

MOJAVE DESERT ISSUES

A Secondary School Curriculum



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Mojave Desert Issues was funded with a grant from the National Park Foundation. Parks as Classrooms is the educational program of the National Park Service in partnership with the National Park Foundation.
Design by Amy Yee and Sandra Kaye
Published in 1999 and printed on recycled paper

A C K N O W L E D G M E N T S

Thanks to the following people for their contribution to this work:

Elayn Briggs, *Bureau of Land Management*

Caryn Davidson, *National Park Service*

Larry Ellis, *Banning High School*

Lorenza Fong, *National Park Service*

Veronica Fortun, *Bureau of Land Management*

Corky Hays, *National Park Service*

Lorna Lange-Daggs, *National Park Service*

Dave Martell, *Pinon Mesa Middle School*

David Moore, *National Park Service*

Ruby Newton, *National Park Service*

Carol Peterson, *National Park Service*

Pete Ricards, *Twentynine Palms Highschool*

Kay Rohde, *National Park Service*

Dennis Schramm, *National Park Service*

Jo Simpson, *Bureau of Land Management*

Kirsten Talken, *National Park Service*

Cindy Zacks, *Yucca Valley Highschool*

Joe Zarki, *National Park Service*

The following specialists provided information:

John Anderson, *California Department of Fish & Game*

Dave Bieri, *National Park Service*

John Crossman, *California Department of Parks and Recreation*

Don Fife, *American Land Holders Association*

Dana Harper, *National Park Service*

Judy Hohman, *U. S. Fish and Wildlife Service*

Becky Miller, *California Department of Fish & Game*

Keith Rogers, *Las Vegas Review – Journal*

Barbara Schneider, *National Park Service*

Walter Swain, *United States Geological Survey*



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I N T R O D U C T I O N

Mojave Desert Issues was designed to be used, either in part or in its entirety, by educators who want students to learn about the Mojave Desert. The culminating activities are real-life environmental issues which seek to teach students how to think about environmental dilemmas, rather than what to think. When combined with the “action taking” methods of the final unit, these activities prepare students to consider possible solutions about environmental issues and provide a mechanism for implementing their solutions.

As students participate in environmental issues activities they gain insight into their complexity through examining the players and their positions, their beliefs and values, and by arriving at potential solutions that help clarify how environmental issues affect deserts. Each issues activity is designed to enable students to think objectively about environmental issues.

The status of environmental issues is constantly changing because of research, new technologies, legislation, and compromise so the activity examples may not necessarily reflect current understanding of the issue. You can have students research the particular issues presented in this curriculum to update the information as a learning extension, or you can have them choose issues that are of concern in their local community or state, making the issues more relevant to them.

Organization and Design of the Units

The Mojave Desert Issues curriculum is not designed to be an all-inclusive or comprehensive curriculum. Instead, it is designed to offer educators the flexibility to choose single units or to teach the entire curriculum. Educators are invited to fill in gaps with content that relates to their community, expertise, interests, or the needs of their students.

Each unit is organized into three major sections: 1) Background Information provides an overview of the unit’s basic concepts; 2) Teacher’s Guide is divided into objectives, materials, subjects, skills, method, time considerations, and extensions; 3) Student Activities enhance specific aspects of the unit.

For the language arts connection, students are asked to keep a journal. A journal is a personal record of a student’s reactions to learning experiences, and is an excellent way to develop ideas for future assignments. Students are encouraged to include illustrations or drawings in their journal as a means of expressing concepts.

Constructivist Theory of Learning

The Mojave Desert Issues curriculum uses the constructivist theory of learning which recognizes that students construct new understandings by combining previous understandings with new discoveries. With this in mind, the lessons are designed to begin with brainstorming sessions to determine what students already know about an issue. These sessions provide opportunities for teachers to guide students toward new discoveries and scientific understanding based on assessing initial knowledge and interest of students.

The following techniques will help educators implement constructivist learning:

- whenever possible use a local emphasis for activities;
- ask students their ideas about concepts before beginning instruction to assess prior knowledge;
- guide students' learning with words such as *classify*, *analyze*, and *predict*;
- allow students' thinking to guide lessons;
- adapt curriculum based on needs of and responses by students;
- have students use primary sources, as well as manipulative materials;
- ask open-ended questions;
- encourage students to ask questions of other students.

Cooperative Learning

Cooperative learning is an instructional method in which students work together in small groups to achieve common goals. Cooperative learning can encourage skills of cooperation and communication and be a valuable addition to the learning experience.

Used appropriately, cooperative learning can motivate students, promote active learning, foster respect, improve language skills, and increase teacher effectiveness. The essential feature of cooperative learning is that the success of one student helps other students be successful. It helps promote equality of all students by encouraging them to cooperate with each other to complete projects.

This is accomplished through organizing students into small teams that work together to accomplish academic and non-academic tasks while, at the same time, developing important social skills. Steps include:

1. Form teams through careful selection of members.
2. Assign roles: a recorder who writes the group's answers and reports them to the entire class; a facilitator who organizes the group's work, makes sure all do their job, and interacts with the teacher for group questions or problems; an artist who draws illustrations or diagrams for the group; and a researcher who looks up unknown words or topics as required.
3. Develop and post classroom rules: everyone must participate; everyone must listen to and help others; all students must complete their assigned task.
4. Encourage students to practice positive social interactions.
5. State directions clearly.
6. Monitor groups.
7. Evaluate outcomes and debrief students after each lesson by asking questions: Did everyone in the group participate? How could you encourage someone to participate? How did you help your group during the activity? What could you do to make your group work better together?

Problem Solving

Emphasizing a problem solving approach to learning promotes the development of skills such as identifying problems, determining desired outcomes, selecting possible solutions, choosing strategies, testing solutions, evaluating outcomes, revising and repeating steps, and predicting new problems. Environmental action is one of the most important components in this curriculum. When students work together on an action project, they develop a sense of belonging and self-esteem, and strengthen the feeling that they can make a difference and, in fact, contribute towards positive change.

Teaching Controversial Issues

Controversy can provide opportunities for increasing the quality of students' thinking and ability to solve problems. It can be intellectually stimulating. As long as students clearly understand that issues are controversial precisely because they are too complex to have clear-cut right or wrong solutions, they can focus on the process of clarifying their own viewpoints through debate and reflection.

Talking About Bias

Before beginning any action project students need to be told that information may be presented in a biased way. Bias is defined as exhibiting a highly personal

and unreasonable distortion of judgment. Most of the time, a biased article does not discuss opposing views of an issue. If other views are presented, they are often left incomplete. It is difficult to get all the information about an issue, but it is important to know all sides to an issue before making a decision.

Consensus

Usually it is necessary to make compromises when arriving at solutions to issues. This is often achieved through reaching a consensus. One way to help achieve consensus is to have everyone rank the ideas that have been presented with a number. For example, if there are six ideas, each person would rank the choices from one to six, with six being the first choice. Total the number of points given for each idea; the one with the highest score represents the majority viewpoint. This technique is especially helpful when you have a large group trying to reach consensus.

Environmentalism Versus Environmental Educator

Before beginning an environmental project, it is important for educators to understand the difference between an environmentalist and an environmental educator. An environmentalist is one who frequently advocates a position concerning an environmental issue. On the other hand, an environmental educator is one who uses information and educational processes to help people analyze the differing points of view usually present in an environmental issue so that they can arrive at their own solution. Environmental educators should be “value-free.”



Unit I: What Makes a Desert Special?

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Unit I
*What Makes A
Desert Special?*

WHAT MAKES A DESERT SPECIAL?

As the fingers of daylight disappear into a brilliant reddish-orange sunset, you hear the familiar calls of the Gambel's quail. Their cries echo from nearby yuccas as they prepare for encroaching nightfall. Joshua trees silhouette the landscape, and the distant cry of a coyote offers a serenity that one can only experience in the majesty of the Mojave Desert.

Yet with all its grandeur, few people would disagree that the desert suffers from an image problem. Some visualize it as a barren wasteland whose sole purpose of existence is to wreak havoc on those poor souls who have the misfortune of being forced to traverse it. Many view the desert as a gigantic, indestructible playground. Some view it as a retreat from the hustle and bustle of everyday life. In reality the desert is a fragile ecosystem whose delicate balance is rapidly approaching crisis.

What is a Desert?

When asking others to define a desert one would probably get many different answers. A dictionary or glossary would describe it as an area where evaporation exceeds precipitation, the average precipitation being less than 10 inches (25 cm) a year. There are deserts in arctic regions, but this lesson will discuss high temperature deserts. One of the best ways to define a *high temperature desert* is to list its characteristics:

- low and often irregular patterns of precipitation
- periods of prolonged high temperatures
- extreme temperature fluctuations
- low humidity
- high percentage of possible sunlight received
- soils high in minerals and low in organic material
- extreme erosion of the ground surface by wind and water

Where Are the World's Deserts Located?

Deserts cover approximately one-seventh of Earth's land surface or about 8,000,000 miles² (20,718,400 km²). Their locations are a direct result of complex global air-circulation patterns. Most of the world's deserts occur in two belts, which encircle the globe between 15 and 35 degrees latitude (Figure 1). This corresponds to the Tropic of Cancer in the Northern Hemisphere and the Tropic of Capricorn in the Southern Hemisphere.



What Are the Different Types of Deserts?

Most geographers divide the world's deserts into four major divisions based on how they form. They are:

1. subtropical deserts
2. rain shadow deserts
3. interior deserts
4. coastal deserts

Subtropical deserts form as a result of global air-circulation patterns caused by Earth's rotation on its axis and the seasonal tilting of Earth in its relationship to the sun. When air is heated at the equator, it rises and is replaced by intruding cooler air. As the warm air rises, it gradually cools. Cool air holds less moisture than warm air, so as it cools moisture is released. (This is what causes tropical rainforests.) As the air continues to flow toward the poles it rises and begins to heat up. Once it is heated the air will sink until it reaches the Tropics of Cancer and Capricorn. As air temperature increases, its ability to retain and absorb moisture also increases. This produces a dry or arid climate. As the air continues to move north and south of the desert latitudes, it rises and produces moisture. After rising, the air moves toward the poles where it descends once again (Figure 2). The Sahara Desert is an example of a subtropical desert.

Rain shadow deserts form where mountain ranges are parallel to moist, coastal areas. Winds moving inland cool as air is forced to rise over the mountains. Clouds form and moisture falls on the slopes facing the winds. That is why



Figure 1
Locations of the World's Deserts



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these slopes are called the windward side of mountains. When the winds move over the summit and down the leeward side, they are very dry. Dry, descending air prevents additional clouds and precipitation from forming. Unless another source of moisture enters the picture, a rain shadow desert forms. The windward side of mountain ranges is usually occupied by heavy woodland areas, while the leeward side and the areas far beyond are usually occupied by deserts (Figure 3). The Mojave Desert is an example of a rain shadow desert.

Interior deserts form because of their remoteness from oceanic moisture sources. Areas lying deep within a continent often become deserts simply because air currents reaching them have lost all of their moisture while traveling long distances. The Gobi Desert is an example of an interior desert.

Coastal deserts form when cold ocean currents, which flow close to the shore, influence winds. Air moving across the frigid currents is cooled causing it to release moisture. When the air reaches the land it is relatively dry. This type of desert usually has early morning fog and very little rain. The Namib Desert is an example of a coastal desert.

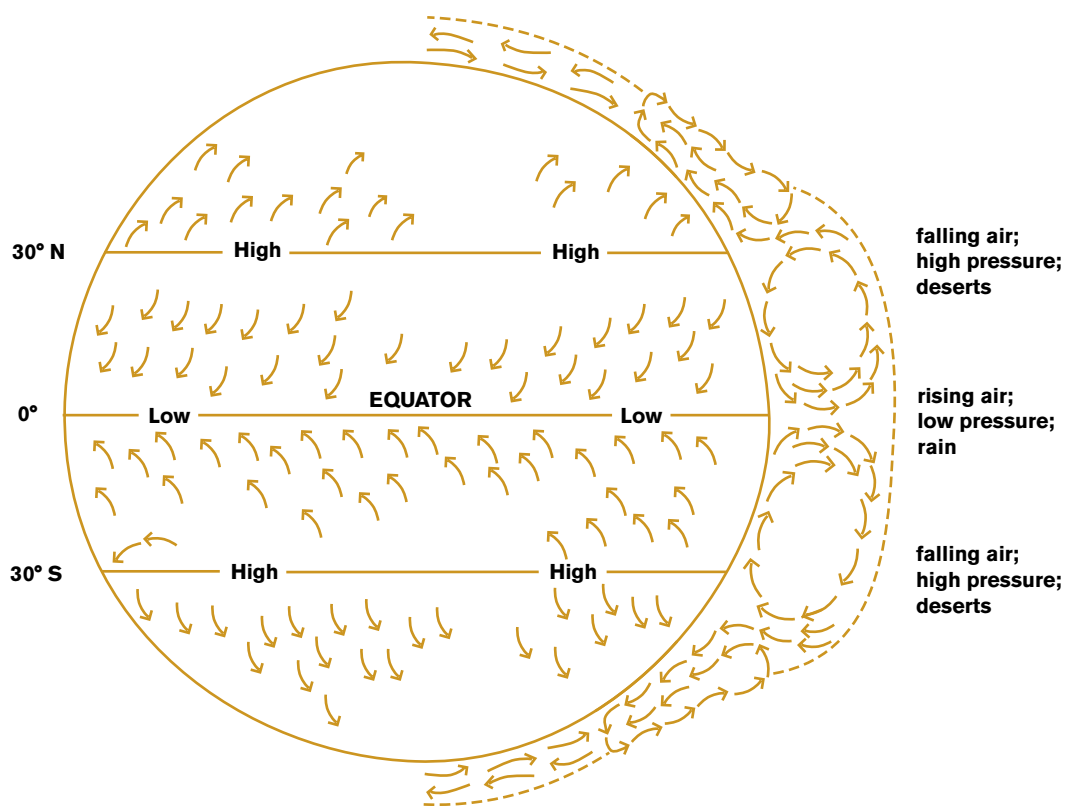


Figure 2
Equatorial Rainforests and Subtropical Deserts



What is the North American Desert?

Although all four types of desert can be found in the North American Desert, the rain shadow desert is the predominant type. The North American Desert can be subdivided into the following members:

1. Great Basin Desert (*rain shadow*)
2. Mojave Desert (*rain shadow, subtropical*)
3. Sonoran Desert (*coastal, rain shadow, subtropical*)
4. Chihuahuan Desert (*interior, subtropical*) (Figure 4).

Locating precise boundaries for three of the four deserts is difficult because each grades into its neighbor.

What About the Mojave Desert?

The Mojave is the smallest of the four North American Deserts. It covers 54,000 square miles (139,849 km²) and has an average elevation range between 2000 and 4000 feet (610 –1219 m). The lowest point, which is 282 feet below sea level (-86 m), is located in Death Valley National Park. Because there are

