Delaware Recommended Curriculum

This unit has been created as an exemplary model for teachers in (re)design of course curricula. An exemplary model unit has undergone a rigorous peer review and jurying process to ensure alignment to selected Delaware Content Standards.

Unit Title: **Humans Interact with the Environment**

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Content Area: **Geography**
Grade Level: **6**

Summary of Unit and Instructional Standards

This instructional unit is supported through by a grant from the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce.

This unit addresses Geography Standard Two: Human/ Environmental interaction. Standard Two at the middle school level requires students to acquire a knowledge of the basic physical processes that shape our planet and, very importantly, a knowledge of the strategies humans use to interact with the natural environment. Inherent in this study is the idea that natural phenomena are not random and the effects are not randomly distributed. They result in patterns of climate, topography, and resource distribution that are of critical importance to the lives of humans. Geographic knowledge of the workings of physical systems is helpful in understanding developments in the past and may prove useful in predicting the effects of current human activities into the future. At the 4-5 level students learned that physical processes, for example erosion and mountain building, have effects for human society. This unit builds on basic concepts developed in social studies in the previous level. It reinforces and extends concepts learned in science instruction related to weather, soils, land and water, and ecosystems by emphasizing an understanding of humans and their interaction with physical Earth. The unit will complement future studies in science related to watersheds and weather.

This benchmark calls for a basic understanding of the physical systems that shape planet Earth:

1) mountain building and erosion;

2) the cycles of water above the surface and below and the movement of water in streams;

3) cycles in the atmosphere that result in climate patterns.

A key to understanding each of these is the idea of a cycle or system with component parts that functions within predictable parameters. A knowledge of cycles and systems and the patterns they produce will assist students in explaining environmental differences.

- Lesson One explores the concepts of cycles and systems using the hydrologic cycles and stream systems as the teaching example.
- Lesson Two looks at Natural Hazards faced by humans around the world, and the ways they react to them.

Armed with a basic understanding of the processes that shape Earth, students should be able to understand the consequences of human actions of the past and predict the likely result of projects and activities that affect the environment. They will appreciate that physical processes may limit or constrain human activities, but are not the sole determining factor. Students will be encouraged to identify intended and possible unintended consequences of human projects.

- Lesson Three looks at farming and irrigation projects in several world regions to evaluate benefits and negative impacts.
- Lesson Four looks at the search for power sources around the world. Armed with this knowledge, students will be faced with the challenge of comparing and contrasting two world areas in terms of human-environmental interaction.

There are two reasons for the use of examples and case studies from several world regions in this unit. First, it is important to establish the universal applicability of natural principles and the possible wider reach of consequences from local actions. Secondly, cultural differences in perception, decision-making and use of resources may result in different approaches to similar environmental challenges. The benchmark implies an element of historical awareness. Students should understand that cultural evaluations and alterations of the environment have evolved over time.

Stage 1 – Desired Results

What students will know, do, and understand

Delaware Content Standards

- **Geography Standard Two 6-8a**: Students will apply a knowledge of the major processes shaping natural environments to understand how different peoples have changed and been affected by, physical environments in the world's sub-regions.

Big Ideas

- Physical Cycles and Systems
- Human strategies of adaptation to physical conditions
- Human alteration of the Environment
- Intended and Unintended Consequences

Unit Enduring Understanding

- The human response to the characteristics of a physical environment comes with consequences for both the human culture and the physical environment.

Unit Essential Questions

- How do Earth's physical processes shape the surface of earth?
- How do physical processes affect human activity?
- How can we use knowledge of cycles and systems to predict environmental hazards?
- How can geographic principles help us make decisions about projects and problems?

Knowledge and Skills

Students will know…

- Physical Processes: Erosion or Weathering/ Mountain Building, Water Cycles and Stream Patterns
- Landscape Patterns produced by physical processes
- Human Adaptations to Environmental Conditions
- Ways People Alter the Environment through their activities

Students will be able to…

- use **deductive reasoning** to determine how physical features impact human settlements.
- examine the **causes/effects** of specific physical features and how climate characteristics affect human activities and settlements.
- **justify** why specific human activities occur in various climate regions.
- **evaluate** locations in terms of suitability for activities.

Stage 2 – Assessment Evidence

Evidence that will be collected to determine whether or not Desired Results are achieved

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Transfer Task

This summative assessment is a transfer task that requires students to use knowledge and understandings to perform a task in a new setting or context. The assessment and scoring guide should be reviewed with students prior to any instruction. Students should complete the assessment after the lessons conclude.

