You Can Die Here
Lesson Overview

GRADE LEVEL: 8-10

TIME ALLOTMENT: Two 45-minute class periods

OVERVIEW: Death Valley lies just to the east of the high peaks of the Sierra Nevada Mountains of central California. At 282 feet below sea level, it is the lowest point in the United States. It is also both the hottest and driest place in the United States. Death Valley is an example of a "rain shadow desert," one of many such deserts located in the lee of high mountain ranges around the world. This lesson will help students to evaluate how the interactions of air, moisture, wind, and topography combine to create an environment of such extremes.

Utilizing a directed inquiry approach, students will discover precipitation patterns in the southwest United States. Using clips from the Nature episode "Life in Death Valley," precipitation maps and Google Maps satellite images (or an optional Google Earth tour) students will describe the differences in precipitation on the west and east flanks of the Sierra Nevada. Through classroom discussion, students will then explore the reasons for those differences.

SUBJECT MATTER: Earth Science, Meteorology, Climate, Deserts, Rain Shadow Deserts

LEARNING OBJECTIVES:

Students will be able to:

- Read and interpret a Planetary Winds diagram
- Describe the precipitation patterns on the windward and leeward sides of mountains
- Explain the reasons for the precipitation patterns on the windward and leeward sides of mountains
- Relate knowledge about temperature and pressure to meteorological effects

STANDARDS AND CURRICULUM ALIGNMENT

National Science Education Standards

http://www.nsta.org/publications/nses.aspx

CONTENT STANDARD D: AS A RESULT OF THEIR ACTIVITIES IN GRADES 9-12, ALL STUDENTS SHOULD DEVELOP AN UNDERSTANDING OF:

ENERGY IN THE EARTH SYSTEM

- Global climate is determined by energy transfer from the sun at and near the earth's surface. This energy transfer is influenced by dynamic processes such as cloud cover and the earth's rotation, and static conditions such as the position of mountain ranges and oceans.

GEOCHEMICAL CYCLES

- The earth is a system containing essentially a fixed amount of each stable chemical atom or element. Each element can exist in several different chemical reservoirs. Each element on earth moves among reservoirs in the solid earth, oceans, atmosphere, and organisms as part of geochemical cycles.
- Movement of matter between reservoirs is driven by the earth's internal and external sources of energy. These movements are often accompanied by a change in the physical and chemical properties of the matter. Carbon, for example, occurs in carbonate rocks such as limestone, in the atmosphere as carbon dioxide gas, in water as dissolved carbon dioxide, and in all organisms as complex molecules that control the chemistry of life.

New York State Regents Core Curriculum Alignments:

Physical Setting: Earth Science Core Curriculum

http://www.emsc.nysed.gov/ciai/mst/pub/earthsci.pdf

Mathematics, Science, and Technology

Standard 2: Information Systems
Students will access, generate, process, and transfer information, using appropriate technologies.

Key Idea 1. Information technology is used to retrieve, process, and communicate information as a tool to enhance learning

Standard 4
Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Key Idea 2. Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

Performance Indicator 2.1c
Weather patterns become evident when weather variables are observed, measured, and recorded. These variables include air temperature, air pressure, moisture (relative humidity and dewpoint), precipitation (rain, snow, hail, sleet, etc.), wind speed and direction, and cloud cover.

Performance Indicator 2.1e
Weather variables are interrelated. Temperature and humidity affect air pressure and probability of precipitation. Air pressure gradient controls wind velocity.

Performance Indicator 2.2c
A location's climate is influenced by latitude, proximity to large bodies of water, ocean currents, prevailing winds, vegetative cover, elevation, and mountain ranges.

Key Idea 4. Energy exists in many forms, and when these forms change energy is conserved.

MEDIA COMPONENTS:

Video

NATURE: *Life in Death Valley*, selected clips

Clip 1, "You Can Die Here."

Environmental conditions of Death Valley, CA.

Clip 2, "Clouds & Currents."

Cloud formations over the Sierra Nevada Mountains.

Clip 3, "Runnin' with the Devil."

Running a race in Death Valley must be done with extreme caution!

Access the streaming and downloadable video segments for this lesson at the Video Segments Page (http://www.pbs.org/wnet/nature/lessons/you-can-die-here/video-segments/1444/).

WEB SITES

Planetary Winds Diagram

http://emsc32.nysed.gov/osa/reftable/esp10-16.pdf

A diagram from the New York State Education Department's Earth Science Reference Tables (ESRT).

Relief Map of California

http://store.usgs.gov/mod/images/i1848_1p.gif

A color-coded map from the United States Geological Survey showing terrain elevations in California.

California's Average Annual Precipitation Map

http://www.ocs.orst.edu/pub/maps/Precipitation/Total/States/CA/ca.gif

A color-coded map from Oregon State University showing average annual rainfall in California.