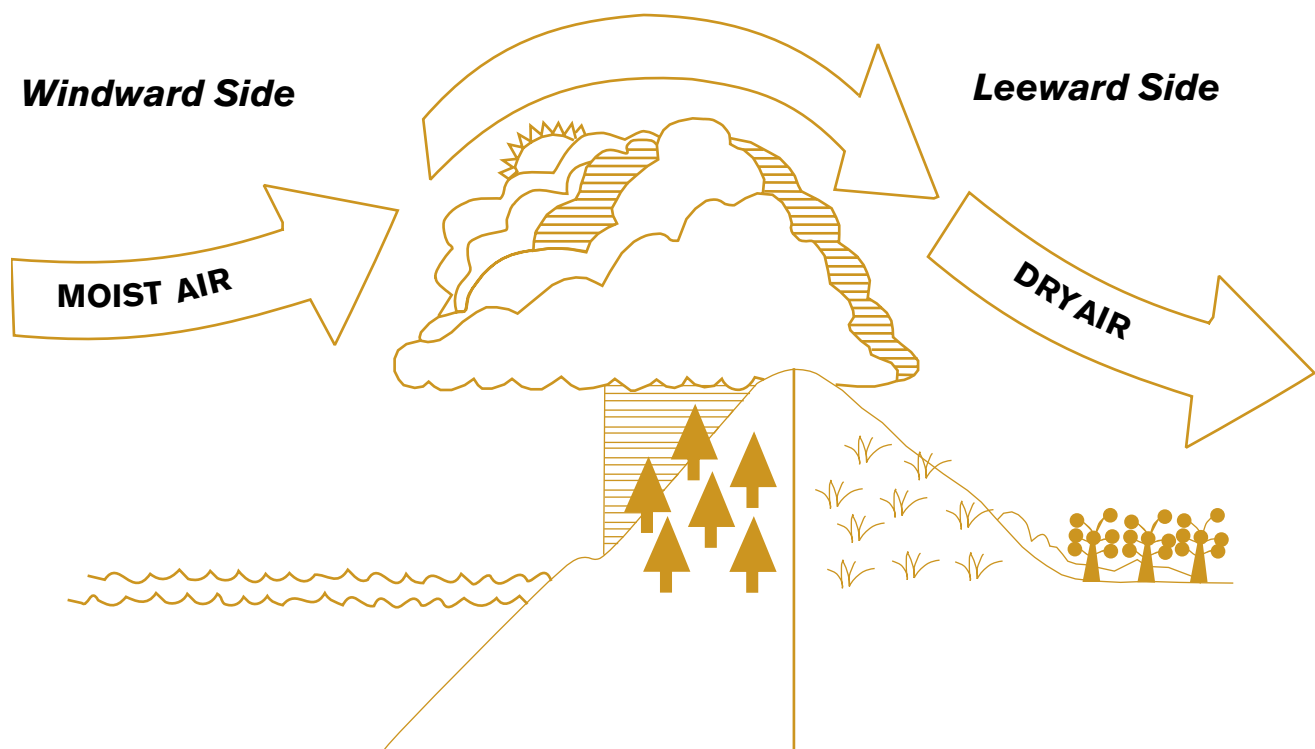


Figure 3
Rain Shadow Deserts



Unit I

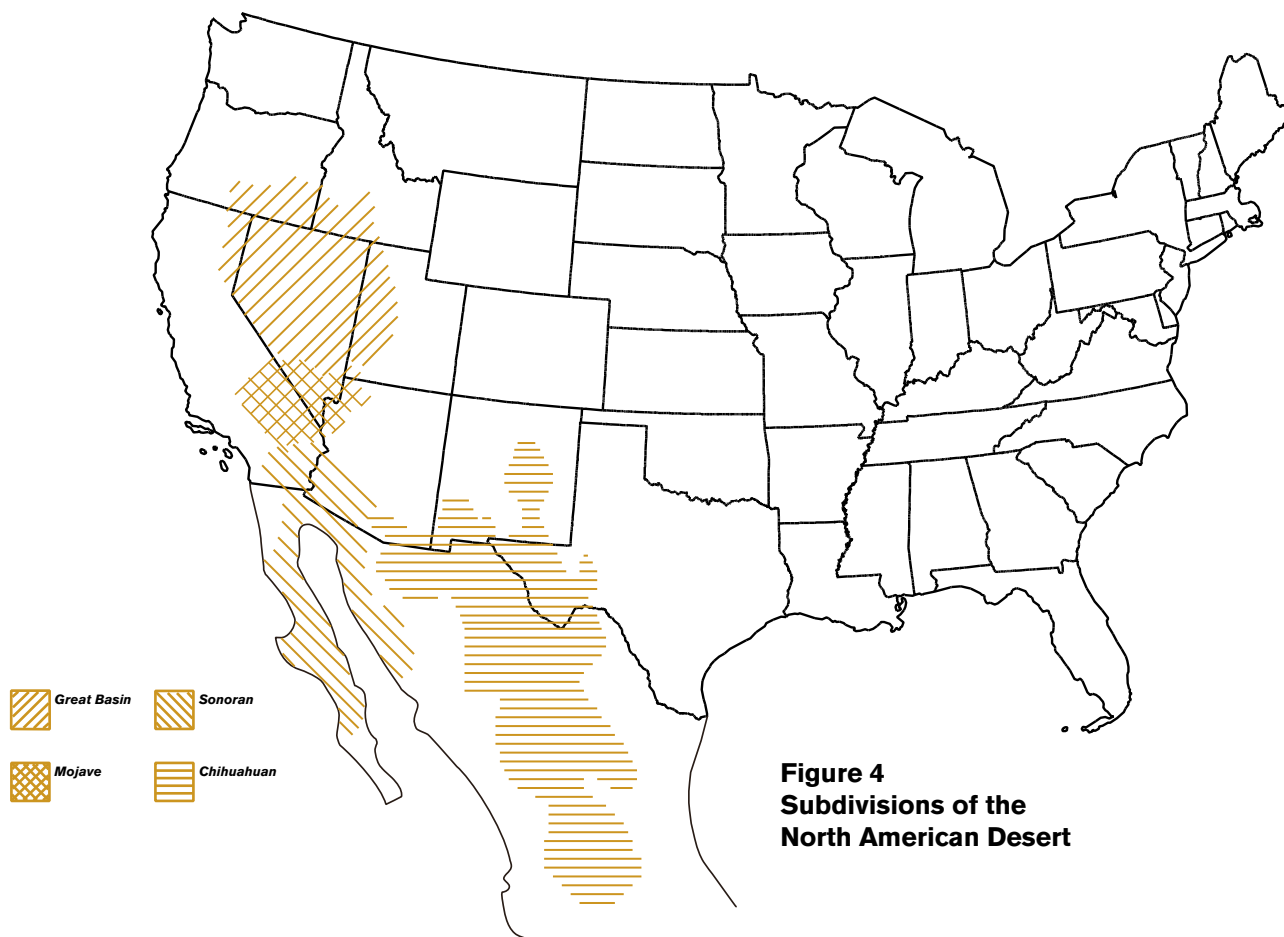
What Makes A Desert Special?

many places with elevations in excess of 5000 feet (1524 m) the Mojave Desert is often referred to as a “high desert.”

Extending eastward from the Sierra Nevada Mountains to beyond the Colorado River, the Mojave blends northward into the Great Basin Desert and southward into the Sonoran Desert (Figure 5). Flanked by mountains on the south and west the Mojave is primarily a rain shadow desert.

For the most part, the Mojave Desert consists of basins bounded by mountain ranges. Relief is the difference in elevation between the high and low points on a land surface. Basins are narrow and mountain ranges have a lot of relief in the northern part of the Mojave Desert. In the southern part of the Mojave Desert, basins are wide and mountain ranges have very little relief. This is due, in part, to large alluvial fans which fill the basins with material that has eroded from the mountain ranges.

The lowest point in most of the basins is a dry lake bed, or playa, which is fed by dry washes, or arroyos. Formed by water, arroyos look like dry stream beds, but rapidly become raging waterways when flash flooding occurs. A flash flood can swiftly carry large amounts of rocks, boulders, branches, sand, and silt





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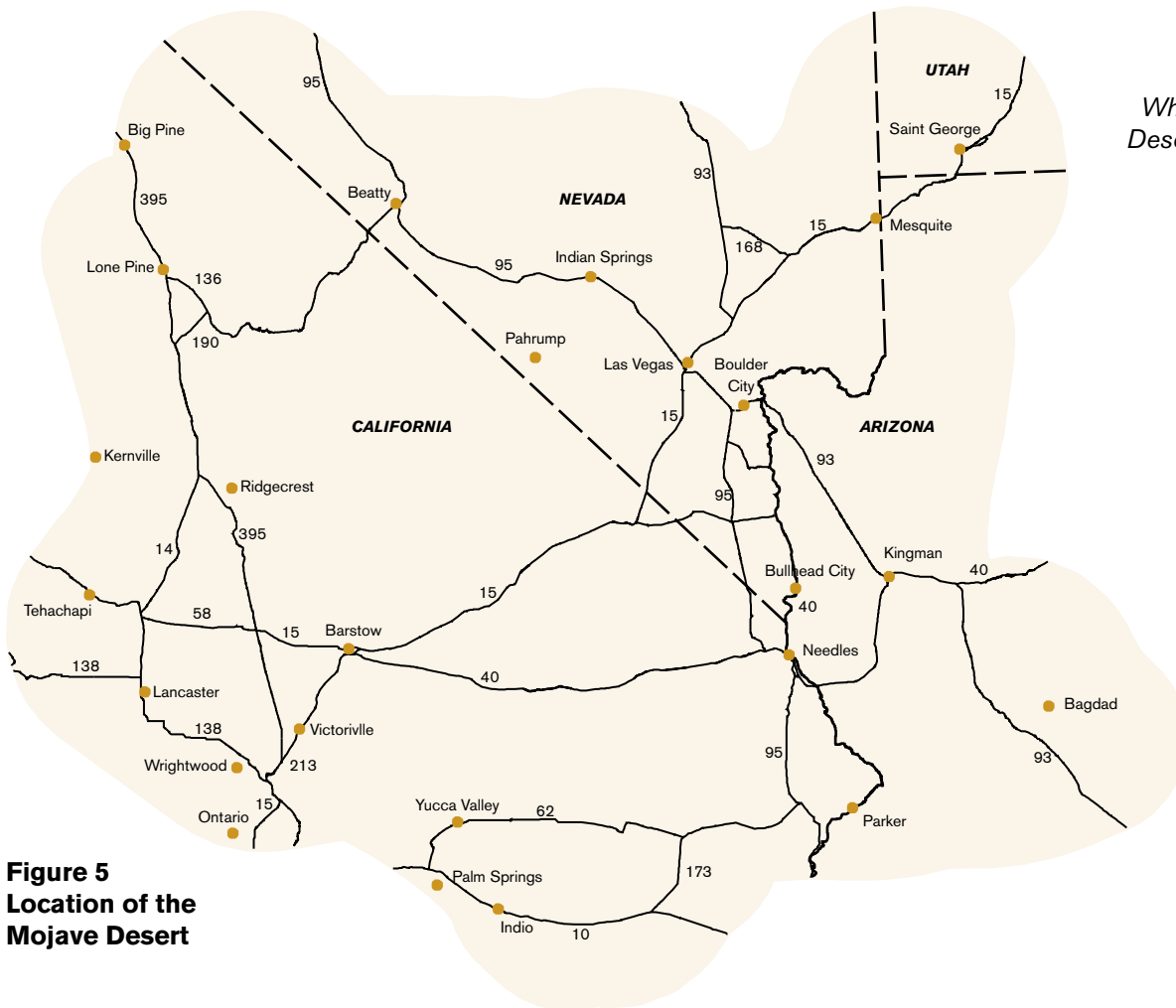


Figure 5
**Location of the
Mojave Desert**

down-stream. Desert explorers have sometimes been chased by a wall of water thundering down one of these washes.

During the last iceage (Pleistocene) the Mojave Desert was a wet, lake-dotted area (Figure 6). The lakes were joined by a network of rivers and were filled with the progenitors of the desert pupfish. Between 10,000 and 20,000 years ago, humans came to the shores of these lakes to hunt and fish. Today, the lakes and the rivers that connected them are gone and water rarely flows between basins.

An exotic river is one that flows into a dry region bringing water from somewhere else. The Colorado River, which flows through the eastern section of the Mojave, is considered an exotic river. There are two rivers which can be called the Mojave's own; they are the Mojave and the Amargosa. The Mojave River begins in the San Bernardino Mountains and flows north for approximately 100 miles (161 km) where it sinks into the desert floor at one of the numerous playas. The Amargosa River begins as a desert spring in western Nevada and flows into the southern part of Death Valley.



Unit I
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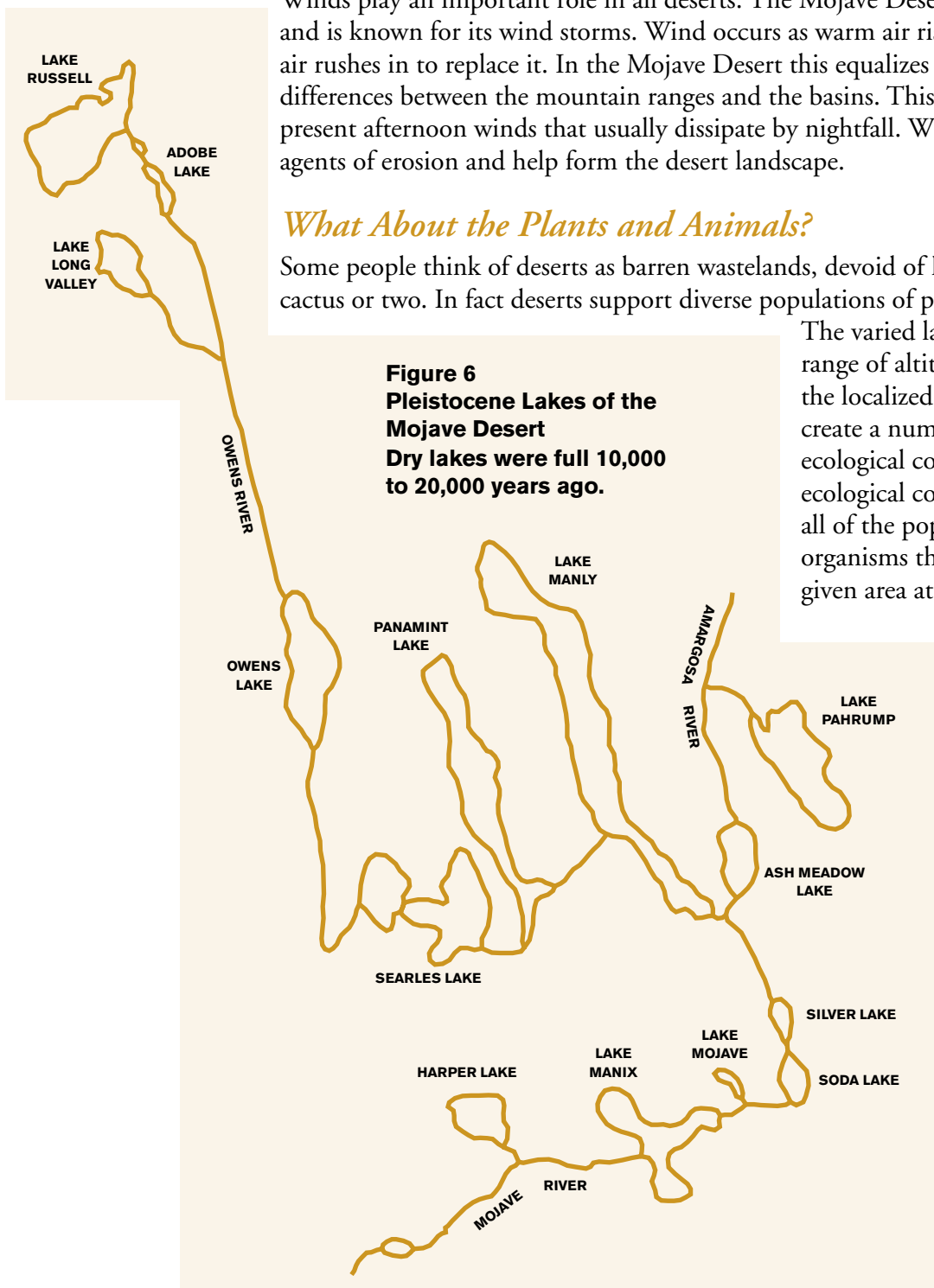
Precipitation decreases in the Mojave Desert from the west to the east. This is caused by air flow patterns and the rain shadow effect of the Transverse Ranges, Peninsular Ranges, Coast Ranges, and Sierra Nevada Mountains (Figure 7). The western portion receives about five inches (12.7 cm) of annual precipitation while the eastern portion receives about two inches (5.1 cm) of annual precipitation. Rainfall is received primarily in the winter months although occasional summer thunderstorms occur in scattered locations. Snow sometimes falls in the higher elevations but seldom stays for any length of time.

Winds play an important role in all deserts. The Mojave Desert is no exception and is known for its wind storms. Wind occurs as warm air rises and cool air rushes in to replace it. In the Mojave Desert this equalizes temperature differences between the mountain ranges and the basins. This causes the ever-present afternoon winds that usually dissipate by nightfall. Winds act as strong agents of erosion and help form the desert landscape.

What About the Plants and Animals?

Some people think of deserts as barren wastelands, devoid of life except for a cactus or two. In fact deserts support diverse populations of plants and animals.

The varied landforms and range of altitudes, along with the localized presence of water, create a number of specific ecological communities. An ecological community includes all of the populations of organisms that interact in a given area at a given time.





Mojave Desert vegetation is dominated by low, widely spaced shrubs. Vegetation in the extreme northern section is sagebrush, which quickly grades into creosote bush as one travels south. The creosote bush dominates the landscape and is the primary type of vegetation in the Mojave Desert. The Joshua tree and Mojave yucca are usually found on well drained slopes at elevations between 2,500 and 4,000 feet (762 –1219m). These odd-looking plants have always intrigued visitors. Juniper and pinyon pines can be found at elevations between 3,500 and 6,000 feet (1067–1829m). Nearly one-quarter of all plants found in the Mojave Desert are endemic (confined to a particular place).

Desert animals are among the most unique in the world and have devised ways to survive in their hot, dry environment. Some animals are crepuscular (active at dawn and dusk). Other animals obtain necessary moisture from their food. These adaptations allow many different types of animals to live in the desert. In fact, rainforests are the only ecosystem with a higher diversity than deserts.



Unit I
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Glossary

alluvial fan – a fan-shaped water-formed deposit of broken down rock material that extends from the base of a mountain outward toward the center of a basin.

arid – a climate which has very little rainfall.

arroyo – a channel of a dry river or wash.

barren – lacking vegetation

basin – a low area in which sediments have accumulated.

crepuscular – active at dawn and/or dusk.

ecological communities – all of the populations of organisms that interact in a given area in a given time.

ecosystem – the interaction of all living things with their physical environment.

endemic – belonging exclusively or confined to a particular place.

exotic river – a river that flows into a dry region bringing water from elsewhere.

flash flood – a sudden, rising flood caused by heavy rainfall.

leeward – the direction toward which the winds are blowing.

playa – a dry, vegetation-free, flat area at the lowest part of an undrained desert basin.

Pleistocene – the time period between 2.5 million and 10 thousand years ago; often referred to as the ice age.

populations – a group of individuals of a single species which can and do freely interbreed.

precipitation – water received directly from the clouds as rain, hail, sleet, or snow.

progenitors – ancestors

relief – the difference in elevation between the high and low points on a land surface.

summit – the top of a mountain.

windward – the direction from which the wind is blowing.



Lesson 1: Introduction to the Unit

- Objectives:**
1. Students will participate in the “pre” part of a pre/post survey.
 2. Students will list their feelings about deserts.
 3. Students will begin a journal of their thoughts and feelings about the material they have learned.