Essential Question addressed by the transfer task:

- How do Earth's physical processes shape the surface of earth in this sub-region?
- How do physical processes affect human activity in this sub-region?
- How can we use knowledge of cycles and systems to predict environmental hazards?
- How can geographic principles help us make decisions about projects and problems?

Prior Knowledge	You have learned about physical systems that shape our natural world. You have also looked at ways humans in many parts of the world have adapted to the environment or have altered the environment to meet their needs. You have looked at some of the intended and unintended consequences of human projects. Now you are ready to put your knowledge to work to evaluate human/ environmental interaction in one of earth's sub-regions.
Problem/Role	World Eco-Tours is a non-profit agency that tries to raise awareness of the importance of our natural world and the interaction of humans with their natural home. The agency takes small groups of eco-tourists on Eco-Adventure trips. The ticket price includes a contribution to their work.
Perspective	As an intern at World Eco Tours you have been asked to help with a design for the new website. Eco-Tourists will visit this website to decide which tour they want to take. You will be asked to design one page for the website, focusing on one of the world's interesting sub-regions. Your supervisor has provided you with a list of areas the group plans to visit this year. Each area is the site of a proposed project designed to improve life for the people of the region. Select one sub-region with its proposed project to profile.
	Costa Rican Rainforest - Logging and fires have destroyed many acres of the tropical rainforest. Replanting with native trees will prevent soils from washing away.
	Mali - In recent years, this region has become drier and is struggling to

	feed its people. The project will drill deep wells for drinking water and crop irrigation
	Nunavut, Canada - Remote and beautiful, this region can only be reached by dogsled and airplane. The project will build a road to connect to nearest hospital.
Product	Your supervisor on the website project has asked you to do a "mock-up" or model of the webpage for your world sub-region. Include these sections in your summary: 1) Identify the sub-region you have chosen and include a map that shows its boundaries and relative location. Describe the physical landscape of the region. 2) Include one or two pictures to highlight the physical system or cycle you consider most important for the people living in the sub-region. 3) Tell about the people who have lived in this region for a long time. How did they adapt to conditions here? Include at least one picture of the traditional culture. 4) In a section labeled Natural Hazards, summarize any conditions in the area that present a problem for people who live there. What has been the response to this hazard in the past? 5) What projects or improvements are proposed for the region? What is the likely impact of these projects based on what you have learned? Your prototype may be an electronic file or it can be a paper model.
Criteria for an Exemplary Response	To be accepted for use on the website, your model will include accurate information about the sub-region including sections on the physical processes that shape the landscape, the adaptations of traditional cultures, ways people have altered the environment, and projects that are proposed. Show that you can apply your knowledge of natural processes, human adaptation, and the consequences of human activity to analyze a sub-region. Present information and analysis in an organized and interesting way.

Rubric

Scoring Category The webpage….	Score Point 3	Score Point 2	Score Point 1
Identifies, locates and describes the sub-region; presents accurate and relevant information including important physical features, climate, and natural hazards.	Description includes complete, accurate and relevant information about the location, physical features, and natural hazards of the selected sub-region gathered from maps and geographic references.	Description includes mostly accurate and relevant information about the location, physical features of the selected sub-region, but information may be incomplete, or poorly organized.	Description does not identify or locate the sub-region or includes inaccurate or irrelevant information about the physical landscape of the selected sub-region.
Links existing physical conditions to appropriate physical processes, systems or cycles.	Makes clear links between existing conditions and appropriate physical processes, giving evidence of clear understanding.	Attempts to relate conditions to appropriate physical processes, but associations are incomplete or show incomplete understanding.	Little or no attempt to relate conditions to appropriate physical processes or product shows little or no understanding of the physical processes.
Tells how the traditional culture of the region adapted to existing conditions	Gives clear, accurate examples of human adaptation to the conditions in the environment supported with illustrations.	Provides clear and accurate description of at least one human adaptations to the environment, but no illustration included.	Incomplete or inaccurate description of human activity or no attempt to relate human activity in the region to environment.
Tells how people have altered the environment of this sub-region to meet their needs.	Specific examples of human alteration of the physical environment of this sub-region are described and evaluated in terms of intended and unintended consequences.	General examples of human alteration are described and evaluated in terms of intended and unintended consequences, but no link is made to the sub-region studied.	Examples of human alteration are described but no successful attempt is made to explain intended and unintended consequences.
Evaluates the likely impact of proposed projects based on learning.	Successfully identifies elements of the environment impacted by the project and the affected natural process. Explains likely consequences with knowledge of natural processes.	Successfully identifies elements of the environment impacted by the project. Predicts likely consequences without explanation.	Inaccurate or incomplete identification of the elements of the environment to be impacted or incomplete or inaccurate prediction of consequences.
Uses content-appropriate vocabulary in order to demonstrate understanding	Content-appropriate vocabulary is **well developed** and evident	**Some** evidence of content-appropriate vocabulary	**Minimal** evidence of content-appropriate vocabulary