MATERIALS:

For each student:

- A copy of the Planetary Winds diagram from page 14 of the Earth Science Reference Tables (ESRT)
- "Rainshadow Deserts Student Organizer "
- "Precipitation Student Organizer"
- Relief Map of California, color copy
- California's Average Annual Precipitation Map, color copy

For each group of 3-4 students:

- "Global Deserts Student Organizer"

For the classroom:

- One computer with broadband internet access, connected to a LCD projector and screen.
- One overhead projector or similar digital projection device.
- Rainshadow Deserts Student Organizer - Teacher Answer Key
- Precipitation Student Organizer - Teacher Answer Key
- Optional Google Earth tour to accompany this classroom exercise: http://pbs.org/wnet/nature/files/2008/08/rainshadow.kmz
- Additional instructions for optional Google Earth tour.

PREP FOR TEACHERS

Prior to teaching this lesson, you will need to:

Preview all of the video clips and Web sites used in the lesson.

Download the video clips used in the lesson to your classroom computer, or prepare to watch them using your classroom's Internet connection.

Bookmark the Web sites used in the lesson on each computer in your classroom. Using a social bookmarking tool such as del.icio.us or diigo.com (or an online bookmarking utility such as portaportal.com) will allow you to organize all the links in a central location.

Make copies of all print materials as outlined in the materials section. Make sure you can quickly and reliably switch the screen from the computer display to the overhead or digital projection display. If using the optional Google Earth Tour for Learning Activity One, follow these additional instructions: http://www-tc.pbs.org/wnet/wp-content/blogs.dir/3/files/2008/08/google-earth-instructions.pdf

INTRODUCTORY ACTIVITY

1) Introduce students to Death Valley by explaining that it is located to the east of the high peaks of the Sierra Nevada Mountains of central California. Provide students with a FOCUS FOR MEDIA INTERACTION by asking students to share what they already know about Death Valley how the characteristics of the landscape effect the climatic conditions of the area. Display this Google Map (http://maps.google.com/?ie=UTF8&ll=36.619937,-118.421631&spn=2.217535,5.141602&t=h&z=8&om=1), OR from the satellite view on http://maps.google.com, search for "Death Valley, CA" and zoom out until the Sierra Nevada Mountains are visible on the left side of the screen. Be sure to explain that it is 282 feet below sea level–the lowest, hottest, and driest place in the United States.

2) Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to describe the climate, weather conditions, and landscape portrayed in the clip. Play Clip 1, "You Can Die Here" (Access the video segments for this lesson at the Video Segments Page, http://www.pbs.org/wnet/nature/lessons/you-can-die-here/video-segments/1444/). Lead students in a discussion of the climate, weather conditions and landscape *(Possible answers: This is the hottest and driest place in the western hemisphere; there are large salt flats, vast deserts, and deep craters.)*

LEARNING ACTIVITY ONE

1) Distribute the "Precipitation Student Organizer" to each student. Open and display this Google Map (http://maps.google.com/?ie=UTF8&ll=36.619937,-118.421631&spn=2.217535,5.141602&t=h&z=8&om=1), OR from the satellite view on

http://maps.google.com, search for “Orange Cove, CA” and zoom in & out in order to be able to see the surrounding landscape. Point out the central valley of California, the Sierra Nevada Mountain range, and the Basin and Range region in nearby Nevada. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to describe the landscape conditions of each area as seen on the Google map. Be sure to point out the differences between the landscapes on either side of the mountain *(see Teacher Key for answers)*.

2) Zoom into and browse around the Orange Cove area on your Google map until you can see the existence of orchards. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to a) describe the type of human activity going on here, and b) describe the surrounding landscape. (Section 1 on the “Precipitation Student Organizer.”) Lead a discussion with the students about their answers and ask them to share how they reached their conclusions *(see teacher key for answers)*.

3) Open and display this Google map (http://maps.google.com/?ie=UTF8&ll=36.619937,-118.421631&spn=2.217535,5.141602&t=h&z=8&om=1) OR from the satellite view on http://maps.google.com, search for “Badger, CA” and zoom in and navigate west in order to be able to see the surrounding landscape. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to describe the vegetation covering these mountains. What does the presence of this vegetation suggest about the amount of rainfall here? (Section 2 on the “Precipitation Student Organizer.”) Lead a discussion with the students about their answers *(see teacher key for answers)*.

4) Using the same map used in Step 3, scroll further east over the top of the Sierras into the arid basins east of the mountains, and zoom in slightly on the landscape. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them how the vegetation here compares to the vegetation at the foothills of the Sierras? What does the landscape suggest about the rainfall (Section 3 on the “Precipitation Student Organizer”)? Lead a discussion with the students about their answers *(see teacher key for answers)*.

5) Project the following two maps:

Relief map of California (http://store.usgs.gov/mod/images/i1848_1p.gif)

California’s Average Annual Precipitation
(http://www.ocs.orst.edu/pub/maps/Precipitation/Total/States/CA/ca.gif)

Optionally, also distribute color copies of each map to the students. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to compare the areas of high and low precipitation with the areas of high and low elevation and fill in Section 4 on the “Precipitation Student Organizer.” Lead a discussion with the students about their answers. Be sure to point out the increase in precipitation that corresponds to an increase in altitude.

