

UNIT OVERVIEW

LAND, WATER, AND HUMAN INTERACTIONS

Unit Issue: Geoscience processes and human activities change Earth’s surface.

Anchoring Phenomenon: The landscape is constantly changing due to natural processes and human activity.

Listed below is a summary of the activities in this unit. Note that the total teaching time is listed as 19–34 periods of approximately 45 to 50 minutes (approximately 5–7 weeks). If you find you cannot finish in this time frame, consider skipping activities 8, 10, and/or 14.

Activity Description	Topics	Advance Preparation	Assessment	Teaching Periods
<p>1. Investigation: Where Should We Build? Students examine photographs of undeveloped and developed hillsides, wetlands, and cliff-top areas. Students make observations about changes that have happened to the land and water in these areas.</p>	evidence human impact trade-offs LITERACY SENSEMAKING	Prepare Student Sheet.		1
<p>2. Laboratory: Does It Dissolve? Students compare the solubility of solids in three different liquids. They compare the ability of the liquids to dissolve salts and apply the results to the natural world.</p>	dissolve evidence human impact LITERACY SENSEMAKING	Set up containers.	ODA Proc.	1–2
<p>3. Investigation: Water Quality Students construct graphs of three common water quality indicators and compare them to a graph of Boomtown population. Students then consider whether the increase in population is a correlation or causal relationship between the population and the decline in water quality.</p>	causal relationship correlation dissolve evidence human impact indicator water quality LITERACY MATHEMATICS SENSEMAKING	Prepare glasses of water (optional); gather local water quality report.	AID Proc. Part B	1–2
<p>4. Investigation: Living Indicators Students analyze and interpret data collected from simulated catches of aquatic invertebrates collected at three different points in time corresponding with different levels of human impact. They identify patterns in the data and construct arguments for possible cause-and-effect relationships.</p>	causal relationship correlation human impact indicators macroinvertebrates model pattern water quality LITERACY MATHEMATICS SENSEMAKING	Prepare Student Sheet.	AID A1 ARG QUICK CHECK A2	1–2

LAND, WATER, AND HUMAN INTERACTIONS (continued)

Activity Description	Topics	Advance Preparation	Assessment	Teaching Periods
<p>5. Laboratory: Nutrients as Contaminants Students explore one of the major routes for contaminants to enter the water supply by investigating water that passes through soil. They first test unfertilized soil and fresh water for the presence of nitrates then add fertilizer to the soil and test both the fertilized soil and the runoff water for nitrates.</p>	contaminants evidence groundwater indicator nutrients runoff trade-offs SENSEMAKING	Gather and prepare local soil; test your local water source for nitrates; find fertilizer label (optional)	ODA Proc. E&T QUICK CHECK A5	1–2
<p>6. Reading: Gulf of Mexico Dead Zone Students read about the large-scale impact of human activity on aquatic systems. Students use an Anticipation Guide before, during, and after the reading to make predictions based on prior knowledge and then examine how their understanding has changed at the end of the activity. Students draw a model diagram to explain the chain of events leading to the formation of dead zones. They also discuss ways to minimize the size and impact of dead zones.</p>	causal relationship contaminant correlation dead zone evidence indicator model nutrients runoff trade-offs LITERACY SENSEMAKING	Prepare Student Sheet.	MOD A4	1–2
<p>7. Modeling: Cutting Canyons and Building Deltas Students use a river model to investigate how flowing water erodes and deposits sediments to create common landforms. They then design erosion-control structures and use the river model to test them. Based on the results of their initial testing, students redesign and retest their structures.</p>	constraint criterion, criteria delta deposition erosion model sediments LITERACY	Gather large containers for sand and water; gather paper towels or newspapers; confirm level work surfaces; prepare Student Sheet.	ENG QUICK CHECK Proc. Part B	2–3
<p>8. Investigation: Traveling with the Water Cycle After reviewing the three most common phases of matter and the phase changes of water, students use a card-based simulation to follow water as it travels through the water cycle. Each pair of students writes a story that describes and demonstrates their understanding of the water cycle’s major processes and reservoirs, and the types and sources of contaminants that can be picked up along the way.</p>	condensing contaminant energy evaporation freezing gravity melting water cycle LITERACY SENSEMAKING	Set up stations around room (optional); prepare Student Sheets.	MOD A4 COM A5	1–2