Total Score: _____

Above the Standard: 16-18
Meets the Standard: 10-15
Below the Standard: 6-9

Stage 3 – Learning Plan

Design learning activities to align with Stage 1 and Stage 2 expectations

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Lesson One: Cycles, Systems and Patterns of Physical Earth

Essential Questions

- How do Earth's physical processes shape the surface of earth?
- How do physical processes affect human activity?
- How can we use knowledge of cycles and systems to predict environmental hazards?

Instructional Strategies

Strategy 1: Gathering Information
Vocabulary and Concept Development: Cycles

Begin by asking a student to dribble a basketball as he/she walks across the classroom. Ask the students to explain the steps of dribbling. Where is the ball in relation to the player at each stage? What will happen if the steady, repetitive motion is interrupted?

On the board or projector display the graphic for cycles (Visual 1).

Ask the students what this graphic might be used to represent. List possibilities on the board (Examples: life cycles, steps in washing clothing, recycling aluminum cans).

Lead the students in a discussion to elicit the understanding that cycles are steps in an on-going process (the number of steps may vary), cycles are recursive and repetitive, and so can be predictable, interruptions in a one stage of a cycle will lead to changes in other stages.

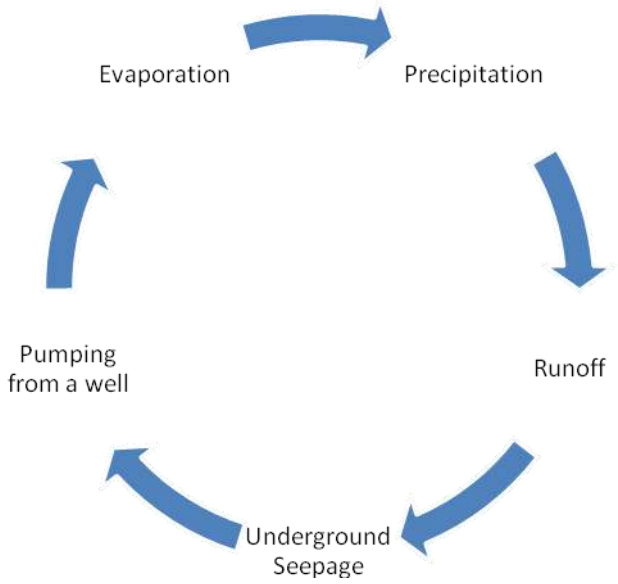
Strategy 2: Gathering Information
Graphic Organizer

Ask students if they can use or adapt the cycle diagram to explain why it rains. (This will review basic concepts learned in elementary science classes. The students should recall the stages of evaporation, condensation and precipitation.) Use the Cycles Diagram Visual 1 to explain and reinforce. Tell the students that this basic understanding must be expanded to understand where drinking water comes from.

Have students research the hydrologic cycle, including groundwater as a source of water, through:

- reading a summary (Handout 1)[1]
- viewing The Groundwater Cycle
- viewing Groundwater.

As students gather the information, they can process it by diagramming the stages of the underground water cycle. A blank cycles worksheet is provided (Handout 2), or the students might devise their own graphic. It is important that students understand that the process is ongoing. While an individual water droplet or molecule may be at one stage, all stages of the cycle are operational at the same time. The student diagram might look something like this:



Ask students to use the diagram they developed to explain to a partner where drinking water comes from. Next, ask students to refer to the diagram to identify which stage of the underground water cycle would be impacted by each of these human activities. In each case, challenge them to predict the likely impact on the amount of water available in wells in the area.

- Paving large areas of the surface for parking lots and streets (Reduces absorption into the ground, increases run-off into streams).
- Cutting down forests (Less water is absorbed into plants through roots, so more water might be available for wells BUT less moisture is released through leaves into the atmosphere, so rainfall might be less.)
- Flooding fields to irrigate crops (If water is drawn from rivers, might increase water absorbed)

Check for Understanding

The weather forecast for south Texas for many weeks has been "hot and dry."

[1] This reading has a lexile level of 780, below the range for the Common Core State Standards 6-8 grade band. Adapted from http://www.weatherwizkids.com/weather-climate.htm.

- Why should homeowners who depend on a well for their drinking water be concerned? Use the cycles diagram to explain your answer.