6) Project the planetary winds diagram on page 14 of the ESRT (http://emsc32.nysed.gov/osa/reftable/esp10-16.pdf). Tell students that the contiguous United States is located between 30 and 45 degrees north latitude. Provide students

with a FOCUS FOR MEDIA INTERACTION by asking them to determine which way the wind moves at that latitude and to write their answers in Section 5 of the "Precipitation Student Organizer." Lead students in a discussion about their answers *(see teacher key for answers).*

LEARNING ACTIVITY TWO

1) Display the "Formation of Rainshadow Deserts Student Organizer" on an overhead projector. Distribute copies of the organizer to the students. Point out the different areas of the diagram and provide students with a FOCUS FOR MEDIA INTERACTION by asking them to describe the types of landscapes found in each area as previously discussed. Tell students that the main movement and direction of wind over the United States is from west to east, and that these are called prevailing winds. The winds that approach the Sierra Nevada Mountains are called the prevailing southwesterlies due to the fact that they are traveling from the south west. Draw a few arrows indicating wind direction and label the "Prevailing Southwesterlies" on the "Formation of the Rainshadow Desert Student Organizer." Ask students to duplicate your drawing on their worksheets. Ask students if anyone can define windward *(facing into the wind)* and leeward *(eastern facing slopes)*. Label area B on the diagram, windward (see figure 1). Label area D on the diagram: leeward (see figure 1).

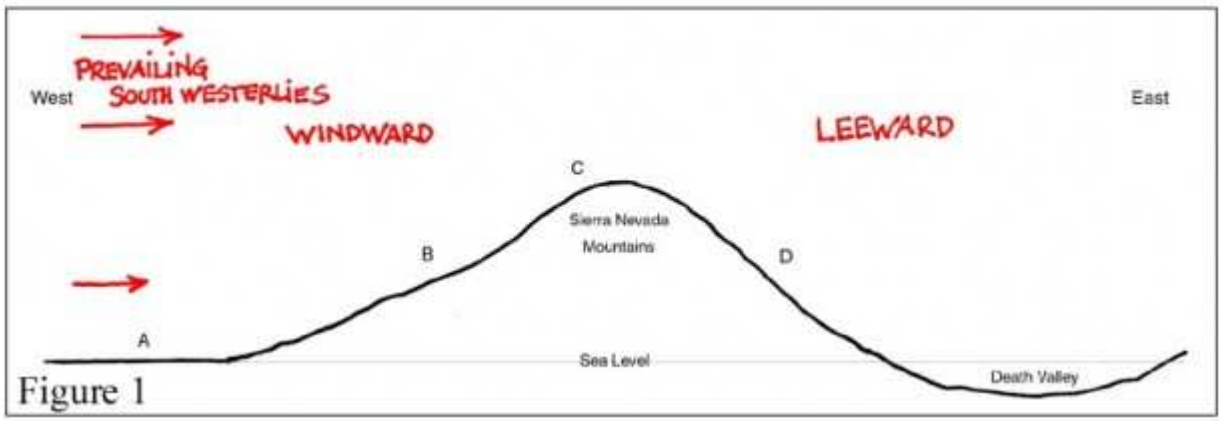

Figure 1

2) Ask students to speculate what happens to air near the surface of the earth as it is encounters the Sierra Nevada Mountains. Be sure to discuss how it rises up over the windward side of the mountains and sinks back down on the leeward side. Ask students to add a few arrows to indicate the movement of air their worksheet (Figure 2).

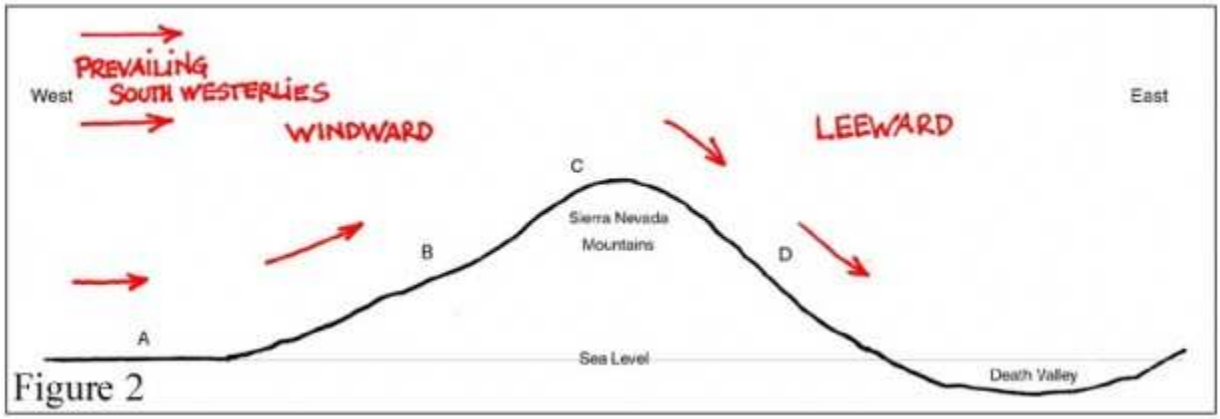

Figure 2

3) Ask students to think about and discuss the nature of the air mass at point A, particularly with respect to temperature and moisture content, as it comes from over the Pacific Ocean. Explain how this maritime tropical air mass is warm and moist due to the fact that it is coming from the subtropics and travels a long distance over the water. Ask students to write "warm moist air" next to point A on the diagram (Figure 3).