Materials: Activity I: What Do You Think? (duplicate for students), student journals

Subjects: science, social science, language arts, economics

Skills: analyzing, categorizing, evaluating, writing

- Method:**
1. Have students do Activity I: What Do You Think? This is designed to be a pre/post activity to see what they already know and what they have learned. Collect and keep these surveys for future reference.
 2. Learn what students think about deserts by using a brainstorming session. Write the term “desert” on the board and solicit all responses. Discuss responses, highlighting the ones related to the background information to be presented in the next lesson.
 3. The language arts connection includes keeping a journal. Students should be asked to keep a journal for this and the following units. Remind students that a journal is a personal record of their reactions to the learning experience. Students should begin each entry with a date, but the rest of their record may be as informal as they wish. Entries do not need to be a set length. Students should be reminded that a journal is an excellent way to develop ideas for future assignments and that illustrations or drawings are great ways to express concepts.
 4. Ask students to include the following in their journals: 1) reactions to what they have read and talked about, 2) reflections on the characteristics of deserts, and 3) ideas on why deserts are important.

- Time**
- Considerations:**
1. survey: 15 – 20 minutes
 2. brainstorming session: 15 – 20 minutes
 3. journaling instructions: 5 – 10 minutes
 4. journaling: 10 minutes

Extension: Have students predict what they think the unit will be about and make note of it in their journals. At the end of the unit ask them to compare what they learned from the unit to their predictions. Ask them to write these comparisons in their journals.



Teacher's Guide

Lesson 2: What is a Desert?

- Objectives:**
1. Students will define “desert” by listing its characteristics: low precipitation, long periods of high temperatures, extreme temperature fluctuations, low humidity, receiving 90 percent of possible sunlight, soils high in minerals but low in humus, and high erosion rates.
 2. Students will use maps to locate regions where deserts occur.
 3. Students will describe the four types of deserts: subtropical, rain shadow, interior, and coastal.
 4. Students will divide the North American Desert into its four components: Great Basin, Mojave, Sonoran, and Chihuahuan.
 5. Students will describe the following Mojave Desert characteristics: size, elevation, location, and relief.
 6. Students will define the following Mojave Desert features: playa, arroyo, exotic river, and alluvial fan.
 7. Students will list two characteristics which allow animals to survive in the Mojave Desert.

- Materials:** Activity II: Rain Shadow Deserts (duplicate for students)
Activity III: North American Deserts Word Search (duplicate for students)
Activity IV: Desert Network Tree (duplicate for students)
Figures 1 – 7 (enlarge and make overhead transparencies, if desired)
world atlas, student journals

Subjects: geography, geology, biology, ecology, math, language arts, art

Skills: writing, computing, graphing, analyzing, categorizing, evaluating

- Method:**
1. Present the background information to students. One of the best ways to do this is to make overheads of Figures 1 through 7. Students should take notes. As an alternative, duplicate the background information for students to read, then discuss in class.
 2. Before beginning Activity II obtain a map that shows the location of Mount San Gorgonio, Bear Valley Dam, and Joshua Tree National Park. Use this to show the students where each of these is located.

Teacher's Guide



3. Activity II could be done either after all the background information has been presented or after the section in the background information, “What Are The Different Types Of Deserts?”
4. Students could do Activity III as a review of the material.
5. Activity IV can be done as either a review of the material or an on going, concept-building tool. The second method is preferred because you can assist students in organizing the material as it is being presented.
6. For closure, students should work on their journal entries. Remind students that a journal is a personal record of their reactions to the learning experiences. Students should begin each entry with a date, but the rest of their record may be as informal as they wish. Entries do not need to be of any set length. Students should be reminded that a journal is an excellent way to develop ideas for future assignments and that illustrations or drawings are great ways to express concepts. This would be an excellent time to discuss journal entries that reflect upon the learning experience.
7. Ask students to include the following in their journals: 1) reactions to what they have read and talked about, 2) reflections on the characteristics of deserts, and 3) ideas on why deserts are important.

Time Considerations:

1. presentation: 30 – 40 minutes
2. Activity II: 30 – 40 minutes
3. Activity III: 15 – 20 minutes (could be a homework assignment)
4. Activity IV: 30 minutes
5. journaling: 10 – 15 minutes

Extensions:

1. Have groups of students describe the Sahara (subtropical), Namib (coastal), and Gobi (interior) deserts. Once this is completed, compare each to the Mojave (rain shadow) desert.
2. Have students describe the ice cap climate (polar desert) and compare it to the Mojave (rain shadow) desert.



Activity I: What Do You Think?

Circle the number that best describes your feelings. Use the following key to determine your response: 1 Strongly Agree; 2 Agree; 3 Satisfactory; 4 Disagree; 5 Strongly Disagree.

1. Do you agree or disagree with the following desert-related statements?

A. The natural resources of the desert enhance the quality of my life.

1 2 3 4 5

B. The natural resources of the desert are important to the nation's economy.

1 2 3 4 5

C. The natural resources of the desert are important to the local economy.

1 2 3 4 5

D. I am well informed about issues regarding deserts in the southwestern United States.

1 2 3 4 5

E. I am well informed about deserts in other parts of the world.

1 2 3 4 5

2. Please rate *five* things deserts provide that you think are important. Use 1 as the most important; use 2 as the next most important; etc.

- | | |
|-----------------------------|--------------------------------|
| ___ food | ___ recreation |
| ___ landfills | ___ plant and wildlife habitat |
| ___ medicine | ___ renewable energy sources |
| ___ beauty | ___ climate control |
| ___ beauty products | ___ open spaces |
| ___ precious minerals | ___ rare earth elements |
| ___ military training sites | ___ state and national parks |
| ___ winter resorts | ___ peace and solitude |



3. Please put a check next to one or more desert topics that you would like to learn more about. Circle the one topic that interests you the most.

- | | |
|--|---|
| <input type="checkbox"/> desert management | <input type="checkbox"/> desert ecology |
| <input type="checkbox"/> desert-related careers | <input type="checkbox"/> environmental issues |
| <input type="checkbox"/> Joshua trees/plant life | <input type="checkbox"/> desert land ownership |
| <input type="checkbox"/> cultural history (people who lived in the desert) | <input type="checkbox"/> desertification (creation of desert through human impact and/or climate changes) |
| <input type="checkbox"/> threatened and endangered species that live in or depend on the desert. | <input type="checkbox"/> other (please describe) |
| | _____ |
| | _____ |

4. How many days a year do you visit the desert to hike, bike, camp, rock climb, hunt, ride off-highway vehicles, observe wildlife, or participate in other activities?

- | | |
|----------------------------------|---------------------------------------|
| <input type="checkbox"/> 0 | <input type="checkbox"/> 15 to 30 |
| <input type="checkbox"/> 1 to 5 | <input type="checkbox"/> more than 30 |
| <input type="checkbox"/> 6 to 15 | |

5. How close is the desert to where you live?

- | | |
|--|---|
| <input type="checkbox"/> live in the desert | <input type="checkbox"/> between 11 and 20 miles away |
| <input type="checkbox"/> less than a mile away | <input type="checkbox"/> more than 20 miles away |
| <input type="checkbox"/> between 1 and 10 miles away | <input type="checkbox"/> not sure |

6. Which of the following words or phrases could you explain to a friend? (Please check only the ones that you are confident about.)

- | | | |
|--|---|--|
| <input type="checkbox"/> The difference between public and private desert lands. | | |
| <input type="checkbox"/> The difference between the Bureau of Land Management and National Park Service management styles. | | |
| <input type="checkbox"/> Endangered species versus threatened species | | |
| <input type="checkbox"/> Rain shadow desert | <input type="checkbox"/> Chemehuevi | <input type="checkbox"/> Multi-use areas |
| <input type="checkbox"/> Exotic river | <input type="checkbox"/> Wilderness areas | <input type="checkbox"/> Ethnocentric |
| <input type="checkbox"/> Soil conservation | <input type="checkbox"/> Endemic | |



Activity II: Rain Shadow Deserts

Part 1

Review the processes which form rain shadow deserts by filling in the diagram.



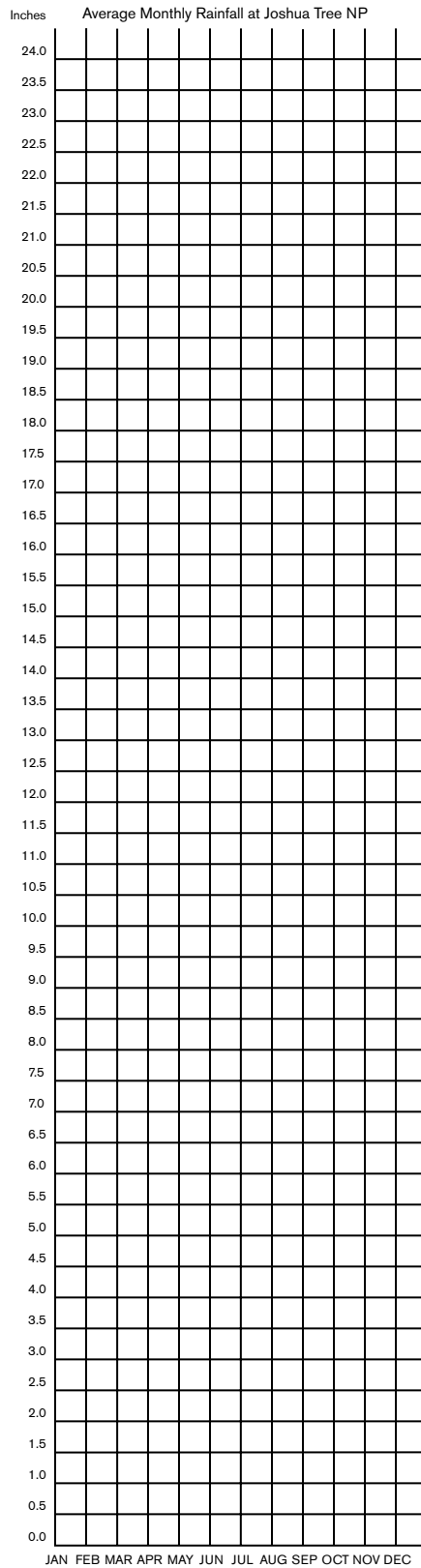
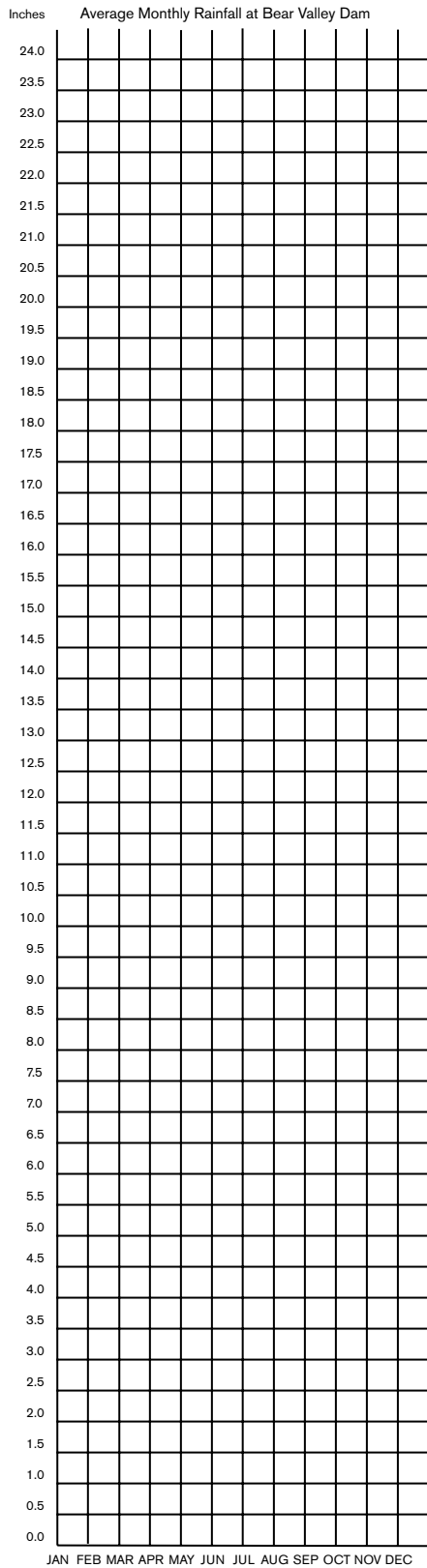
Part 2

Below is a listing by month of rainfall totals at Bear Valley Dam at Big Bear Lake and Headquarters at Joshua Tree National Park (JTNP) for 1995.

Month	Bear Valley Dam	JTNP
January	23.67 in (60.10 cm)	2.13 in (5.40 cm)
February	9.20 in (23.40 cm)	0.86 in (2.20 cm)
March	10.65 in (27.10 cm)	0.29 in (.74 cm)
April	0.91 in (2.30 cm)	0.18 in (.45 cm)
May	0.97 in (2.40 cm)	0.00 in (0.00 cm)
June	0.25 in (.64 cm)	0.00 in (0.00 cm)
July	0.24 in (.61 cm)	0.07 in (.18 cm)
August	1.27 in (3.23 cm)	0.03 in (.08 cm)
September	0.02 in (.05 cm)	0.13 in (.33 cm)
October	0.00 in (0.00 cm)	0.00 in (0.00 cm)
November	0.00 in (0.00 cm)	0.00 in (0.00 cm)
December	1.82 in (4.60 cm)	0.00 in (0.00 cm)
Totals	49.00 in (124.50 cm)	3.69 in (9.37 cm)



Use the monthly rainfall totals from the previous page to make bar graphs. Color in the squares to make the graph easier to read.



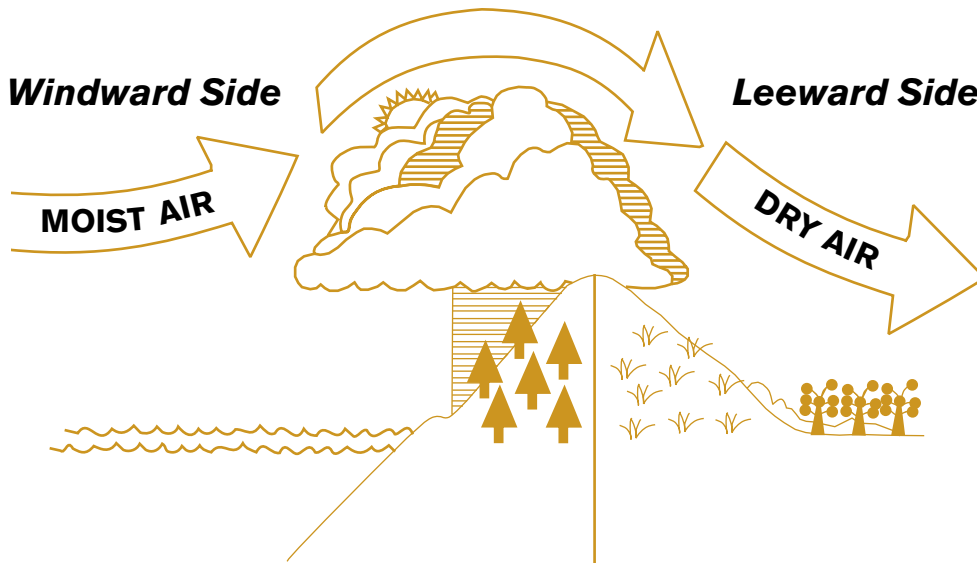
Answer Key



Activity II: Rain Shadow Deserts

Part 1

Review the processes which form rain shadow deserts by filling in the diagram.



Part 2

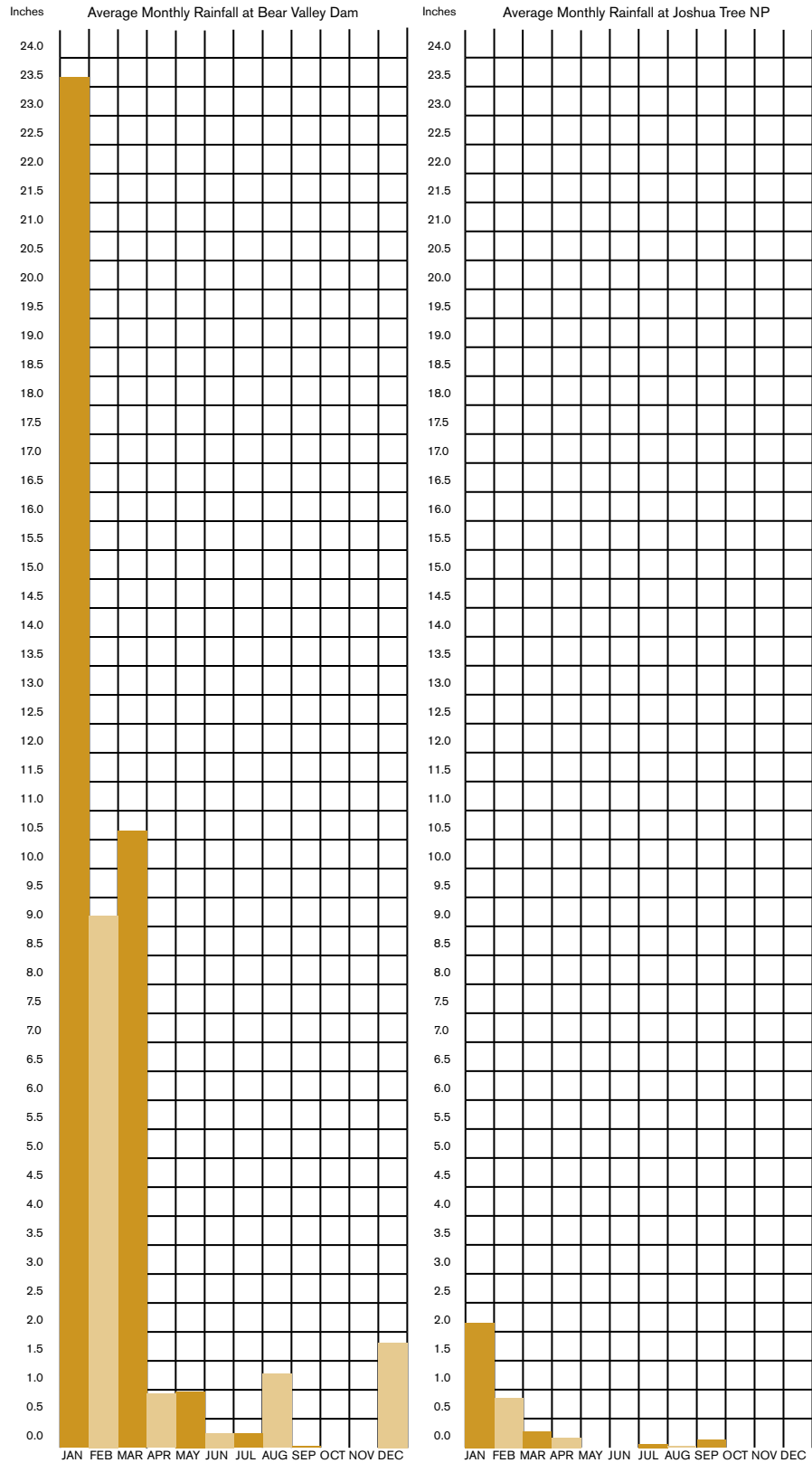
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December	1.82 in (4.60 cm)	0.00 in (0.00 cm)
Totals	49.00 in (124.50 cm)	3.69 in (9.37 cm)

Answer Key



Use the monthly rainfall totals from the previous page to make bar graphs. Color in the squares to make the graph easier to read.