Rubric

2 – This response gives a valid reason with an accurate and relevant explanation that uses the cycles diagram.

1 - This response gives a valid reason with an inaccurate, irrelevant, or no explanation or does not use the cycles diagram.

Strategy 3: Extending and Refining

Vocabulary and Concept Development: Cycles and Climate Patterns

Activate prior knowledge of climate regions by challenging students to sketch a picture of a landscape. Their sketch must include at least one plant, one animal, and a typical house.

Ask half of the students to sketch a desert landscape, and the other half to sketch a rainforest. When the sketches are complete, have students pair up to compare and contrast their landscape pictures.

Ask the students what single factor caused the differences in the landscapes. They should recognize that available water for plant, animals and humans is the key factor determining differences in the landscape.

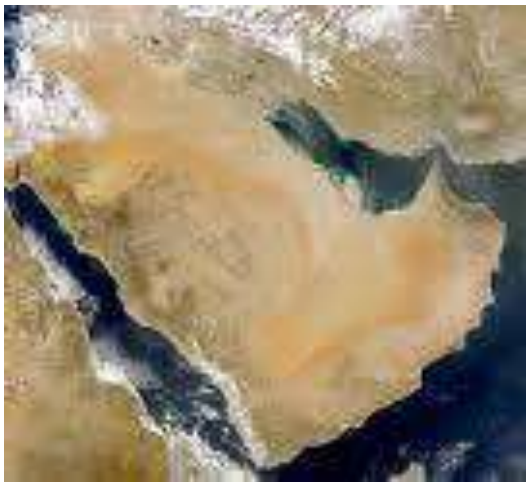
Activate prior knowledge of latitude and longitude and deductive reasoning with this map activity:

Provide the students with an outline world map with a simple latitude and longitude grid overlay (Handout 3). Have the students practice latitude and longitude skills while locating and labeling desert and rainforest regions. They should label the desert regions in orange or red and the rainforest areas in green.

When the labeling is completed, ask the students to identify the pattern that emerges and to speculate about causes. (They should note that rainforests occur in a band along the equator, while the Earth's deserts are found in two bands roughly located along the Tropics of Cancer and Capricorn.) Ask the students to speculate on why this pattern of precipitation differences may exist. Explain that the concept of cycles in the atmosphere can help explain climate patterns.

Use the reading Global Circulation Patterns (Visual 2) to help students understand what causes the climate patterns they discovered in the distribution of rain forests and deserts. Use a globe or a large ball and a slinky to model the bands of air circulation that rise near the equator and fall near 20 degrees north and south latitude.

Check for Understanding also provided as Visual 3



Photos of earth taken from space clearly show the Arabian Peninsula and North Africa. But they seldom allow a good view of the Amazon Basin- it is usually covered with clouds.

Why might photographers have a better view of the deserts than the rainforests? Use the concept of cycles to explain your answer.

Rubric

2 – This response gives a valid reason with an accurate and relevant explanation that uses the concept of cycles.

Sample Response: Student explains a clear connection between high temperatures and low rainfall with a reduced amount of cloud cover and uses an understanding of water cycles to explain.

1 – This response gives a valid reason with an inaccurate, irrelevant, or no explanation that uses the concept of cycles.

Sample Response: Student correctly answers that less rainfall occurs in desert areas, but explanation reveals only a partial understanding of the water cycle or no explanation is given.

Strategy 4: Extending and Refining

Rain Shadow Effect and Sea Breezes as examples of local or "micro climate"

Some differences in climate may result from conditions of the atmosphere or the land that affect relatively small areas. Two examples are the Rain Shadow Effect and the Land Breeze/ Sea Breeze change often observed along the coast.

Rain Shadow Effect - Where prevailing winds pass over bodies of water and then encounter high mountains, a rain shadow may result. On the windward side of the mountains, lush vegetation covers the slopes. As clouds are forced higher and the air cools, precipitation increases. The air that crosses the top of the mountains is

therefore very dry. On the leeward side of the mountains, very dry, almost desert conditions exist.

Click here for an animation to illustrate this effect.

Physical Systems - Just as the health of the human body depends on proper balanced functioning of the circulatory, digestive, respiratory, and other systems, so the health of our environment depends on earth's physical systems. Components of physical systems may be distant from each other, so the relationship of a local body of water, landform, or topographic region to other parts of its system may not be readily apparent. The student needs to understand the interdependence of parts of the physical system and the need for them to achieve balance.

Check for Understanding

- Read aloud the Langston Hughes Poem "A Negro Speaks of Rivers" (Visual 4). What rivers did the poet mention? Why have rivers been important to humans and their activities throughout history?
- Click here for a graphic organizer to help the students with this poem.