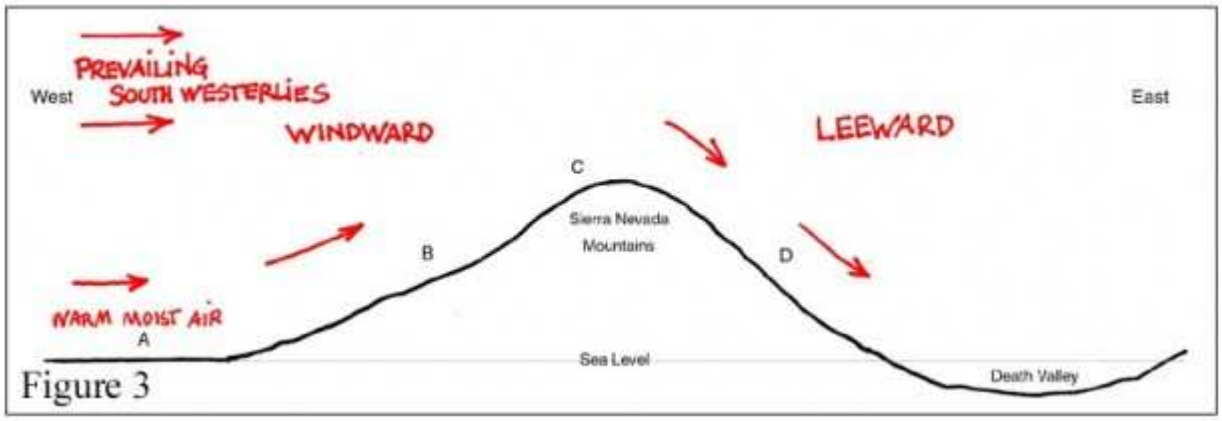

Figure 3

4) Ask students to predict what topographical features might influence cloud formation. Discuss these predictions. Provide students with a FOCUS FOR MEDIA INTERACTION, asking them over what topographic features do the clouds form, and where do they seem to dissipate? (Section 6 on the "Precipitation Student Organizer.") Play video clip 2, "Clouds & Currents" (Access the video segments for this lesson at the Video Segments Page, http://www.pbs.org/wnet/nature/lessons/you-can-die-here/video-segments/1444/)). Explain how storm clouds from the south west are formed over the mountain peaks due to the warm air that cools and expands as it rises over the mountain. This cooling and expanding causes the condensation of water vapor in the air. Ask the students to draw a rain cloud in area C on their diagram (Figure 4). Lead a discussion with the students about their answers in Section 6 of the student organizer, making sure to incorporate the definition of a rainshadow *(the dry area on the leeward side of a mountain)*.

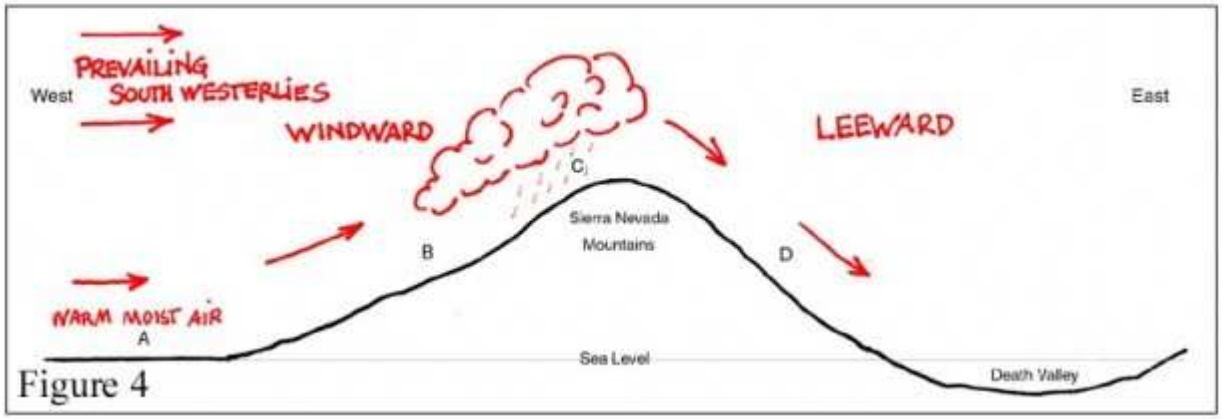

Figure 4

5) Explain to the students that the condensation that occurs over the mountain peak releases latent heat (energy stored in the water vapor) at evaporation. This releases measurable, sensible heat back into the environment, keeping the rising air warmer than dry air that has risen to the same altitude. This process adds to the warming effect on the leeward side of the mountains. The air then continues down the leeward side of the mountain. The pressure increases as the air descends and results in further warming. The end result is the extremely hot, dry air found in Death Valley. Ask students to add the label "Hot Dry Air" to their diagram (figure 5).