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Activity Description	Topics	Advance Preparation	Assessment	Teaching Periods
<p>9. Reading: Human Impacts on Earth’s Water Students complete a Three-level Reading Guide as a means to increase their comprehension of a reading that describes some ways in which human activities affect Earth’s water. The reading focuses on how humans impact water quality and the water cycle, and on how these effects can be mitigated.</p>	<p>condensation contaminants evaporation freezing human impact melting mitigate monitor water cycle water quality</p> <p>LITERACY SENSEMAKING</p>	<p>Prepare Student Sheet.</p>	<p>MOD A3 (Assessment of PE MS-ESS2-4) ARG A6</p>	<p>1–2</p>
<p>10. Investigation: Making Topographic Maps Students use a small-scale plastic model to construct a topographic map of a land formation. This experience provides students with a better understanding of topographic maps and how to interpret them.</p>	<p>contour line topographic map topography</p>		<p>MOD QUICK CHECK A5</p>	<p>1–2</p>
<p>11. Investigation: Boomtown’s Topography Students compare the street maps and topographic maps of Boomtown in the present with topographic maps of Boomtown from 25 and 100 years ago. They identify changes that have taken place in the landforms at the building locations. They consider how evidence from the topographic maps might suggest potential problems for the three possible building locations.</p>	<p>contour interval contour line landform scale topographic map topography</p> <p>LITERACY</p>	<p>Prepare Student Sheets.</p>	<p>QUICK CHECK ENG Proc. Part B</p>	<p>1–2</p>
<p>12. Modeling: Modeling Cliff Erosion Students model the effect of ocean waves on a cliff. They design, test, and redesign structures to prevent cliff erosion. They use their observations and understanding of erosion to compare the likely rate of erosion on a hillside and a shoreline cliff.</p>	<p>causal relationship constraint correlation criterion, criteria deposition erosion mitigation model</p>	<p>Gather large containers for sand and water; prepare Student Sheet.</p>	<p>ENG A7 (Assessment of PE MS-ETS1-1)</p>	<p>1–2</p>
<p>13. Reading: Weathering, Erosion, and Deposition Students read about geoscience processes that include those they investigated in the last activity—erosion and deposition—and the related earth process of weathering. The impact of human activity on these earth processes is presented with information on how to monitor and mitigate changes caused by development.</p>	<p>deposition earth processes erosion human impact sediment weathering mitigation monitor</p> <p>LITERACY SENSEMAKING</p>		<p>MOD A2 EXP A6</p>	<p>1–2</p>

LAND, WATER, AND HUMAN INTERACTIONS (continued)

Activity Description	Topics	Advance Preparation	Assessment	Teaching Periods
<p>14. Role Play: Building on the Mississippi Through a role-playing exercise, students explore the history of New Orleans' location on the Mississippi River and the interaction of the city and the river. Students focus on the impact of human activities that have prevented natural cycles of erosion and deposition in the Louisiana Delta region.</p>	<p>dead zone deposition erosion evidence mitigation monitoring trade-offs LITERACY</p>	<p>Prepare Student Sheet; gather information on hurricane impact; decide on student roles</p>	<p>EXP QUICK CHECK E&T A4 EXP A5 (Assessment of PE MS-ESS2-2)</p>	<p>1-2</p>
<p>15. Investigation: Building in Boomtown Students use the information they have gathered throughout the unit to create a report about the geology at each building location in Boomtown. They use their reports and information from the Boomtown City Council to make their decision.</p>	<p>causal relationship constraint criterion, criteria deposition erosion evidence nutrient runoff sediments topographic map trade-off LITERACY SENSEMAKING</p>	<p>Prepare Student Sheets.</p>	<p>COM Proc. E&T A1</p>	<p>2-3</p>
<p>16. Design: Building Site Plan Students play the role of building team members who generate a site plan for the school and fields. They design a plan for monitoring and minimizing soil erosion, nutrient runoff, and reductions in the water quality of the Boomtown River.</p>	<p>causal relationship constraint criterion, criteria deposition erosion evidence mitigation monitor nutrient runoff sediments trade-off water quality LITERACY</p>	<p>Prepare Student Sheets.</p>	<p>COM PROC. (Assessment of PEs MS-ESS3-3 and MS-ETS1-2) ENG QUICK CHECK Proc.</p>	<p>2-3</p>