Strategy 5: Extending and Refining
Vocabulary and Concept Development: River Systems

Use the slideshow Rivers and Streams to present students with information about the components and stages of streams as they make their way from an inland source to the sea.

Have students read Introduction to Rivers (Handout 4)[2]. As they read, have them highlight the following vocabulary words: *source, course, meander, tributaries, oxbow, runoff, mouth, delta, erosion, sediment, estuary, brackish.* The word deposition should be added in the margin, and students can infer its meaning from the reading.

Working in pairs, have students create flashcards for the vocabulary words. On one side of a card, have them write a word, and on the other side, the definition. They may add pictures if they choose.

Show the graphic of the Colorado River (Visual 5).[3] Have the pairs of students line up their vocabulary cards in a vertical line on their desktops to label the graphic as you start from the source of the river and point to areas along it.

To help students organize information about the river system, provide them with a graphic organizer in the shape of a river system (Handout 5). This organizer is used to represent the components of the physical system. Help students to recognize the

[2] The lexile level of this reading is 1260, above the range for the Common Core State Standards 6-8 grade band. The previously viewed power point presentation, pictures, and accompanying activity will serve to lessen the reading load.

[3] Retrieved from http://www.roaringfork.org/images/maps/corivermapfromHCNlarge.jpg.

pattern by showing them photos from space, maps showing river systems, etc. Find two graphics of Delaware's surface water systems at:

- Delaware Major Surface Water Systems
- Satellite Image of Delaware

Have students label the graphic organizer "Highlands" across the top and "Sea" at the bottom. (Be certain that students understand the direction water will flow in the system, as a common misconception is that rivers get their water from the sea.) It may be helpful to have students add directional arrows on the diagram.

Review the character of the stream near its origins, mid- stream and near the mouth. Review the idea of erosion and deposition, which students first encountered in science studies in elementary school. They should remember that fast-moving water near the source causes more erosion. Rock and soil particles are carried downhill and may be deposited near the mouth of the stream or carried into the sea.

Next have the students label the organizer with the vocabulary terms (Visual 5a) at the appropriate place on the diagram. Alternately, provide them with printed labels to place on the diagram. This will provide an informal assessment of student understanding of the key vocabulary.

Check for Understanding

- Read the poem Wilderness Rivers by Elizabeth Coatsworth (Visual 6). Ask the students which part of the graphic organizer is probably described by the poem. How can they tell?

- Next read The River that Meanders (Visual 7). Ask the students to contrast the look and behavior of this stream to the one described in Coatsworth's poem.
- How and why might people use these rivers in different ways?

Strategy 6: Extending and Refining

Photographic Analysis

Present the students with photos showing streams at various stages and ask them to place or associate the photo with the part of the stream where it might occur (Visual 8).

Next add a set of photos showing activities of humans along the river (Visual 9). Ask students where along a stream or river these activities would most likely be found. Kayaking, whitewater rafting, and troutfishing are possible in upstream areas, while cargo ships and barge traffic are commonly found downstream.

Ask the students to match construction projects of humans (bridge, dam, port, wastewater treatment plant, hydroelectric dam) with the part of the stream system where they would be built.

Point out that many communities use rivers as a primary source for drinking water.[4]

- What would happen if river water upstream was diverted for industrial purposes or irrigation?
- How might pollution from upstream facilities affect the lives of people downstream?

Use an atlas map showing physical features, or online source, to allow students to examine several river systems in other parts of the world. For each system, have the students apply vocabulary learned to identify the source, the mouth, the delta (if present), tributaries, the main stream, etc.

Ask students to identify a large city located on a river.

- How might the people of the city make use of the river?
- How might they change the river by their activities and by construction projects?

Ancient civilizations often started in river valleys. Using an unlabeled map of the Nile River (Visual 10), the Tigris-Euphrates River (Visual 11), or the Yangtze River (Visual 12), ask the students to speculate on what part of the river system people chose to settle. [mid-stream or near the mouth] Why? [agriculture depends on lots of water, deposition of soils produced by erosion upstream provides good cropland near the mouth of the river.] Have students use atlases to confirm their predictions.

Strategy 7: Application

Constructing a River Puzzle

Distribute Handout 6, River Puzzle to students.[5] (Note: There are two pages; the front and the back of the original activity page.) Have them cut out the parts, and then lay them out in an order that represents what they have learned about how man interacts with the physical system of a river, using the features at each point in the river system to the best advantage.