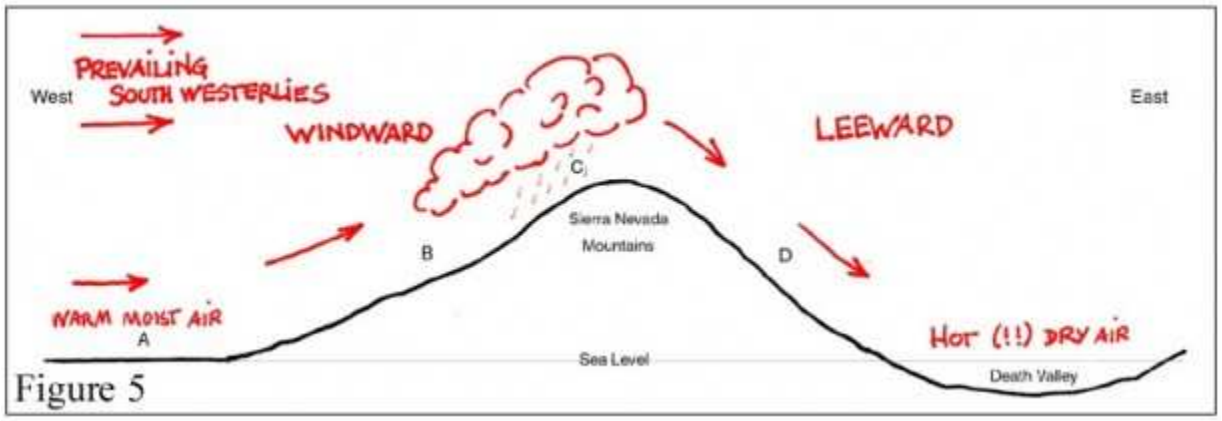

Figure 5

6) Below the rainshadow desert diagram, there are five statements referencing the different areas in the diagram. Ask the students to match the appropriate description with its corresponding area (area A, area B, area C, area D or Death Valley) as it appears on the bottom of their rainshadow desert diagram. Lead students in a discussion about their answers *(see Teacher Key for answers)*.

7) Provide students with a FOCUS FOR MEDIA INTERACTION, asking them to describe the conditions in Death Valley, especially in terms of moisture evaporation rates and temperature and record their answers on Section 7 of the "Precipitation Student Organizer." Play video clip 3: "Runnin' with the Devil" (Access the video segments for

this lesson at the Video Segments Page, http://www.pbs.org/wnet/nature/lessons/you-can-die-here/video-segments/1444/). Lead students in a discussion about their answers *(see teacher key for answers)*. Ask the students if they'd like to visit Death Valley and why .

CULMINATING ACTIVITY

Group 3-4 students per computer with broadband internet access. Look back at the planetary winds diagram (http://emsc32.nysed.gov/osa/reftable/esp10-16.pdf) and ask students to predict what areas of the world other deserts will be found *(along the 30 degree north and 30 degree south latitude lines)*. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to use the following Web sites to research other examples of deserts across the globe and record their characteristics on their "Global Deserts Student Organizer."

Missouri Botanical Gardens: Desert Topics
(http://www.mbgnet.net/sets/desert/index.htm)

U.S. Geological Survey (USGS): Geologic Information
(http://pubs.usgs.gov/gip/deserts/contents/)

CROSS-CURRICULAR EXTENSIONS

Geography

Using the USGS website listed in the Culminating Activity, guide students to the information pertaining to desertification (http://pubs.usgs.gov/gip/deserts/desertification/). Lead a discussion with the students about the dangers of desertification (the "degradation of formerly productive land") and some potential remedies.

Physical Science/Chemistry

Using a CO_2 fire extinguisher, demonstrate the cooling that occurs when gas expands. Explain to students that the CO_2 inside the fire extinguisher is under great pressure. Ask students to predict what they think will happen to CO_2 gas as it exits the container. Spray a piece of fabric with the fire extinguisher. The escaping CO_2 will solidify and form icey residue on the material demonstrating the cooling that occurs as the escaping gas expands.

History/Global Culture

Have students research how different cultures have adapted to life in deserts. Possible subjects could include nomadic Bedouins and southwestern Native Americans..

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COMMUNITY CONNECTIONS

Ask students to research and report on the meteorological conditions of their local area, and how they are affected by geographical features.

Invite a local nursery to make a classroom presentation about the needs of desert-habitat plants. Ask any students who have such plants at home to bring them in to share with the class.