Answer Key



Part 3 Putting It Together

1. Does the amount of rainfall at each site suggest that Mount San Gorgonio causes the rain shadow for JTNP? Explain your answer.

Yes, it is possible that Mount San Gorgonio is the rain shadow for JTNP. Explanations will vary but should state that storms come from the west and lose most of their moisture before coming to JTNP.

2. During the month of September the rainfall is higher in JTNP than Bear Valley Dam. If Mount San Gorgonio is the rain shadow why do you think this occurred? Explain your answer.

During the summer most of the rainfall received in the Mojave Desert comes from the south via storms coming up from Baja, California.

3. Using the total rainfall numbers, calculate how many times more rain falls at Bear Valley Dam than JTNP. Does this support the theory that Mount San Gorgonio is the rain shadow for JTNP? Explain your answer.

$49.00 \div 3.69 = 13.28$ (rounded off). With a little over 13 times as much moisture as JTNP, San Gorgonio Mountain is most likely the rain shadow for JTNP.

4. Now that you have analyzed rain shadow deserts, draw a diagram of an imaginary desert which is of rain shadow origin. Label the air currents and estimate the rainfall on the summit, the leeward side, and the windward side of the diagram. Be creative and make the best drawing possible.

Student diagrams should look like Figure 3 (Rain Shadow Desert). Students should include rainfall totals from Bear Valley Dam and JTNP and estimate what occurs between them. The major decrease should begin at the summit.



Activity III: North American Deserts Word Search

Part 1

In each of the following statements, a term has been scrambled. Unscramble the term and write it on the line provided.

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____
- 7. _____
- 8. _____
- 9. _____
- 10. _____
- 11. _____
- 12. _____
- 13. _____
- 14. _____
- 15. _____
- 16. _____
- 17. _____
- 18. _____
- 19. _____
- 20. _____

- 1. A river that flows into a dry region bringing water from somewhere else is said to be an *iextoc vrire*.
- 2. The *habanuhiuc* desert covers parts of Texas, New Mexico, and mainland Mexico.
- 3. The most northern member of the North American Desert is called the *ertga sbian*.
- 4. *iard* is another way of saying dry.
- 5. The *oepnlteies* is the geological time period in which many lakes covered the Mojave.
- 6. A *apyla* is a dry lake bed found in desert basins.
- 7. A *nria dswhoa* desert forms because clouds have already lost their moisture by rising over the mountains.
- 8. *dmecein* plants are confined to a particular place.
- 9. Deserts usually form on the *erwldea* side of a mountain.
- 10. A *lptoapouin* includes individuals of a particular species with definable group characteristics.
- 11. *scaolat* deserts form by wind blowing over cold ocean currents.
- 12. The *jvmaoe* is the smallest of the four American Deserts.
- 13. *psrucbltaio* deserts form as a result of air circulation and the seasonal tilting of the earth.
- 14. An *orayro* is another name for dry desert washes.
- 15. A *msutmi* is another name for the top of a mountain.
- 16. An *rionerti* desert forms when air masses have lost all of their moisture because of traveling long distances.
- 17. The *dwrnadwi* side of a mountain is often heavily forested.
- 18. An ecological *mncitoumy* is a population of organisms that interact in a given area in a given time.
- 19. The *onsaorn* desert occupies California, Arizona, and parts of Mexico.
- 20. A *sdrete* receives very little precipitation.



Part 2

Now find each unscrambled term in the hidden word puzzle below. The terms can be written horizontally, vertically, or diagonally and forward and backward. Circle each term as you find it.

a	e	a	n	i	s	a	b	t	a	e	r	g	a	t
c	r	c	y	p	b	z	p	l	a	a	y	r	r	w
h	c	r	d	a	l	n	e	p	n	r	i	e	d	o
i	o	t	o	r	l	e	l	i	e	d	s	a	r	d
h	m	v	l	y	a	p	i	v	h	e	u	y	a	a
u	m	o	c	h	o	w	i	s	d	n	c	t	w	h
a	u	o	c	a	l	r	e	l	t	x	u	a	d	s
h	n	o	m	x	c	c	s	e	a	o	x	z	n	n
u	i	o	a	i	i	n	s	q	l	t	c	m	i	i
a	t	o	t	m	a	u	q	s	e	z	s	e	w	a
n	y	o	e	r	m	c	u	e	a	v	z	a	n	r
v	x	d	o	m	z	s	d	z	o	l	a	g	o	e
e	n	n	i	r	o	i	r	e	t	n	i	j	g	c
e	o	t	n	o	i	t	a	l	u	p	o	p	o	x
s	f	b	l	a	c	i	p	o	r	t	b	u	s	m

Activity III: North American Deserts Word Search

Part 1

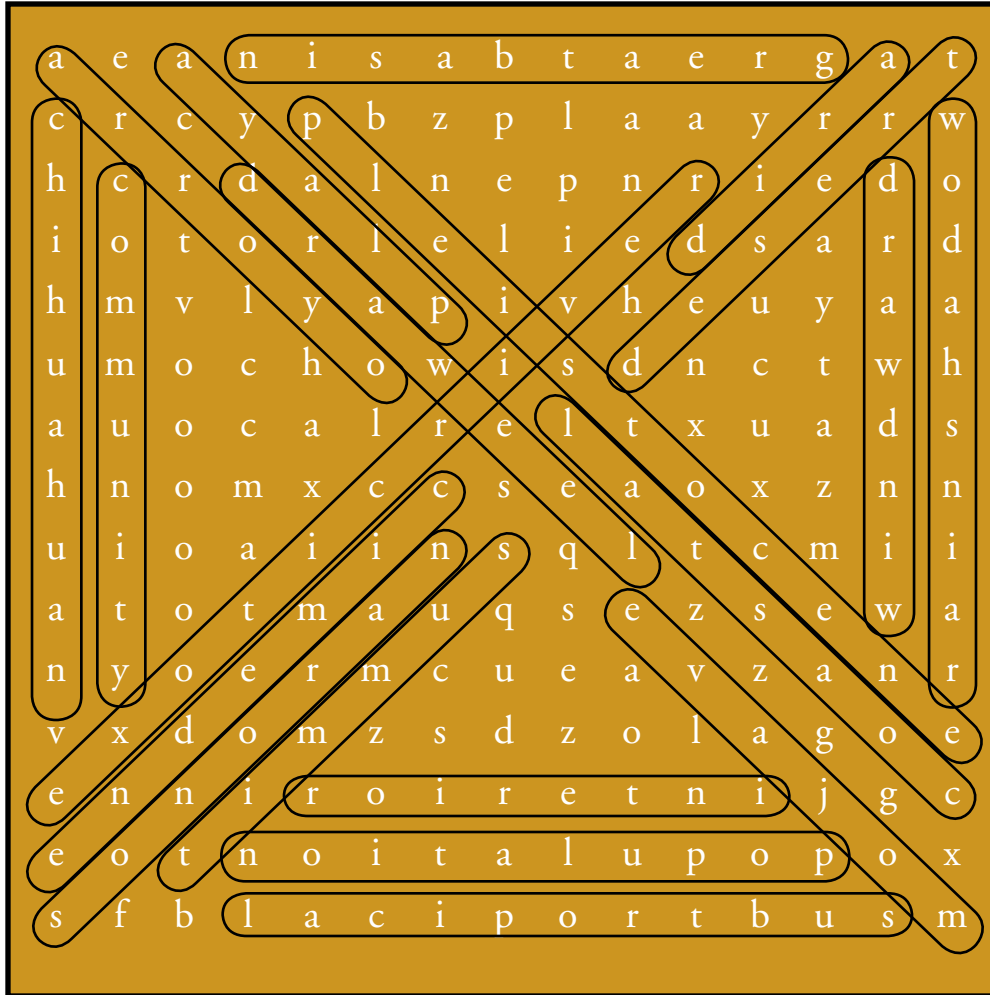
In each of the following statements, a term has been scrambled. Unscramble the term and write it on the line provided.

1. exotic river
 2. Chihuahuan
 3. Great Basin
 4. Arid
 5. Pleistocene
 6. playa
 7. rain shadow
 8. Endemic
 9. leeward
 10. population
 11. Coastal
 12. Mojave
 13. Subtropical
 14. arroyo
 15. summit
 16. interior
 17. windward
 18. community
 19. Sonoran
 20. desert
1. A river that flows into a dry region bringing water from somewhere else is said to be an *ixtoc vrire*.
 2. The *habanuhiuc* desert covers parts of Texas, New Mexico, and mainland Mexico.
 3. The most northern member of the North American Desert is called the *ertga sbian*.
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Answer Key

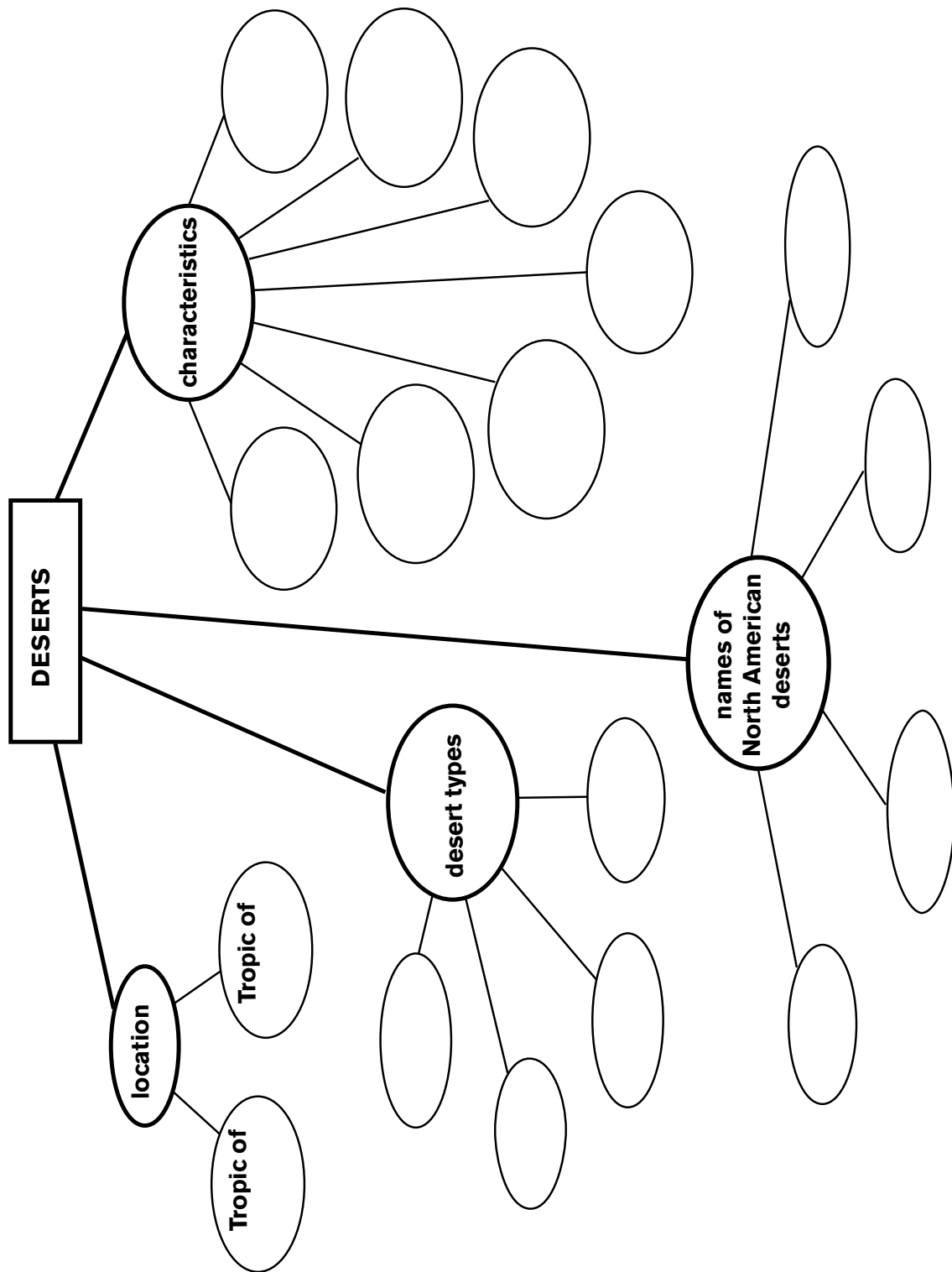
Part 2

Now find each unscrambled term in the hidden word puzzle below. The terms can be written horizontally, vertically, or diagonally and forward and backward. Circle each term as you find it.



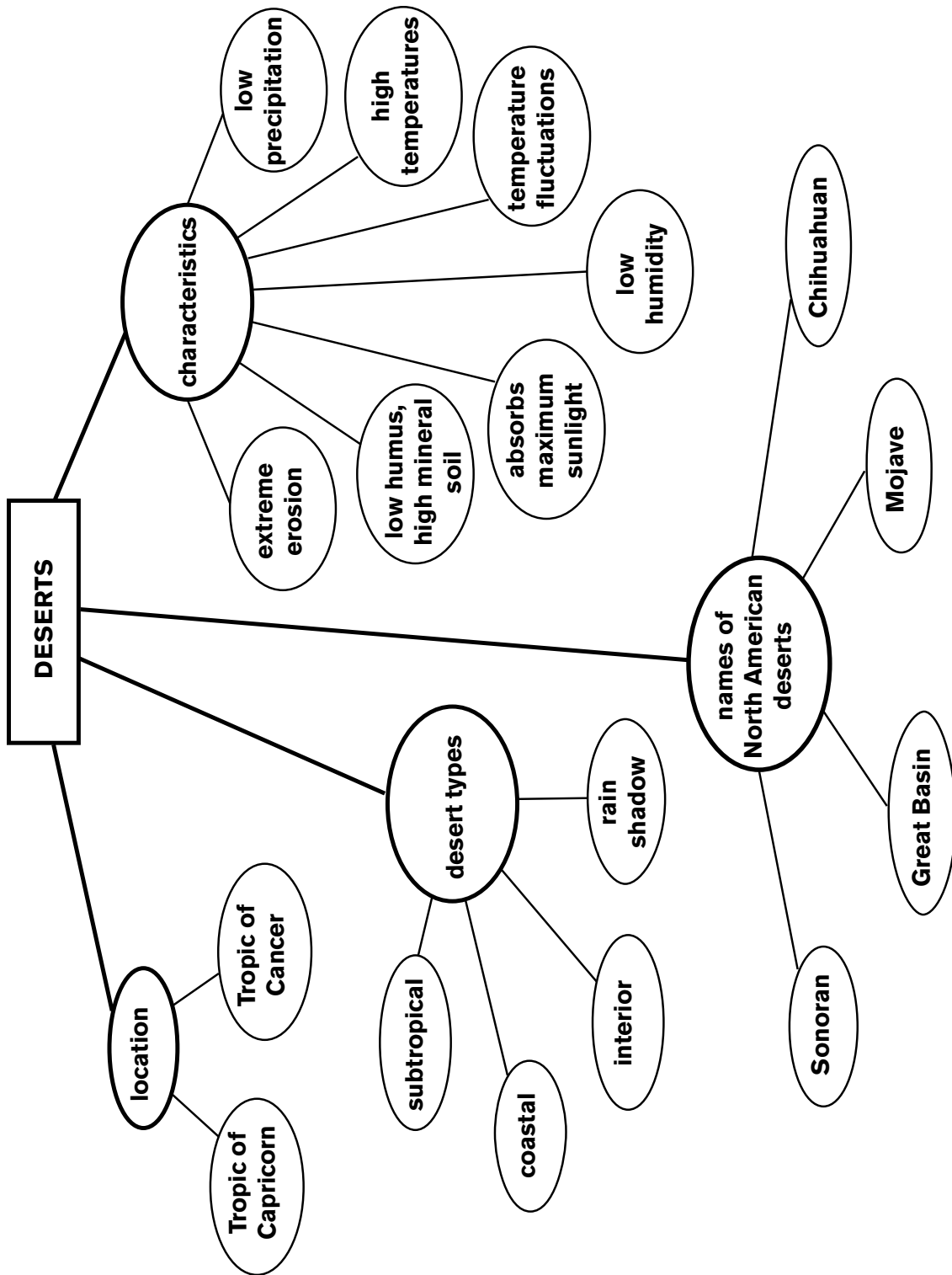


Activity IV: Desert Network Tree



Answer Key

Activity IV: Desert Network Tree



Unit II: Who Owns the Mojave Desert?