Teaching Tip: "A River Ran Wild"[1] by Lynne Cherry, will provide students with an example of the impact of human development on a river system.

Check for Understanding

Use a map of the Colorado River System (Visual 5) to answer these questions:

- How have humans adapted their activities to take advantage of the Colorado River system?
- What are some ways humans have altered or changed the Colorado River?
- How have the actions of humans affected the Colorado River System?

[4] Teaching Tip: At this point, the book "Letting Swift River Go"[4], by Jane Yolen, provides a true story of a town that was flooded in order to provide drinking water to Boston. The stories of the original residents are available on several websites, including: http://insideout.wbur.org/documentaries/hauntingquabbin/

[5] The activity is also available here from the Canadian Council for Geographic Education.

Lesson Two: Humans Respond to Environmental Conditions

Essential Questions

- How do physical processes affect human activity in this sub-region?
- How can we use knowledge of cycles and systems to predict environmental hazards?

Instructional Strategies

Strategy 1: Gathering Information

Concept and Vocabulary Development

Concepts: Adaptation Strategies (extracting and gathering resources; choice of economic activity; design and construction of shelter, clothing, and transportation)

Vocabulary: natural resources, adaptation, alteration, perception, hazard, risk

Ask the students to think about a time when they found themselves in a new group or in new surroundings. What are some strategies they used to adapt to the new situation? (Notice what types of clothing were needed, move out of the way of activity going on, find out where resources were located.)

The ability to assess a new place and decide how to use the assets available is a survival strategy people have used since ancient times. But not every person or group of people reacts in the same way.

Strategy 2: Extending and Refining

Adaptation Strategies in History

Just like today, people in ancient times made geographic choices regarding the environment. They could choose to stay in an area and adapt to the conditions there, or they could move to another area with resources and conditions they liked better. As civilizations developed, most groups of people chose to stay in one place; nomadic people moved more often. The cultures of both groups developed to give them skills in adapting to the environment- including possible environmental risks. Look at the chart (Visual 13) to gather information about settled people and compare their ways of life.

- Based on the chart, how do you think nomadic people would react if the river near-by flooded? How do you think settled people would react? What are your reasons?
- Which group would be most affected by a flood? Why?

Strategy 3: Extending and Refining

Reactions to Natural Hazards

When we assess the relative safety of a place, some natural hazards are easy to spot. A cliff is clearly a dangerous place! Other hazards may not be so apparent.

Tectonic plates may shift and cause earthquakes. Earthquakes can touch off tsunamis thousands of miles from the original shock. When people are faced with natural hazards, there are basic strategies they use to deal with the situation:

- They can migrate or move away from the area to an area that seems safer.
- They can stay in place, but make plans for emergency evacuations.
- Use tools and technology to warn of danger and protect from harmful conditions.
- Accept some risk. Make plans for responding to people in trouble and repair or rebuilding of damaged property.
- Discount the risk as not very likely.

Perception plays a big part in decision-making. In general, people tend to underestimate the danger of natural hazards and overestimate their ability to cope. Use the DGA slideshow Natural Hazards to introduce and /or reinforce the concepts of natural hazards and how people tend to respond to them. Sometimes the amount of risk that exists is underestimated. It may surprise you to learn that floods account for more loss of life and property than other hazards in the US each year. People make decisions about how to act during an event and what to do afterwards based on their perceptions of risk.

Using the graphic organizer Rate the Risk (Handout 7), ask students to rate the level of danger they would expect if they experienced some natural hazards.

Strategy 4: Application

Research

Over time, people have developed some strategies to help them deal with natural hazards. Some strategies give early warning so people have more time to react. Others attempt to provide protection from dangers or shortages. Some strategies involve building projects to control the risk. Using available resources, students should complete the graphic organizer Strategies for Natural Hazards (Handout 8).

Check for Understanding

- Two places in Latin America were recently damaged by violent earthquakes. The quakes were about the same in level of severity, but Chile experienced far less loss of life and damage than Haiti.

Why might the earthquake in Chile have caused less damage? Explain your answer using what you have learned about the strategies people use to deal with natural hazards.

Rubric

2 – This response gives a valid reason with an accurate and relevant explanation.

1 – This response gives a valid reason with an inaccurate, irrelevant, or no explanation.

Lesson Three: Farmers Interact with the Environment

Essential Questions

- How do physical processes affect human activity?
- How can geographic principles help us make decisions about projects and problems?

Instructional Strategies

Successful farmers put geographic knowledge to work for them to grow food. Good farmers know the local environment well. They try to choose the right crops for local conditions. Sometimes they use technology to alter the local environment and increase crop yields. The intended result of their efforts is more and better crops. But altering the environment can have unintended consequences. This lesson looks at three aspects of agriculture: crop choices, terrace farming, and irrigation. All three have historical context but are still in use today.