Invite a local pet store to make a classroom presentation about the needs of desert-habitat animals. Ask any students who have such pets at home to bring them in to share with the class.

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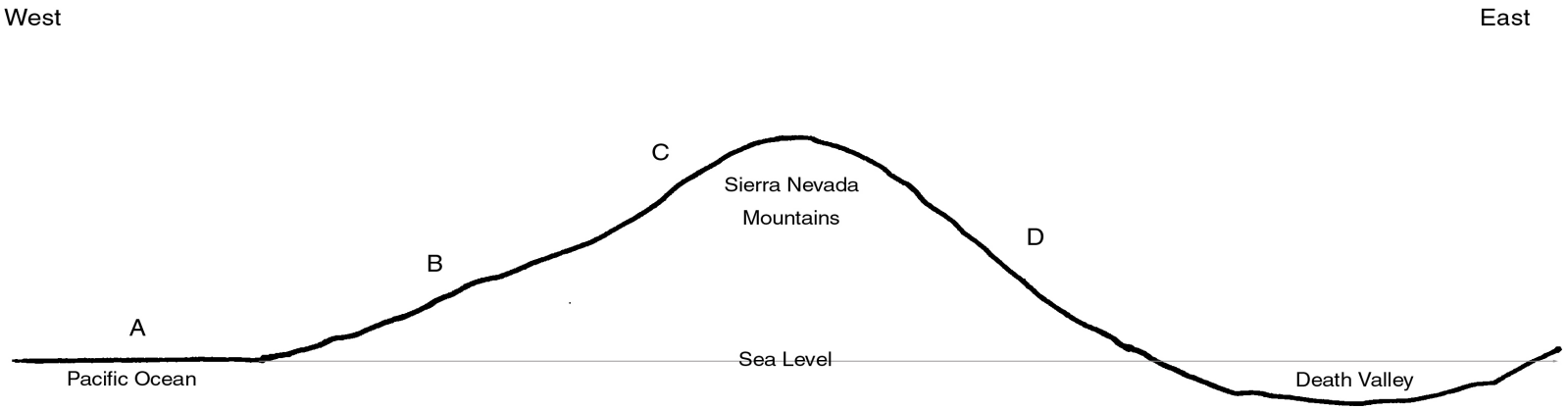
The Formation of Rain Shadow Deserts / The Orographic Effect

Student Organizer



Match the appropriate description with its corresponding area (A, B, C, D or Death Valley) from the diagram above:

_____ Air is very warm[1] and dry, creating a "rain shadow desert" here

_____ Cooling triggers condensation, forming clouds and precipitation, and releasing additional heat into the air[2]

_____ Warm air rises as it moves eastward over the Sierra Nevadas. The air expands[3] and cools[4] as it rises.

_____ Compression of dry, descending air warms it further.

_____ Warm moist air moves eastward over coastal California

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[1] Adiabatic(occurring without gain or loss of external energy) heating by compression, as well as the earlier release of latent heat during condensation, results in very hot, dry air.

[2] Condensation releases latent heat of evaporation (stored in water vapor) back into the environment as measurable, sensible heat, keeping the rising air warmer than dry air that has risen to the same altitude. That heat will add to the warming effect on the leeward side of the mountains.

[3] Atmospheric pressure decreases with altitude. The decrease in confining pressure causes the rising air to expand.

[4] Expanding air cools adiabatically.

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Precipitation in California and the Southwestern United States

Student Organizer

After viewing a map of southern California:

1. View Google Map: **Orange Cove, California**

Describe the type of human activity going on here: _____

Describe the surrounding landscape: _____

Do you think that water for agriculture in Orange Cove comes from rainfall, or from local rivers? What evidence can you cite to support your idea? _____

_____

2. View Google Map: **Badger, California**

Describe the vegetation covering these mountains*:* _____

What does the landscape suggest about the amount of rain that falls here? _____

3. View Google Map: **Badger, California**

How does the vegetation here compare to the vegetation to the Foothills of the Sierras? _____

_____

What does the landscape here suggest about the amount of rain that falls here? _____

_____

4. View California Precipitation Image & Relief Map: _____

_____

5. Refer to the Planetary Winds diagram and determine which way the prevailing winds move at the latitude of the United States (between 30 and 45 degrees north latitude): _____

_____

6. View Video Clip 2, “Clouds & Currents.”
Over what topographical features do the clouds form and where do they seem to dissipate?

_____

7. View Video Clip 3, “Runnin’ with the Devil.”

What are the two biggest problems the competitors face and how are they solved?

