li>2. <a href="#">Model a Catchment Basin</a> (5-ESS2-1, 5-ESS2-2)</li> </ol> <p><b>Elementary GLOBE Books:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Discoveries at Willow Creek</a> (4-ESS2-1, 5-ESS2-1)</li> <li>• <a href="#">What in the World is Happening With Our Climate?</a> (4-ESS2-1, 5-ESS2-1, 5-ESS2-2)</li> </ul>	<p><b>Guiding Questions:</b></p> <ul style="list-style-type: none"> <li>• What effect does water and/or ice have on the rate of erosion? What can be done to reduce the rate of erosion caused by water and/or ice?</li> <li>• How do changes in the hydrosphere affect other spheres within the Earth system?</li> <li>• What factors affect the distribution of water on Earth?</li> </ul>
<b>NASA Resources</b>		
<p><b>Extension Learning Activities/Resources:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">NASA Climate Change Educational Modules:</a></li> <li>• <a href="#">NASA Wavelength 3-5 List of Learning Resources</a> <a href="http://nasawavelength.org/list/2035">http://nasawavelength.org/list/2035</a></li> </ul>	<p><b>My NASA Data Visualization Tool: <a href="#">Earth System Data Explorer:</a></b></p> <p><b>Variable Suggestions:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Daily Sea Surface Temperature (GHRST)</a></li> <li>• <a href="#">Cryosphere: Monthly Snow and Ice Amount (ISCCP)</a></li> <li>• <a href="#">Monthly Cloud Coverage (CERES)</a></li> <li>• <a href="#">Monthly Precipitation (GPCP)</a></li> </ul>	<p><b>NASA Lessons/Activities:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Erosion and Landslides</a></li> <li>• <a href="#">Earth's Water</a></li> </ul>