Strategy 1: Gathering Information

Using Climate Patterns to Make Crop Choices

Use a computer simulation for matching suitable crops to growing conditions. ("Command Economy" from the *Teaching Geography* CD by Phil Gersmehl, or Activity from ARGUS Activities and Readings in the Geography of the United States, will work well.) Each of these activities supplies students with mapped information about precipitation and temperatures, and length of growing season. Crop requirements are also provided. The student receives points based on the best match for each crop. Alternately, use the following exercise with student atlases. (See Handout 9 for a copy that students can fill out.) Possible answers are shown below:

Crop	Conditions Needed	Best State or States
Corn	80 day growing season Moderate moisture Heat tolerant	Oklahoma Iowa Kansas Nebraska
Apples	70 days frost free Moderate to high moisture Cool temperatures	Washington New York
Wheat	80 day growing season Drought tolerant	Nebraska Kansas
Rice	90 day growing season High moisture and temperature requirements No frost	Florida Texas California

Cherries	70 days frost free High moisture requirement Cool temperatures for highest yield	Oregon Washington Maine
Oranges	100 day growing season High temperature Moderate moisture requirement No frost	Florida Texas California
Potatoes	Early planting preferred 80 day growing season Moderate temperatures and moisture	Pennsylvania Ohio Idaho
Sugar Beets	90 day growing season Moderate temperatures and moisture	Illinois Indiana Nebraska

Strategy 2: Extending and Refining Concept Development

Use the reading Terrace Farming[6] (Handout 10) to further develop the idea of crop choice based on geographic conditions, and to introduce farmer adaptations.

Strategy 3: Application

Use the readings Irrigation[7] (Handout 11) and Aral Sea[8] (Handout 12) and the photos in the readings to answer the following questions:

- What are the intended consequences of irrigation systems?
- What unintended consequences resulted from diverting the rivers feeding the Aral Sea for irrigation?
- What might the white surface in the 2004 photo be? How did it get this way?
- What is the green/brown substance in the Aral Sea in the 2004 photo? What does this signify?

[6] The lexile level of this reading is 1040, within the range for the Common Core State Standards 6-8 grade band.
[7] The lexile level of this reading is 980, within the range for the Common Core State Standards 6-8 grade band.
[8] The lexile level of this reading is 900, slightly below the range for the Common Core State Standards 6-8 grade band.

Lesson Four: Searching for Energy

Essential Questions

- How do Earth's physical processes shape the surface of earth?
- How do physical processes affect human activity?

Background: The activities of humans often require energy, and the development of energy sources is important for future development. The reading Energy in History summarizes the history of energy use and introduces alternative energy sources.

Students should apply concepts of cycles and systems, adaptation and alteration of the environment to evaluate the likely impact of alternative energy sources.

Instructional Strategies

Strategy 1: Gathering Information
Organizing Data

Teaching Tip: If a teacher or team has multiple classes engaged in the same lesson, students will benefit from comparing data gathered from class groups and also from compiling data from all the students. The results can be posted in the room and may be the subject of follow-up discussion.

Begin by posting three charts with these headings:

- Things That Use Energy
- Things That Generate Energy
- Things That Store Energy

Give each student a set of post-it notes and ask them to write words or phrases that might go under each heading. Call rows or groups of students forward to place their notes on the charts. If another student has already posted an answer, they should post next to the first one, forming a bar graph.

The resulting charts will summarize student knowledge about energy users, energy producers, and energy storage. Ask the students to examine the collected data and evaluate the information.

- Are there areas that might be incomplete or where more information might be needed?

Tell the students that this lesson will focus on energy use and how it impacts the environment.

Strategy 2: Extending and Refining
Analyzing Geo-graphics

Exhibit two cartograms: World Energy Users and Oil Producing Nations (Visual 6).

Ask the students to speculate on the reason for the distortion patterns on the two diagrams. After they have deduced that relative size of countries has been adjusted

to show the statistical differences in consumption and production, ask the students to discuss problems that might arise in the future based on the information presented.

Next distribute the student readings Energy in History[9] (Handout 13) and Alternative Energy Sources[10] (Handout 14). As the students read, they should develop a list of energy uses and energy sources.

- How do these compare with the lists developed at the beginning of the lesson?
- What are the advantages and disadvantages of each energy source used in the past?

Strategy 3: Application

Have students research one of the following proposed alternative energy projects. What might be the advantages and disadvantages for each project? Are there unintended consequences to consider?