<i>Background Information</i>	Ownership Categories	2
	Federal Land Ownership	2
	National Park Service	2

<i>Lesson: Who Owns the Mojave Desert</i>	Objectives	4
	Materials	4
	Subjects	4
	Skills	4
	Method	4
	Time Considerations	4

<i>Activity</i>	Who Owns the Mojave Desert?	5
	<i>Answer Key</i> to Who Owns the Mojave Desert?	9

W H O O W N S T H E M O J A V E D E S E R T ?



Unit II

Who Owns the Mojave Desert?

Most of the Mojave Desert is owned by the American public and managed by federal, state, and county agencies. This did not happen by accident and is a result of agreements between federal and state governments concerning statehood. The purpose of this unit is to categorize land ownership of the Mojave Desert. Land management practices will be described in the next unit.

Ownership Categories

There are three major categories of land ownership in the Mojave Desert: the federal government, private concerns, and state and local governments. The federal government category includes all of the agencies that manage land in the Mojave Desert. Private concerns include corporate and individual landholders. Because state and local governments own a small percentage (2%), they have been grouped together.

Although the largest portion of the Mojave Desert is located in southern California, it extends into southern Nevada, northwestern Arizona, and southwestern Utah. It encompasses approximately 22,450,977 acres (9,085,910.4 ha). The largest land owner is the federal government which owns 18,879,789 acres (7,640,650.6 ha). Private landowners are the second largest group, owning 3,119,603 acres (1,262,503.2 ha). State and local entities are the smallest group with 451,585 acres (182,754.8 ha). Figure 1 shows ownership distribution.

Federal Land Ownership

Federal lands in the Mojave Desert are managed by six groups: Bureau of Land Management; National Park Service; Department of Defense; Bureau of Indian Affairs, Bureau of Reclamation, and U.S. Fish and Wildlife Service. The latter three agencies own 5688 acres (2301.9 ha) or less than .03% of the land.

The Bureau of Land Management (BLM) manages 9,153,625 acres (3,704,472 ha). The National Park Service (NPS) manages 7,065,581 acres (2,859,440.6 ha). The Department of Defense (DOD) manages 2,654,895 acres (1,074,436 ha). Figure 2 shows the distribution of federal land by managing agency for the Mojave Desert.

National Park Service

The National Park Service management area is divided into four distinct units in the Mojave Desert. They are Death Valley National Park with 3,367,627 acres (1,362,878.7 ha), Joshua Tree National Park with 793,995 acres (321,329.8 ha), Lake Mead National Recreation Area with 1,484,159 acres (600,639.2 ha), and Mojave National Preserve with 1,600,000 acres (647,511.1 ha). Figure 3 shows the distribution of federal land that is managed by the National Park Service in the Mojave Desert.



Unit II
Who Owns the Mojave Desert?

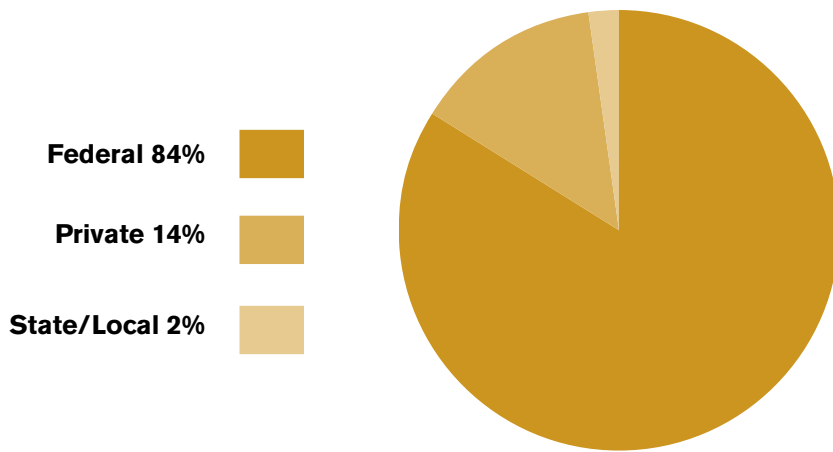


Figure 1 Mojave Desert Land Ownership

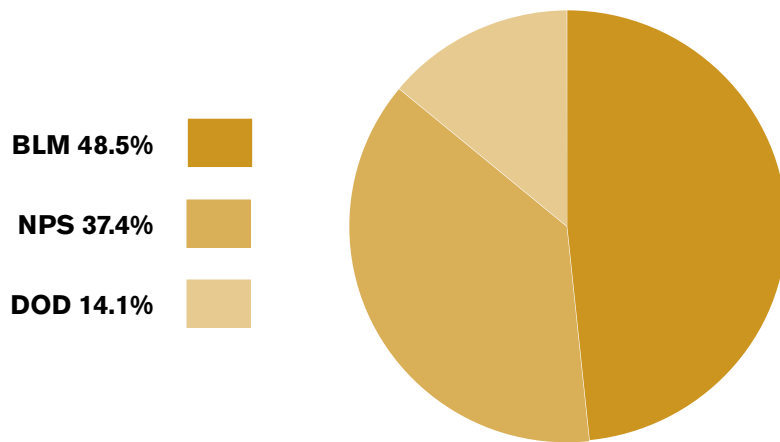


Figure 2 Distribution of Federal Land by Managing Agency

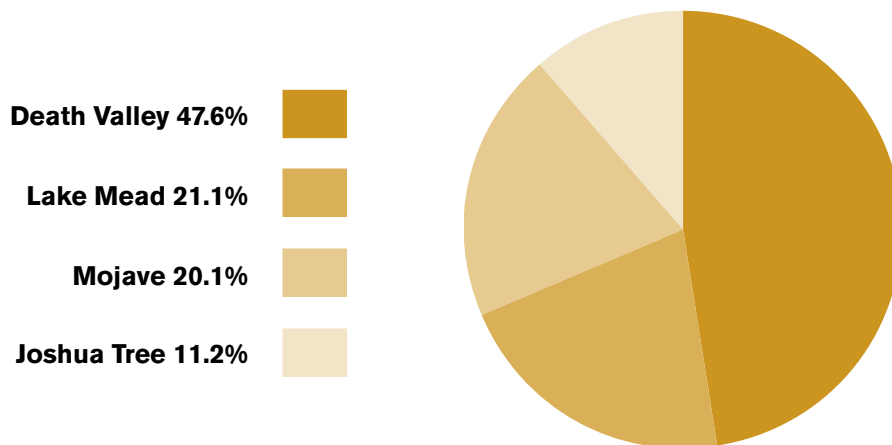


Figure 3 Mojave Desert Land Managed by the National Park Service

Teacher's Guide



Lesson: Who Owns the Mojave Desert?

Objectives: Students will gain an understanding of Mojave Desert ownership by categorizing land ownership.

Materials: Who Owns the Mojave Desert Activity (duplicate for students)
student journals

Subjects: social sciences, language arts, math

Skills: analyzing, interpreting, categorizing, predicting, and writing

- Method:**
1. Ask students: Who do you think owns our local desert? List their responses on the board.
 2. Tell students that they will be utilizing data tables to discover who owns the desert.
 3. Have students complete the Who Owns the Mojave Desert Activity.
 4. Have students reflect on what they found in relationship to their initial responses.
 5. Once the project is completed, have students journal their thoughts and feelings on land ownership in the Mojave Desert. Remind them that there is not a right or wrong answer for this activity.

- Time Considerations:**
1. background information: 20 – 30 minutes
 2. Activity: 20 – 40 minutes
 3. journaling: 10 – 15 minutes



Activity: Who Owns the Mojave Desert?

Use the information from the following three tables on land ownership in the Mojave Desert to construct three bar graphs and answer the questions. The bar graphs provided are for data in acres.

Table 1 Mojave Desert Land Ownership Categories

Land Owner	Acres (In Millions)	Hectares (In Millions)
Federal Government	18.9	7.6
Private	3.1	1.3
State/Local	0.5	0.2
Total	22.5	9.1

Table 2 Mojave Desert Federal Land Managing Agencies

Federal Agency	Acres (In Millions)	Hectares (In Millions)
Bureau of Land Management	9.2	3.7
National Park Service	7	2.8
Department of Defense	2.7	1.1
Other *	0.0006	0.0002
Total	18.9006	7.6002

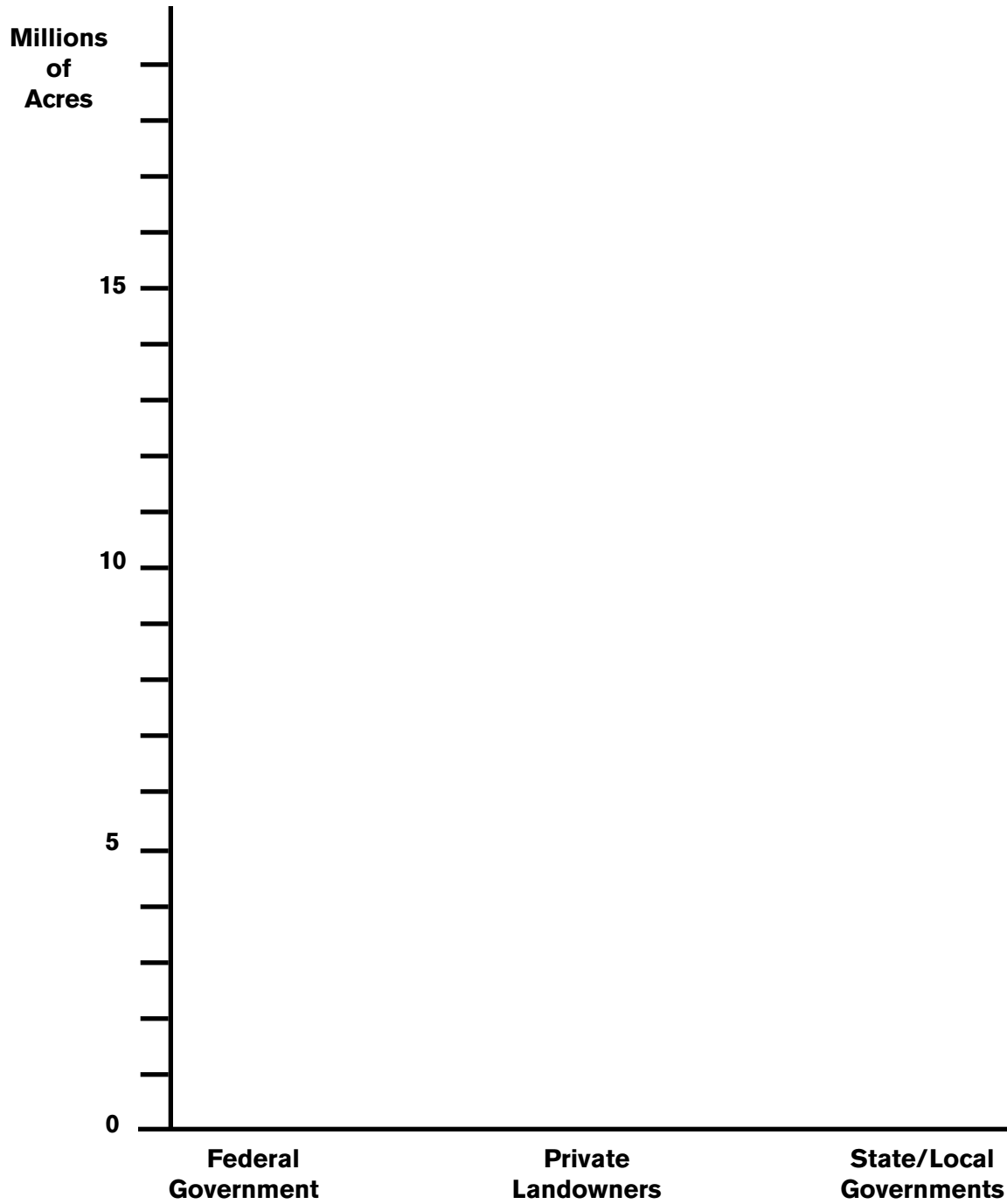
*Other = Bureau of Indian Affairs, Bureau of Reclamation, U.S. Fish and Wildlife Service.

Table 3 Mojave Desert Land Managed by the National Park Service

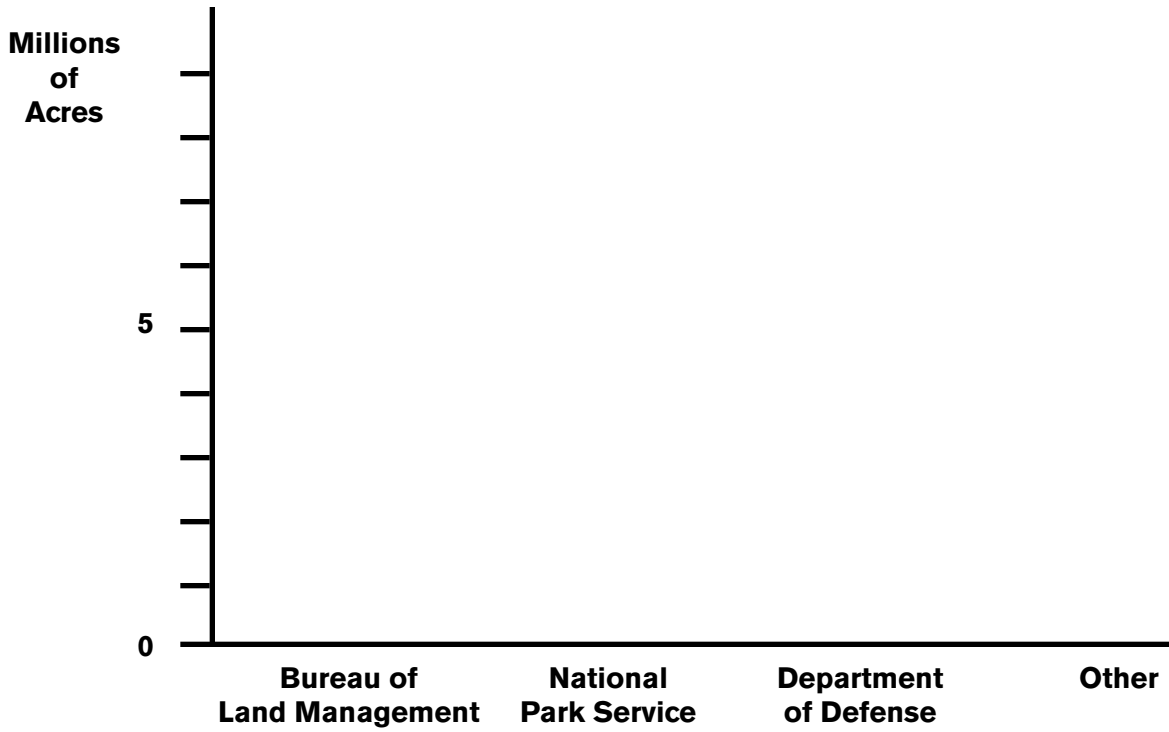
National Park	Acres (In Millions)	Hectares (In Millions)
Death Valley	3.4	1.4
Lake Mead	1.5	0.6
Mojave	1.6	0.6
Joshua Tree	0.8	0.3
Total	7.1	2.8

Figures are rounded

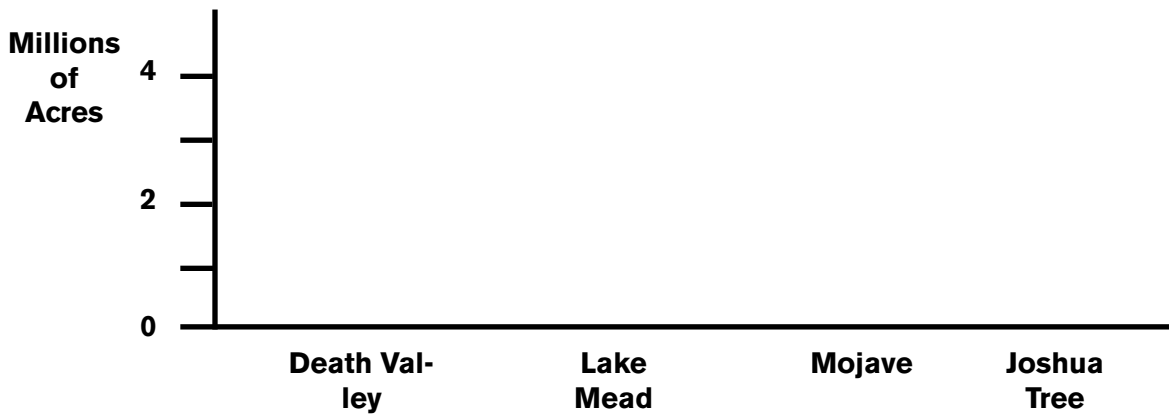
Source: Bureau of Land Management; Public Affairs Office, 1997.



Graph 1 Mojave Desert Land Ownership Categories



Graph 2 Mojave Desert Federal Land Managing Agencies



Graph 3 Mojave Desert Land Managed by the National Park Service



Questions

1. Using the information from Table 1, calculate the percentage of the Mojave Desert that is owned by the federal government.
2. Using the information from Table 1, calculate the ratio of federal land to private land. Explain what this means.
3. Were you surprised to find out how much of the Mojave Desert is owned by the federal government? Explain your answer.
4. Rank the land ownership of the following federal agencies and national parks. Write “1” in front of the agency with the most acreage; write “2” in front of the second largest; etc.