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Global Deserts Student Organizer

1. Desert Name:_____
   Location (Region/Country):_____
   Longitude/Latitude:_____
   Features:_____
_____

2. Desert Name:_____
   Location (Region/Country):_____
   Longitude/Latitude:_____
   Features:_____
_____

3. Desert Name:_____
   Location (Region/Country):_____
   Longitude/Latitude:_____
   Features:_____
_____

4. Desert Name:_____
   Location (Region/Country):_____
   Longitude/Latitude:_____
   Features:_____
_____

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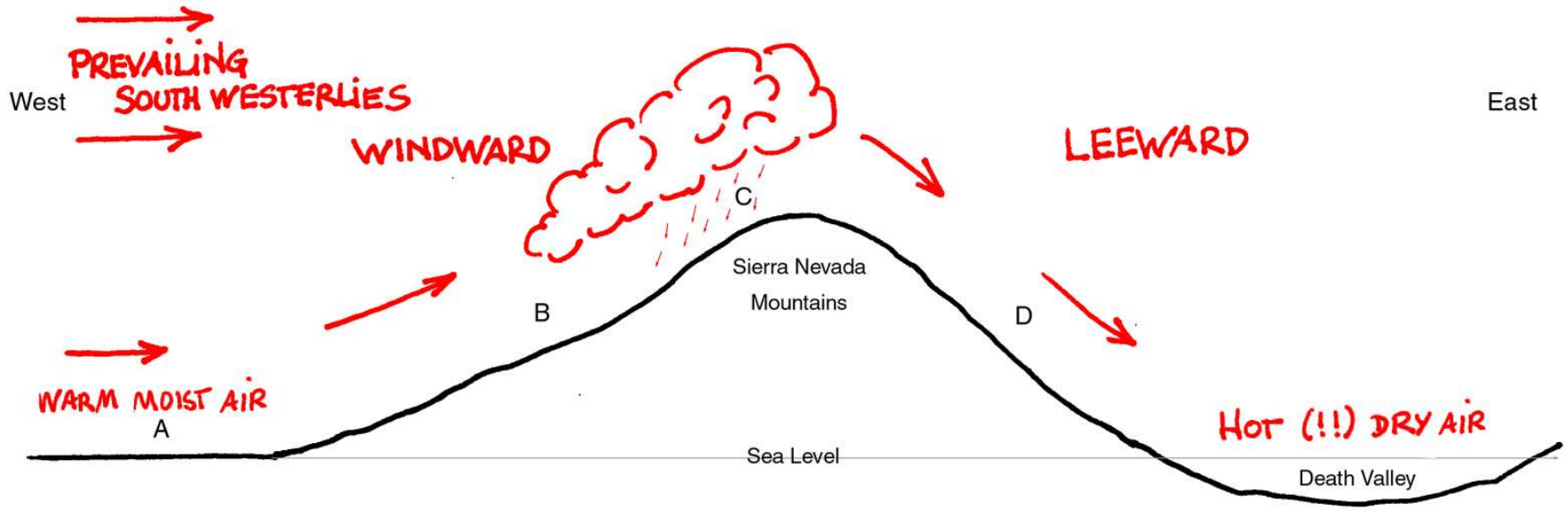
NAME: _____

DATE: _____

The Formation of Rainshadow Deserts / The Orographic Effect

Teacher Answer Key



Match the appropriate description with its corresponding area (A, B, C, D or Death Valley) from the diagram above:

Death Valley. Air is very warm[5] and dry, creating a "rain shadow desert" here

C. Cooling triggers condensation, forming clouds and precipitation, and releasing additional heat into the air[6]

B. Warm air rises as it moves eastward over the Sierra Nevadas. The air expands[7] and cools[8] as it rises.

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[5] Adiabatic(occurring without gain or loss of external energy) heating by compression, as well as the earlier release of latent heat during condensation, results in very hot, dry air.

[6] Condensation releases latent heat of evaporation (stored in water vapor) back into the environment as measurable, sensible heat, keeping the rising air warmer than dry air that has risen to the same altitude. That heat will add to the warming effect on the leeward side of the mountains.

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NAME: _____

DATE: _____

D. Compression of dry, descending air warms it further.

A. Warm moist air moves eastward over coastal California

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[7] Atmospheric pressure decreases with altitude. The decrease in confining pressure causes the rising air to expand.

[8] Expanding air cools adiabatically. A CO_2 fire extinguisher illustrates the point perfectly. If you have one in your room, get permission to do a 3 second discharge at close range onto a dark colored fleece jacket or shirt. Have students observe the frozen CO_2 on the jacket, and feel the "cold" on the underside of the CO_2 ice.

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Precipitation in California and the Southwestern United States
Teacher Answer Key

After viewing a map of southern California:

1. View Google Map: **Orange Cove, California**

   Describe the type of human activity going on here: *Farming.*

   Describe the surrounding landscape: *Mountainous with nothing growing.*

   Do you think that water for agriculture in Orange Cove comes from rainfall, or from local rivers? What evidence can you cite to support your idea? *Local rivers – see answer above.*

2. View Google Map: **Badger, California**

   Describe the vegetation covering these mountains*: Lots of vegetation, lush forests.*

   What does the landscape suggest about the amount of rain that falls here? *Ample rainfall.*

3. View Google Map: **Badger, California**

   How does the vegetation here compare to the vegetation to the Foothills of the Sierras? *There is little to no vegetation here compared to the very lush vegetation on the foothills.*

   What does the landscape here suggest about the amount of rain that falls here? *Extremely dry.*

4. View California Precipitation Image & Relief Map:

   Describe any relationship between elevation and precipitation that you notice.