- Windfarm off the shore of Delaware and New Jersey
- Large solar farm in southern Delmarva
- Nuclear electric generating facility in northern California
- Ethanol plant in North Carolina

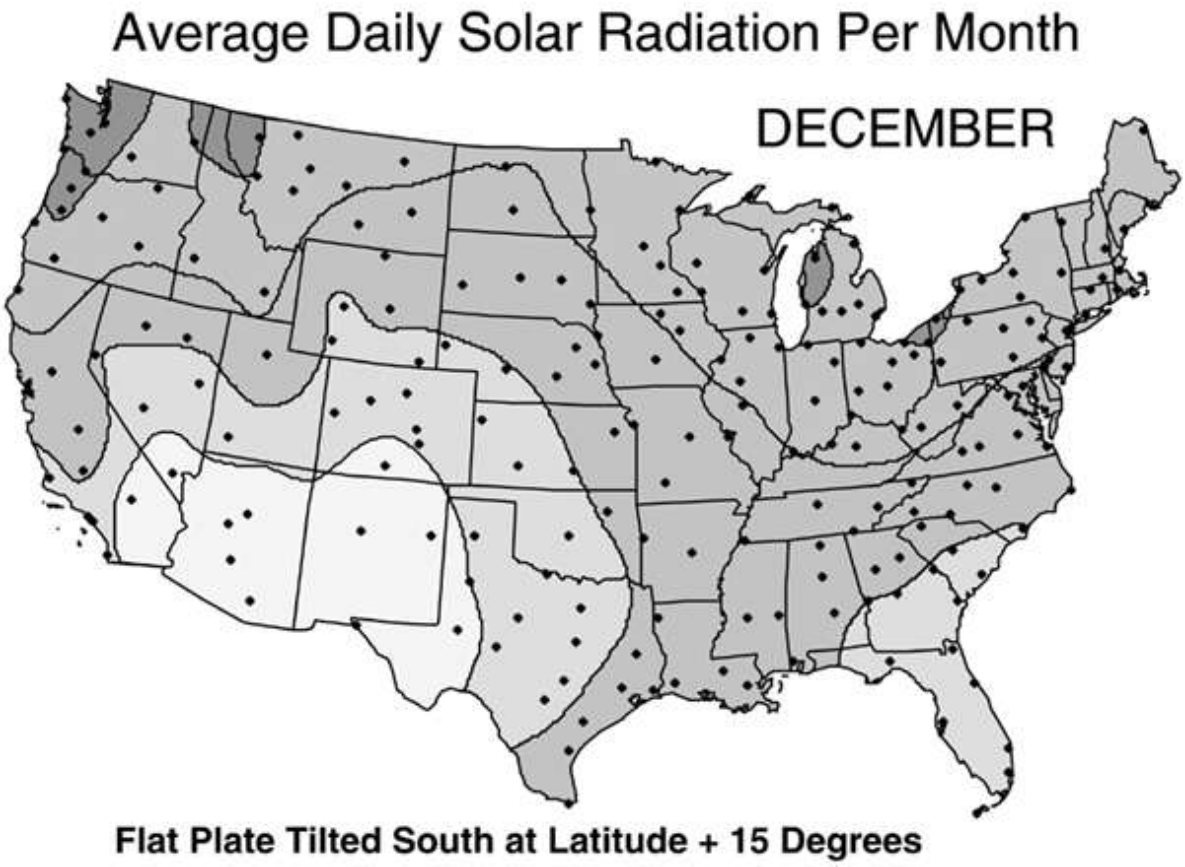
A Check for Understanding is below.

[9] The lexile level of this reading is 970, within the range for the Common Core State Standards 6-8 grade band.
[10] The lexile level of this reading is 1020, within the range for the Common Core State Standards 6-8 grade band. The source for this reading is Benefits of Recycling. This site credits two others for the data: http://www.eia.doe.gov/kids/energyfacts/ and http://www.eere.energy.gov/kids/renergy.html.

Check for Understanding[11]

This map shows where the power of the sun is available in December. The lightest areas receive the most solar radiation, while the darkest areas receive the least. Use this map to answer these questions:

1. Which region of the country would be most likely to benefit from solar energy for heating in winter? Which area would benefit least? Why?
2. Which region would probably benefit from solar energy for cooling in summer? Explain why you think this is so.
3. Citizens in Texas are debating the benefits of solar energy. Why might Texans have different opinions on the usefulness of solar power?



[11] Map from: http://www.fs.fed.us/t-d/pubs/htmlpubs/htm99712805/index.htm