_____ Joshua Tree National Park

_____ Lake Mead National Recreational Area

_____ National Park Service

_____ Department of Defense

_____ Mojave National Preserve

_____ Death Valley National Park

_____ Bureau of Land Management

Answer Key

Activity: Who Owns the Mojave Desert?

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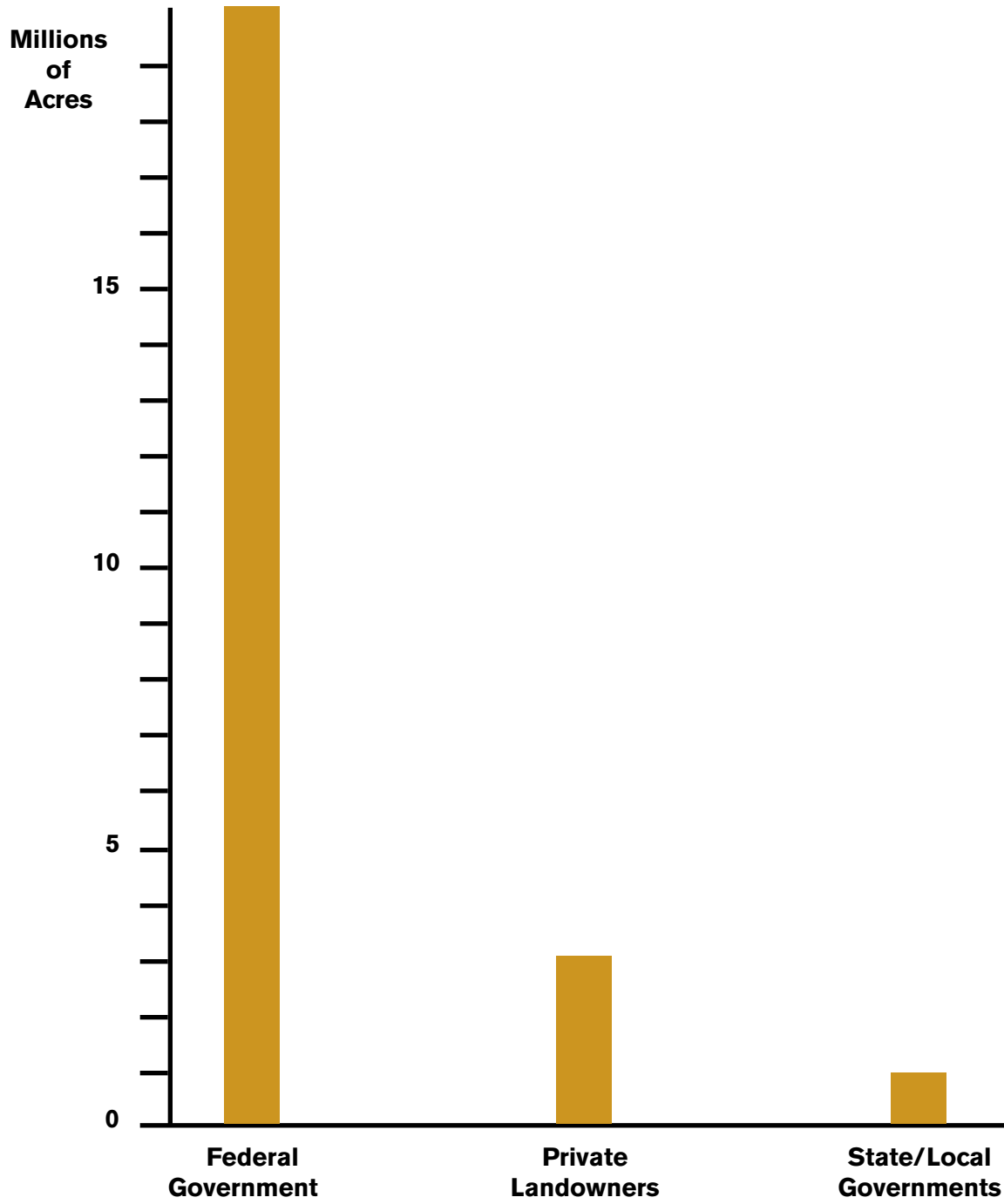
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Mojave	1.6	0.6
Joshua Tree	0.8	0.3
Total	7.3	2.9

Figures are rounded

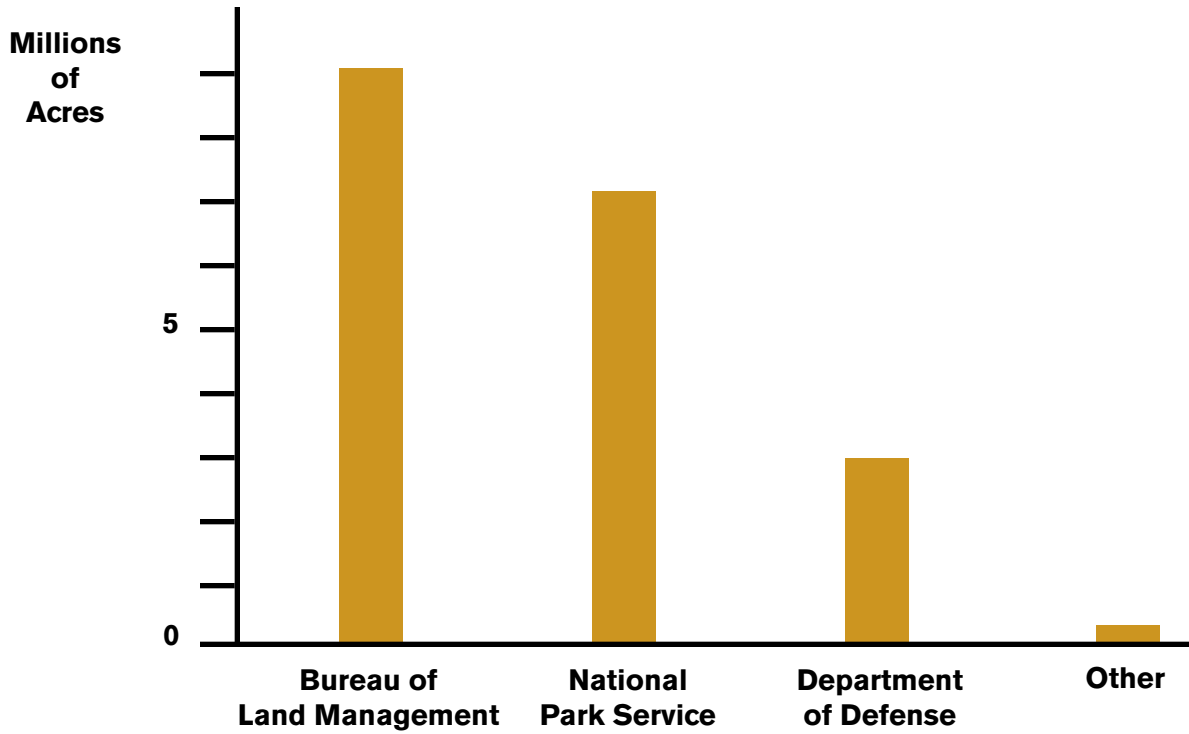
Source: Bureau of Land Management; Public Affairs Office, 1997.

Answer Key

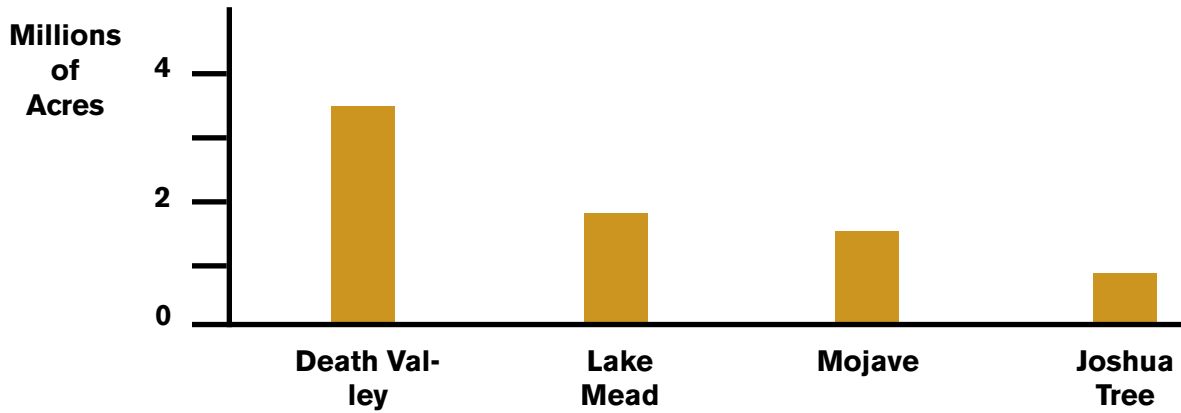


Graph 1 Mojave Desert Land Ownership Categories

Answer Key



Graph 2 Mojave Desert Federal Land Managing Agencies



Graph 3 Mojave Desert Land Managed by the National Park Service



Answer Key



Questions

1. Using the information from Table 1, calculate the percentage of the Mojave Desert that is owned by the federal government.

$$18.9 \div 22.5 \times 100 = 84\%$$

2. Using the information from Table 1, calculate the ratio of federal land to private land. Explain what this means.

$$18.9 \div 3.1 = 6.1 \text{ times or } 6:1.$$

For every acre of private land there are 6.1 acres of federal land.

3. Were you surprised to find out how much of the Mojave Desert is owned by the federal government? Explain your answer.

Answers will vary but must have an adequate explanation.

4. Rank the land ownership of the following federal agencies and national parks. Write “1” in front of the agency with the most acreage; write “2” in front of the second largest; etc.

7 Joshua Tree National Park

6 Lake Mead National Recreational Area

2 National Park Service

4 Department of Defense

5 Mojave National Preserve

3 Death Valley National Park

1 Bureau of Land Management

Unit III: How Are Our Deserts Managed?

<i>Background Information</i>	Department of the Interior	2
	Bureau of Land Management	2
	National Park Service	2
	Fish and Wildlife Service	3
	Department of Defense	3
	State, County, and City Agencies	3
	Ecosystem Management	3
	Glossary	6

<i>Lesson 1: How are Deserts Managed?</i>	Objectives	7
	Materials	7
	Subjects	7
	Skills	7
	Method	7
	Time Considerations	7

<i>Lesson 2: How are Deserts Managed?</i>	Objectives	8
	Materials	8
	Subjects	8
	Skills	8
	Method	8
	Time Considerations	8

<i>Activities</i>	I - Mojave Desert Ecosystem Initiative Network Tree	9
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HOW ARE OUR DESERTS MANAGED?



Unit III *How Are Our Deserts Managed?*

Over 86 percent of the Mojave Desert is owned by the American public and managed by federal, state, and county agencies. Because federal agencies manage the largest percentage of land in the Mojave Desert and have specific missions, their management practices will be emphasized in this unit.

Congress is responsible for establishing specific management purposes for all federal lands. Each federal agency has a different mission which has resulted in different management styles. The Bureau of Land Management (BLM), National Park Service (NPS), and the Department of Defense (DOD) are the primary federal land management agencies in the Mojave Desert.

Department of the Interior

The Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service (FWS) are all agencies of the Department of the Interior (DOI). Each agency reports to the Secretary of the Interior, a Cabinet level position appointed by the President. Each agency has a separate and distinct mission as provided for in law by Congress. The BLM administers the public domain lands of the West under a multiple use mission. The NPS administers park units with a mission to preserve them unimpaired for the enjoyment of present and future generations. The FWS manages national wildlife refuges and administers the Endangered Species Act, Migratory Birds Treaty Act, and other wildlife regulations within other areas.

Bureau of Land Management

The Bureau of Land Management's mission is to provide for a wide variety of public land use without compromising the long-term health and diversity of the land. This is to be accomplished without sacrificing significant natural, cultural, or historical values. As a result, the BLM focuses its management on multiple use and maintaining long-term health of the land. Multiple use includes land use regulation and enforcement; range management; resource conservation; forest management; fish and wildlife management; wild horse and burro management; cultural resource management; outdoor recreation; wilderness management; environmental management; energy and mineral management; public land surveys; and fire protection.

National Park Service

The National Park Service was created by the Organic Act of 1916. This act states that the primary purpose of park units is to preserve the scenery, natural and historic objects, wildlife, and to provide for the enjoyment of each of these while leaving them undisturbed so that future generations may enjoy them. The emphasis is on preserving the resource. As a result, the NPS focuses its management on preservation of the site while still allowing use and enjoyment of the area.



Unit III
*How Are Our
Deserts Managed?*

Fish and Wildlife Service

The mission of the U.S. Fish and Wildlife Service is to conserve, protect, and enhance fish and wildlife and their habitats. Even though the FWS manages a small area near Ash Meadows in the Mojave Desert, it plays a key role in Mojave Desert land management because it assists other agencies in implementing plans for the recovery of species listed as threatened or endangered.

Department of Defense

The Army, Air Force, Navy, and Marine Corps, all part of the Department of Defense, report to the Secretary of Defense, a Cabinet level position appointed by the President. Each of the armed forces has large land holdings in the Mojave Desert. The basic military mission is to maintain national defense readiness through ongoing activities that include training exercises and testing of weapons systems. As a result, military land management practices focus on national defense preparedness while preserving and maintaining sustainability of the land.

State, County, and City Agencies

The California Department of Parks and Recreation manages several units in the Mojave Desert. Its mission is to provide for the health, inspiration, and education of the people of California. This is accomplished through preserving the state's extraordinary biological diversity, protecting valued natural and cultural resources, and creating opportunities for high quality outdoor recreation. Because of the emphasis on preservation, its management style is similar to the NPS.

Most county agencies and municipalities provide services for the citizens who reside in their jurisdiction. These services include planning and developing roads, towns, sewage disposal plants, parks, etc. Because of limited resources they may not have mission statements, but may have codes that directly relate to land management practices.

Ecosystem Management

Land managers realized that focusing on one issue at a time such as wildlife, recreation, or cultural resources is ineffective. This led to the development of ecosystem management, which is the integration of ecological, economic, and social principles to manage biological and physical systems in a manner that safeguards the long-term ecological sustainability, natural diversity, and productivity of the landscape. Thus, land managers think of individual resources as interrelated parts of systems rather than as single components that stop at agency boundaries.

As local land managers developed ecosystem management plans for the Mojave Desert, they realized the need for coordination and cooperation among federal, state, regional, and local agencies. The result has been the development of a plan for collaborative management of the California desert.



Unit III
*How Are Our
Deserts Managed?*

The plan is called the Mojave Desert Ecosystem Initiative (MDEI). Its mission is to design, build, and use a scientific database that can reliably yield the data necessary to allow land management agencies to base their decisions on facts that will enhance the Mojave Desert ecosystem while supporting sustainable economics, communities, and national defense preparedness.

The MDEI is a model for the sharing and integration of data from a long list of participants. The military installations in the Mojave Desert will provide resources and personnel to help meet scientific goals. The U.S. Geological Survey (USGS) will provide geological and topographical data, as well as experience in developing similar resource management systems. The Biological Resources Division of the USGS will provide research methods, scientific expertise, and existing and ongoing research within the ecosystem. The National Park Service will provide personnel and resources in current and previously obtained scientific research. The Bureau of Land Management will serve as the management forum through which scientific data can be readily integrated into land use/management decisions. The U.S. Fish and Wildlife Service will provide technical assistance in locating and determining threatened, endangered, and sensitive species and their habitats, as well as oversight and support in permitting and accomplishing data acquisition. The U.S. Army Topographical Engineering Center will provide base maps, remote sensing data, and data acquisition expertise.

The information will be used to develop scientifically-based land use management programs for the Mojave Desert. Figure 1 shows the current management hierarchy of the MDEI.

Collaborative Management in the California Desert



Unit III How Are Our Deserts Managed?