   Heaviest precipitation is in the higher mountains while the valleys are relatively dry.

5. Refer to the Planetary Winds diagram and determine which way the prevailing winds move at the latitude of the United States (between 30 and 45 degrees north latitude):

   Southwesterly, from the southwest, to the northeast, etc.

6. View Video Clip 2, "Clouds & Currents."
   Over what topographical features do the clouds form and where do they seem to dissipate?

   They form over the mountains and dissipate over the valleys

7. View Video Clip 3, "Runnin' with the Devil."

What are the two biggest problems the competitors face and how are they solved?

Overheating and dehydration due to evaporation. Lots of ice and water are essential.

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DATE: _____

Instructions for Google Earth Tour option for Intro & Learning Activity One

Media Component
rainshadow.kmz
Prep For Teachers

Make sure that Google Earth is installed and running properly on your classroom computer. If not, download and install the free version at http://earth.google.com or get your technology support team to do it for you.

Download and save the Google Earth tour *rainshadow.kmz* to accompany this classroom exercise. When you double click it the file will automatically launch Google Earth and open as "Rainshadow Desert Tour" in Temporary Places at the bottom of the Places sidebar. Once the file is in Google Earth, right click it and select "Save to My Places". It will now be saved in My Places in the Places sidebar.

It is important that you are familiar with the controls and behavior of Google Earth before using it in front of the classroom. Expand the Rainshadow tour folder and practice turning on and off and double clicking on and displaying the place marks and overlays in the "Rain Shadow Desert" tour.

Open Google Earth with the Rainshadow Desert Tour folder open and expanded in the Places sidebar. Turn on each of the place marks in the tour by toggling on the checkmark in the boxes next to the place mark in the sidebar.

Introductory Activity

1) Introduce students to Death Valley by explaining that it is located to the east of the high peaks of the Sierra Nevada Mountains of central California. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to share what they already know about Death Valley and how the characteristics of the landscape affect the climatic conditions of the area . Double click on the Google Earth place labeled "The Rainshadow Desert Tour." Double click on the area east of the Sierras in order to zoom in and view the surrounding landscape. Be sure to explain that it is 282 feet below sea level--the lowest, hottest, and driest place in the United States.

2) Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to describe the climate, weather conditions, and landscape portrayed in the clip. Play Clip 1, "You Can Die Here." Lead students in a discussion of the climate, weather conditions and landscape (Possible answers: This is the hottest and driest place in the western hemisphere; there are large salt flats, vast deserts, and deep craters.)

Learning Activity One
1) Double click on the Google Earth place labeled "The Rainshadow Desert Tour." Point out the central valley of California, the Sierra Nevada Mountain. range, and the Basin and Range region in nearby Nevada. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to describe the landscape conditions of each area as

seen on the Google Earth tour. Be sure to point out the differences between the landscape on either side of the mountain (see teacher key for answers).

2) Double click on the Google Earth place labeled "What human activity is going on here?" Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to a) describe the type of human activity going on here, and b) describe the surrounding landscape. (Section 1 on the "Precipitation Student Organizer.") Lead a discussion with the students about their answers and ask them to share how they reached their conclusions (see teacher key for answers).

3) Double click on the Google Earth place labeled "The Windward Side of the Sierra Nevada." Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to describe the vegetation covering these mountains. What does the presence of this vegetation suggest about the amount of rainfall here? (Section 2 on the "Precipitation Student Organizer.") Lead a discussion with the students about their answers (see teacher key for answers).

4) Double click on the Google Earth place labeled "The Leeward Side of the Sierra Nevada." Provide students with a FOCUS FOR MEDIA INTERACTION by asking them how the vegetation here compares to the vegetation at the foothills of the Sierras? What does the landscape suggest about the rainfall (Section 3 on the Precipitation Student Organizer)? Lead a discussion with the students about their answers (see teacher key for answers).

5) Be sure the checkbox next to Central California Precipitation is checked. The precipitation map should appear as an overlay on the satellite image map. Distribute copies of each of the maps to the students. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to compare the areas of high and low precipitation with the areas of high and low elevation and fill in Section 4 on the Precipitation Student Organizer. Lead a discussion with the students about their answers. Be sure to point out the increase in precipitation that corresponds to an increase in altitude.

6) Project the planetary winds diagram on page 14 of the ERST: http://emsc32.nysed.gov/osa/reftable/esp10-16.pdf. Tell students that the contiguous United States is located between 30 and 45 degrees north latitude. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to determine which way the wind moves at that latitude and to write their answers in Section 5 of the Precipitation Student Organizer. Lead students in a discussion about their answers (see teacher key for answers).

(Continue lesson using Learning Activity Two in the "You Can Die Here" lesson.)