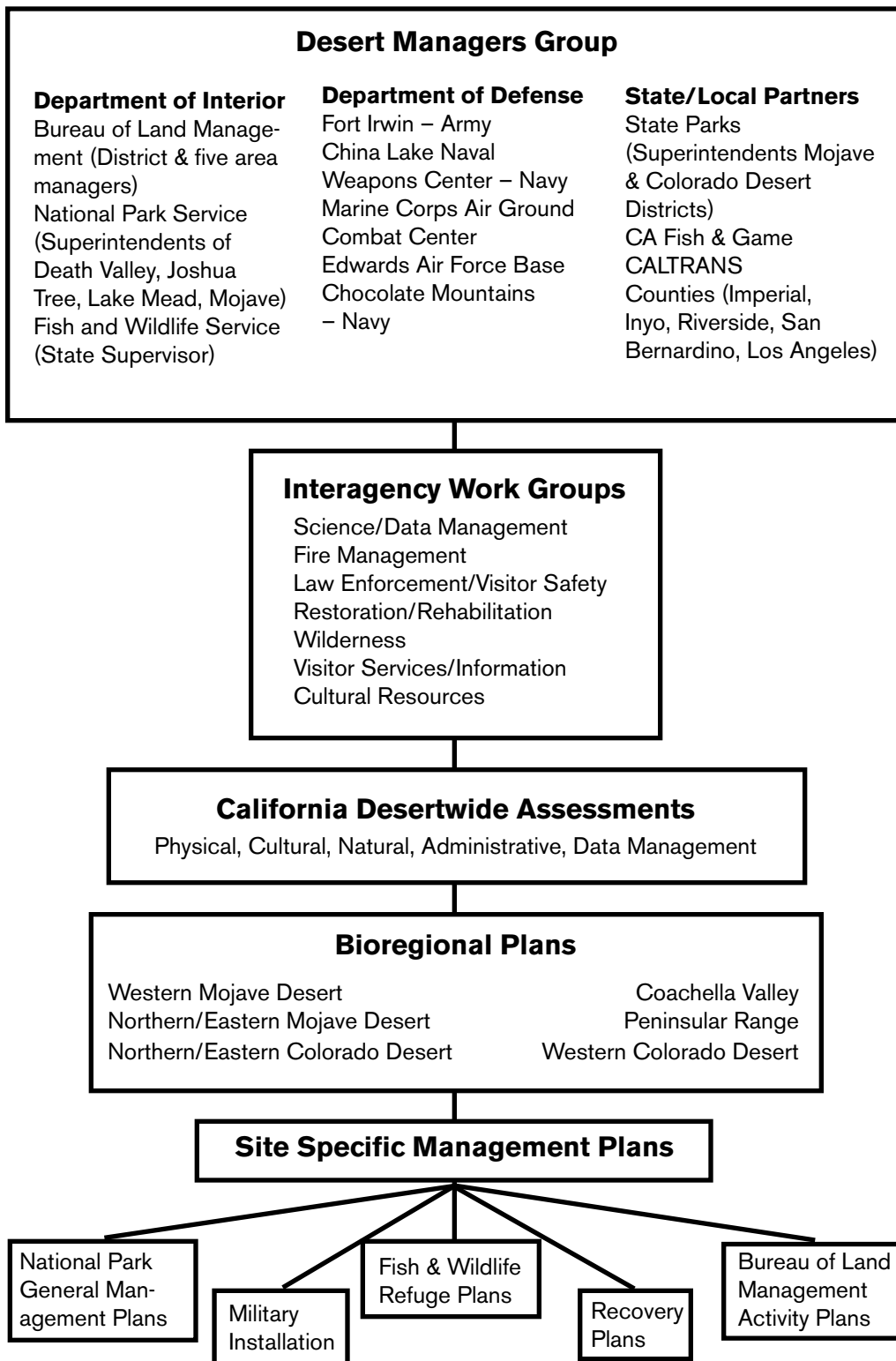


Figure 1 Management Hierarchy of Mojave Desert Ecosystem Initiative



Unit III
*How Are Our
Deserts Managed?*

Glossary

bioregional – refers to land management plans which cover large areas and include all living and nonliving things.

ecosystem – a grouping of plants, animals, and other living organisms interacting with each other and with their environment in such a way as to perpetuate the grouping more or less indefinitely.

ecosystem management – a management system designed for a specific ecosystem.

habitat – the specific environment or geographic region in which an organism lives.

multiple use – a land management plan which provides for a wide variety of land usage.

municipality – a city, town, or other district possessing governing authority.

physiographic map – a map which uses symbols to show local features of the Earth's surface.

public domain lands – lands that are owned jointly by the American public and managed by either federal, state, or local authorities.

recovery – refers to a plan which rebuilds populations of endangered species to a point where they are no longer on the brink of extinction.

remote sensing – the collection of data about an object by a recording device not in immediate contact with it. Includes the use of cameras, infrared detectors, radar, etc.

sustainability – a harmony of natural systems in which they maintain their health and integrity indefinitely.

topographical – pertaining or related to the general configuration of the land's surface.

unimpaired – refers to preserving the land in its original form and character

Teacher's Guide

Lesson 1: How Are Our Deserts Managed?

- Objectives:** Students will gain an understanding of the management of the desert by:
- writing down the mission and management style of the public agencies that manage the Mojave Desert
 - defining ecosystem management
 - listing the agencies involved in the Mojave Desert Ecosystem Initiative and describing the task that each one has agreed to perform



- Materials:** Unit III background information (duplicate for students)
Figure 1 Management Hierarchy of Mojave Desert Ecosystem Initiative (make transparency for overhead projector)
Activity I: Mojave Desert Ecosystem Initiative Network Tree (duplicate for students)

Subjects: social sciences, language arts, science

Skills: analyzing, categorizing, predicting, and writing

- Method:**
- Define land management as the act of handling, directing, or controlling land use. Ask students what they know about land management of the desert. List their responses on the board.
 - Present the background information, including the glossary, to students. Emphasize ecosystem management and the partners involved.
 - Have students complete Activity I: Mojave Desert Ecosystem Initiative Network Tree based on the notes from the presentation.

Time 1. background information: 20 – 30 minutes

Considerations: 2. Activity I: 10 – 20 minutes

Teacher's Guide

Lesson 2: How Are Our Deserts Managed?



- Objectives:**
1. Students will develop a Mojave Desert land use plan from a physiographic map.
 2. Students will compare their land use plan to actual land use in the Mojave Desert.
 3. Students will journal their thoughts and feelings on the activity.

Materials: Activity II: Land Use Exercise (duplicate for students)
maps of California, Nevada, and Arizona
current map of Mojave Desert
colored pens or crayons
student journals

Subjects: social sciences, language arts, science, art, math

Skills: analyzing, interpreting, categorizing, predicting, and writing

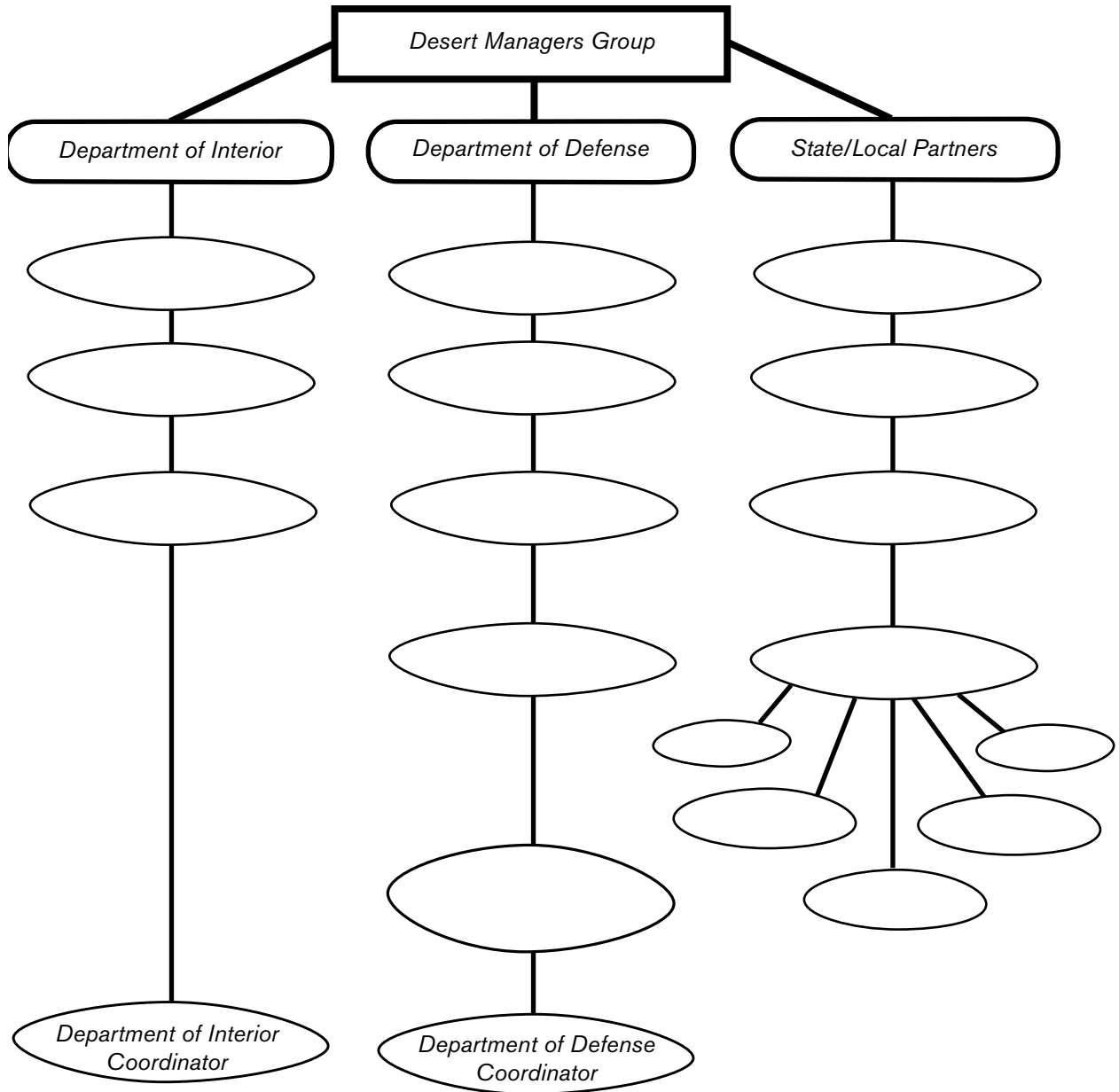
- Method:**
1. Have students complete Activity II: Land Use Exercise according to the instructions in the handout. This should be done in cooperative groups of three or four students. Remind students that there is not a single, definitive answer to the exercise and that they must justify their decisions.
 2. Have groups briefly share their plans.
 3. Have students journal their thoughts and feelings about this project.

Time 1. Activity II: 40 – 50 minutes

- Considerations:**
2. sharing: 20 – 30 minutes
 3. journaling: 10 – 15 minutes

Activity I: Mojave Desert Ecosystem Initiative Network Tree

This network tree will help you identify the agencies and other partners participating in the Mojave Desert Ecosystem Initiative, a collaborative management plan for the California desert.

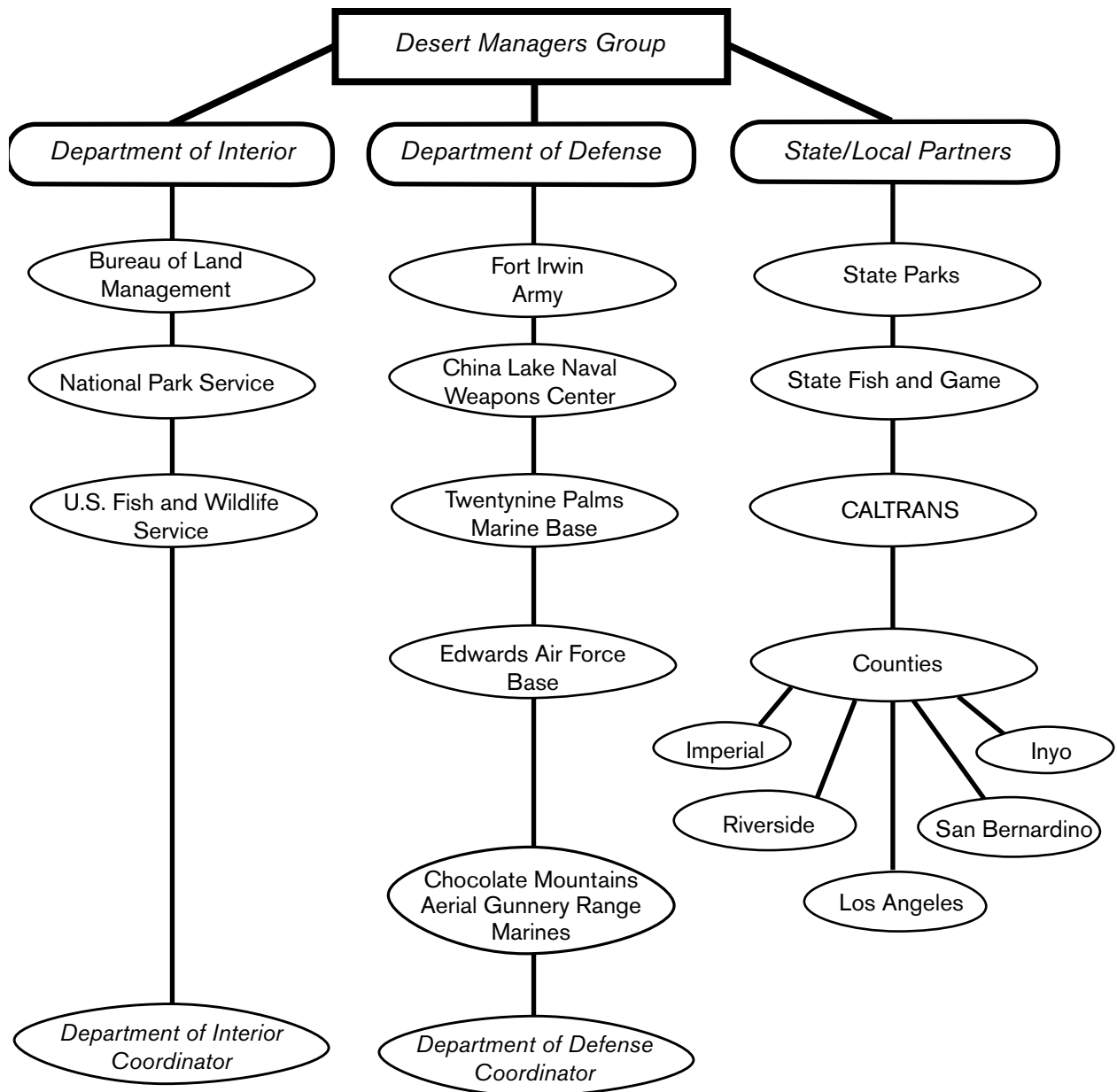


Answer Key

Activity I: Mojave Desert Ecosystem Initiative Network Tree



This network tree will help you identify the agencies and other partners participating in the Mojave Desert Ecosystem Initiative, a collaborative management plan for the California desert.



Activity II: Land Use Planning

Undeveloped land has many potential uses. A desert could be a vast repository for refuse, a recreational site, a unique ecosystem that should be preserved, or a place to live.

With three or four students consider the undeveloped Mojave Desert and devise a use plan for it. You will need to take into consideration the missions of all agencies that will be involved and designate the land to each agency that best reflects its management style. You will also need to provide for private land ownership, including both commercial and residential development. The development of a road and rail system will also need to be accomplished. Once this has been completed, each group will present its plan to the class.

Lands owned by the federal government and managed by the Bureau of Land Management, the National Park Service, the U.S. Fish and Wildlife Service, and the military are managed for specific purposes, based on a mission statement. As a result, management styles vary.

Mission Statements of Government Agencies

Bureau of Land Management (BLM) — To provide for a wide variety of land use without compromising the long-term health and diversity of the land. Includes range management, fish and wildlife management, cultural resource management, outdoor recreation, wilderness management, environmental management, energy and mineral management, public land surveys, and fire protection.

National Park Service (NPS) — To provide for the preservation of scenery, natural and historic objects, and wildlife in such a manner that they remain undisturbed so that future generations may also enjoy them. The NPS has several designations for park units, including national parks, national monuments, and national preserves. National parks contain a variety of resources and encompass land or water areas large enough to provide adequate protection of the resource. National monuments preserve at least one nationally significant natural or cultural feature, are usually smaller than a national park, and lack the diversity of resources. National preserves differ from national parks in that they allow sport hunting.

U.S. Fish and Wildlife Service (FWS) — To conserve, protect, and enhance fish and wildlife and their habitats for the benefit of all. Key responsibility lies in implementation and enforcement of endangered species laws. Land ownership can occur as wildlife preserves, but its primary function is to assist others in developing recovery plans.

Military — To provide for national defense by maintaining readiness through ongoing activities that include training exercises and testing of weapons systems. Your group must consider use by the Army, Air Force, Navy, and Marines. The Army needs an armor training facility. The Air Force and Navy need air space for testing new types of aircraft and weapons systems.



The Marines need an area where they can train both ground troops and aviators. Each of the four branches of the military will need its own site.

State and county — For this exercise, their mission is to develop a road system and to locate municipalities. These local partners will need to interact with federal agencies.

Commercial and Private Land Owners

Commercial Land Owners — This group includes ranchers, farmers, miners, railroads, and business owners. Each will need to lease or buy land from the federal government in order to conduct business.

Private Land Owners — This includes the individual land owner.

Instructions

1. Use a Physiographic Map of the Mojave Desert as the base map for your project.
2. Use the following list of features, taken from the map, as a guide to determine how to divide the land. Death Valley; limestone caverns in Providence Mountains; Devil's Playground (sand dunes); lava flows; Colorado River; Hoover (Boulder) Dam; Lake Mead; Soda Lake (dry); China Lake (dry); Silver Lake (dry); Searles Lake (dry); large Joshua tree woodland located between the Bullion and San Bernardino mountain ranges; gold deposits in the Bullion, Granite, and Tehachapi mountain ranges; and Antelope Valley grasslands.
3. Be sure to plan for use by BLM, NPS, FWS, military, commercial concerns, and private landowners. Remember that the NPS has several designations you may use.
4. Mountain ranges are indicated on the map. The white area between them is relatively flat and suitable for habitation and other human use.
5. Each group should plan for the development of municipalities and private land ownership. Established municipalities include, but are not limited to, Bakersfield, Barstow, Los Angeles, and Las Vegas.
6. Each group should plan a road and a railroad system through the area.
7. Use the following color code to indicate which agency manages each area: BLM, yellow; NPS, purple; FWS, green; military, pink; roads, black; railroads, brown; commercial land, white; private land, tan.
8. Once you have completed your desert-use map, present it to the class.
9. After all of the groups have presented their plans, compare them with yours.
10. After you have compared plans, your teacher will show you a map of the Mojave Desert. Compare the actual land usage with your plan.
11. Write about your land use planning experience in your journal. How has it changed your view of how the desert is managed?

Unit IV: Endangered Species — What Are the Choices?

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ENDANGERED SPECIES — WHAT ARE THE CHOICES?



Unit IV *Endangered Species—* *What Are the Choices?*

An endangered species is a plant or animal in danger of becoming extinct throughout all or a large part of its range. The United States Fish and Wildlife Service manages this nation's endangered species program, including developing and maintaining the federal list of endangered and threatened species. Each state has a program as well. In this unit students will have an opportunity to explore the causes of extinction and get a first-hand look at an endangered species, the Mohave tui chub.

Extinction Is Forever

Extinction is a natural evolutionary process. Throughout the history of the world different types of plants and animals have emerged, flourished, and then disappeared. The reason for extinction is not always clear but appears to be linked to climate changes, disease, overpopulation, or competition for food. Sometimes a combination of these factors is the cause for extinction.

Unfortunately, the activities of humans are, in some cases, directly responsible for the extinction of species. Many of the disappearing plants and animals have never been studied and classified, so we are unaware of the role they play in the Earth's web of life. The major problem with this is that once they are gone they can not be studied because extinction is forever.

The Endangered Species Act

In 1973 the United States established the Endangered Species Act to prevent extinction and to grant the federal government the authority to protect certain species of plants and animals along with their habitats. The Act protects listed species from "harm or take." "Take" is defined as: to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. It can be considered "take" even if it is unintentional or accidental. There are both civil and criminal penalties which may include fines and/or imprisonment.

The United States Fish and Wildlife Service (FWS) is responsible for managing and enforcing the nation's endangered species program. This includes the listing of species. FWS must follow a strict legal process to propose and list species. Once a species is proposed it is called a candidate. Unfortunately, there are so many candidates that the system has become backlogged, and a species may become extinct while waiting to get on the official list.

States have their own endangered species lists which may be slightly different from the federal list. Each state's fish and game agency is responsible for carrying out the enforcement of its plan.

Classifications

There are three classifications into which at-risk species fall. They are rare, threatened, and endangered. A rare species, a status only used for plants, is one that has such a small population throughout its range that it could become endangered if its current environment is further harmed. A threatened species is not in immediate danger of extinction but is likely to become endangered if it is not protected because its numbers are low or declining. An endangered species is one that is in immediate danger of becoming extinct throughout all or part of its range unless special protective measures are taken.

Major Causes of Extinction

Plants and animals are becoming extinct at a higher rate than ever before due to the activities of people. Four major reasons for extinction are: pollution, exotic or non-native species, habitat destruction, and overhunting.

Animals are more prone to extinction if they interfere in some way with people's activities; migrate; have very specific food or nesting requirements; are sensitive to changes; have low birth rates or small families, and long pregnancies; or are naturally rare.

Extinction and the Mojave Desert

The Mojave Desert has a wide variety of habitats. This makes it home to many different plants and animals. Adaptations of desert plants and animals allow them to live successfully in the desert environment.

Most desert animals have developed strategies for surviving in the heat. The most prevalent strategies are being crepuscular which means being active in the evening or morning, or being nocturnal which means being active at night when the desert is coolest. Another adaptation is the assimilation of moisture from food. A fourth is estivation, a form of warm weather hibernation.

Many desert plants are ephemeral, perennial, or endemic. Ephemeral plants have a short growing season. They grow quickly, flower, produce seeds for the next generation, and die. Seeds may lie dormant for many years before sprouting. Perennial plants grow for many years. They resist dry periods by becoming dormant and may appear dead. They flower in the spring and then shed all or part of their leaves when the temperatures rise. Endemic plants grow in a limited or restricted area.

Any minor change in the desert habitat which upsets the delicate balance can have devastating effects on the life there. People have played a major role in altering habitats by pumping groundwater, constructing buildings and roads, grazing domestic stock, mining, farming, recreating, and engaging in a host of other activities. Each time a habitat is altered, extinction might occur. It would be unrealistic to ask people to stop all activities which alter habitats. What can be asked is that people take into consideration the impact their activities have on an area. This is important because humans are part of the habitat and all living things are connected and interdependent.

Unit IV
*Endangered Species—
What Are the Choices?*





Unit IV
*Endangered Species—
What Are the Choices?*

Glossary

assimilate – to take in and incorporate as one’s own; absorb.

biodiversity – the variety of life forms that inhabit Earth.

candidate – a species that is being considered for inclusion on the endangered species list.

crepuscular – active at dawn or dusk.

diurnal – active by day.

ecosystem – a system of interdependent and interacting living organisms and their immediate physical, chemical, and biological environments.

endangered species – one that is in serious danger of becoming extinct throughout all or a significant portion of its range unless special protective measures are taken.

endemic – plants which grow in a limited or restricted area.

ephemeral – plants which complete their life cycle in a very short time.

estivation – warm weather hibernation.

exotic species – non-native, something that did not exist in an area before being introduced by human influence.

habitat – the specific environment or geographical region in which a species is found.

indicator species – a species that is monitored and whose condition is used to indicate the overall health of an ecosystem.

nocturnal – active by night.

perennial – a plant which persists in whole or in part from year to year and flowers in more than one year.

population – individuals of a particular species with definable group characteristics.

range – the extent of the distribution of a species.

rare species – one that has such a small population throughout its range that it could become endangered if its current environment is further harmed (a status used only for plants).

threatened species – one that is not in immediate danger of extinction but is likely to become endangered if it is not protected because its numbers are low

Teacher's Guide

Lesson 1: Introduction to the Unit

- Objectives:**
1. Students will assess their thoughts on endangered species by responding to a question about the types of animals they feel are important to save.
 2. Students will arrive at a consensus about whether to preserve an endangered species or to build a recreation center.

Materials: Endangered Species — What are the choices? (duplicate for students)

Subjects: science, social sciences, language arts

Skills: analyzing, interpreting, categorizing, predicting, writing

- Method:**
1. Write the following question on the board: Which of the following do you think is most important to save?
 - a. animals that are very beautiful
 - b. large animals, such as whales, grizzly bears, and bighorn sheep
 - c. a fish that lives in weedy lakes
 - d. a plant with blue flowers that only grows in certain sandy areas
 - e. a rat that lives where people often want to build

Have students briefly discuss and list their responses

2. Write the following issue on the board: Your town is thinking of building a recreation center in your neighborhood. But the proposed site is the home of an endangered lizard, and building the center might wipe out the lizard. Do you think it is okay for the recreation center to be built on that site? Explain your answer.

Would you feel different if there were an endangered plant living on the site where the center might be built? What if it was an endangered fly? Explain your answer.

3. Divide students into groups of three or four. Tell them to discuss their responses to the issue and to be prepared to present their choices and rationales to the class.
4. Ask the groups to briefly share their choices and rationales with the class.
5. After all groups have presented their choices and rationales, guide the class





into reaching a consensus about building the recreation center. Explain that this is one of the techniques used to arrive at solutions for issues concerning endangered species. One way to help achieve consensus is to have everyone rank the ideas that have been presented with a number. For example, if there are six ideas, each person would rank the choices from 1 to 6 with 6 being the first choice. Total the number of points given for each idea; the one with the highest score represents the majority viewpoint. This technique is especially helpful when you have a large group trying to reach consensus.

6. Present Endangered Species — What Are The Choices? (Unit IV background information) to students. One of the best ways to do this is to duplicate it and let them read it. After this is completed, discuss it with the class. As an alternative, it can be presented to the class while they take notes.

*Time
Considerations:*

1. background information: 5 – 10 minutes
2. group discussions, presentations: 20 – 30 minutes
3. background information: 10 – 15 minutes

Teacher's Guide

Lesson 2: A look at an Endangered Species

Objective: Students will develop a plan to reintroduce the Mohave tui chub, an endangered species, back into its native habitat.

Materials: Activity: The Mohave Tui Chub — Endangered Species (duplicate for students), student journals.

Subjects: science, social sciences, language arts

Skills: analyzing, categorizing, predicting, evaluating, researching, decision making

Method: 1. Give students a copy of the Mohave Tui Chub activity. Once this has been done, divide them into cooperative learning groups of four to five students. Tell the class that each group is to use the provided information and any outside resource necessary to construct and present a plan to reintroduce the fish into its native habitat. Note: Instead of the Mohave tui chub, your students may wish to research another Mojave Desert endangered species from the following list:

Animals

Arroyo toad
Bald eagle
California brown pelican
Least Bell's vireo
Peregrine falcon
Southwestern willow flycatcher
Yuma clapper rail
Desert pupfish
Unarmored three spine stickleback
Razorback sucker
Stephens' kangaroo rat
Desert tortoise
Inyo California towhee

Plants

Cushenbury buckwheat
Cushenbury milkvetch
Slender-petaled thelypodium
Bird-footed checkerbloom
Slender-horned spineflower
Parish's daisy

Status

Endangered
Endangered
Endangered
Endangered
Endangered
Endangered
Endangered
Endangered
Endangered
Endangered
Endangered
Threatened
Threatened

Status

Endangered
Endangered
Endangered
Endangered
Endangered
Threatened





A list of questions to guide their learning in either option includes:

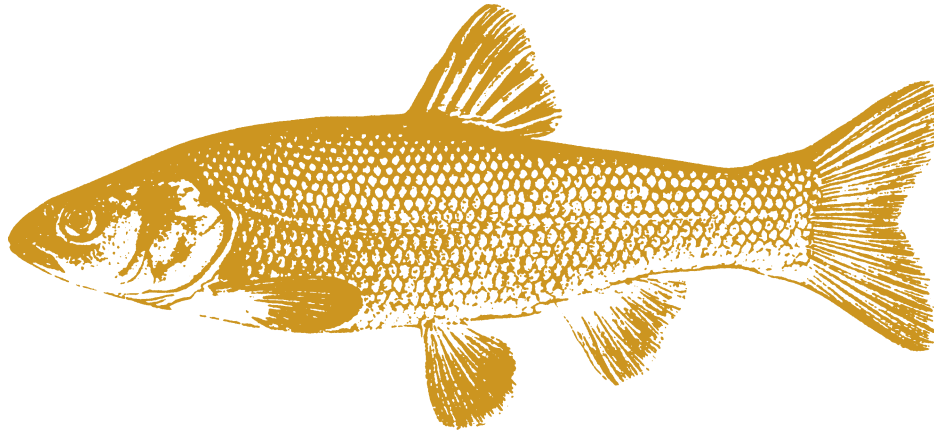
- What would be a description of this species' lifestyle?
 - What characteristics of this species contributed toward it being endangered or threatened?
 - How is the natural habitat of the endangered species threatened? (Briefly describe the causes.)
 - What steps have been taken to protect this habitat?
 - What agencies, individuals, or groups might assist the research into the threats to the habitat of the endangered species?
 - How could we (as students) educate the community about the threats to the habitat of the endangered species? (List plans for the neighborhood, school, and community.)
 - What other steps might we, as students, take to protect the habitat of the endangered species? (List the steps.)
2. Once all the plans have been presented, guide students into a class consensus, or general agreement, for each species. Use this consensus as the "class plan."
 3. Have students revisit the first question regarding animals that are important to save. Have their feelings changed? Students should journal how they feel about saving plant and animal species. Remind students that a journal is a record of their personal responses to their learning experiences.

- Time* 1. Mohave tui chub activity: 40 – 50 minutes
- Considerations:* 2. journaling: 10 – 15 minutes

- Extensions:*
1. Have students contact appropriate federal and state agencies to find out about how they plan to help the Mohave tui chub or other select endangered species. Once this is completed have students send the class plan to the appropriate agencies.
 2. Have the class actually carry out their plans to help an endangered Mojave Desert species (See Unit VII on taking action).

Activity: The Mohave Tui Chub — Endangered Species

Your assignment is to construct and present a plan to reintroduce the Mohave tui chub into its native habitat. Use the following information and other available materials to accomplish this task.



Mohave Tui Chub
Gila bicolor mohavensis

Description and Natural History

Mohave tui chub are chunky fish, two to eight inches (5–20 cm) long, with scales and short, rounded fins. Their heads are broad, and they have a short snout and small mouth. Olive-brown above and silvery-white underneath, the Mohave tui chub glistens with a metallic sheen in bright sunlight. The fish eat aquatic insects and their larvae; small, benthic invertebrates; plankton; and detritus. This makes them opportunistic feeders, meaning that they eat both plants and animals. Mohave tui chub live in weedy, near-shore areas of lakes, in the shallow areas of streams flowing out of lakes, and in mineral springs.

Even though water conditions fluctuate widely in Mohave tui chub pools during winter and spring flooding and summertime evaporation, they are not very tolerant of changes in temperature and salinity. They are unable to withstand water temperatures above 97°F (36°C) and retreat to deeper waters during the warmest hours. In winter, when water temperatures drop to 54°F (12°C), the fish stop feeding and move down to the pool bottom to await warmer temperatures. From late spring to early fall, they emerge and devour large quantities of food. This is probably done to store energy for the cold periods.

Breeding occurs in March or April when water temperatures warm to 64°F (18°C); some females spawn again in the fall. Females release their eggs over aquatic plants, primarily ditch grass. The fertilized eggs adhere to the vegetation, hatching in less than nine days. The young fish form schools, but they spread out and become more solitary as adults.



Distribution

The Mohave tui chub is the only known fish native to the Mojave River. Historically, it occurred from the headwaters in the San Bernardino Mountains to Soda Lake near the southern end of Death Valley. Only three pools of water now contain these species in the wild. All of them are near Soda Springs in San Bernardino County. There have been successful transplants of this population into China Lake Naval Weapons Center and the Desert Research Station Pond at Barstow. For those who would like to see Mohave tui chub, there is a population in a pond at the California Desert Information Center in Barstow.

Potential Conflicts

Construction of dams and reservoirs, along with competition with non-native species, are threats to this species. Extensive interbreeding with the Arroyo chub, which was introduced in the 1930s for sportfishing, resulted in the reduction of the Mohave tui chub from most of its historical range. The feasibility of removing Arroyo chub from the Mojave River and restocking Mohave tui chub to their native river is being studied, but could prove challenging because reservoirs and dams have changed the Mojave River's natural flow. These changes have resulted in conditions which now favor introduced fish.

Current Status

The Mohave tui chub is listed as endangered both federally and by the State of California.

Unit V: How Have Various People Viewed the Mojave Desert?

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	American Explorers	3
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	Ranching	3
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HOW HAVE VARIOUS PEOPLE VIEWED THE MOJAVE DESERT?

Mojave is spelled two ways in this unit; Mojave and Mohave. When you see Mojave it refers to the area occupied by the desert, and when you see Mohave it refers to an American Indian tribe.

The region occupied today by the Mojave Desert has not always been arid. Movement of the North American continent has resulted in climate changes. During the last 2.5 million years, the area has changed from a series of interconnected lakes to a desert.

The Mojave Desert has been used by many groups of people through time. During this time the climate has changed and become more arid. This change has influenced the lifestyles of local human inhabitants.

Early Human History

The exact time that humans first came to live in the area now occupied by the Mojave Desert is not known. Evidence indicates that the area has been used by humans for the last 10,000 years. Early humans lived on the shores of lakes and the climate was cool and moist. Streams and marshes covered the area and a large number of game animals and edible plants were present. Humans established a hunting culture where they used spears and darts to fish and hunt large game animals such as mammoths, mastodons, and bison; they also gathered edible plants.

As the climate became hotter and the lakes dried up, humans changed their lifestyle. As game became scarce, humans were forced to migrate. Migration patterns were dictated by seasonal changes, with winter spent at lower elevations and summer spent at higher elevations. This new lifestyle resulted in trade among differing groups, which led to widespread use of the bow and arrow, grinding tools, baskets, and pottery.

American Indians

The Chemehuevi, Mohave, Serrano, Pauite, and Shoshone were the American Indian groups who occupied the Mojave Desert when the first European Americans arrived. Each of these groups occupied a fairly large, exclusive territory. A peaceful coexistence usually prevailed since each group had a high respect for the rights of others. Each group was further subdivided into close-knit extended family units that were independent of one another except for trade and intermarriage. The make-up of these units would change from season to season or as need arose. This resulted in loose-knit bands instead of tribes. Their descendants still occupy lands in the Mojave Desert.



Unit V
*How Have Various
People Viewed the
Mojave Desert?*

Spanish Explorers

Pedro Fages is considered the first European to enter the Mojave Desert. In 1772, he was the Spanish army officer in charge of a detail dispatched to find and return some deserters from the presidio of San Diego; it is possible that these fugitives were actually the first to cross the desert. Although the criminals were never found, Fages traveled north toward the San Bernardino Valley, crossing the mountains near Cajon Pass. He then made his way into the Mojave Desert to the southern tip of the San Joaquin Valley, and ultimately to his home in Monterey, CA.

Father Francesco Gárces was next and is considered the first European to enter the interior of the Mojave Desert. Led by three Mohave Native Americans in 1776 he traveled from Piute Springs over the Providence Mountains and north of the Kelso Dunes to Soda Lake. This route became known as the Mohave Indian Trail.

American Explorers

In 1826, Jedediah Smith used the Mohave Indian Trail to cross the Mojave Desert. Kit Carson used the same trail in the 1830s and again in 1844 when he served as a guide for Captain John Fremont. Fremont was on an information gathering expedition and kept detailed journals on the geology, botany, and geography of the region.

As more people came to the Mojave Desert, the trail became known as the Mojave Road. Increased usage resulted in hostilities with local American Indians, which led to the establishment of a series of army posts. By 1870, hostilities ceased and the posts were abandoned.

Mining

Many early settlers were miners who believed that since the desert was so visibly lacking in resources to support life, it must be hiding untold riches beneath its surface. The discovery of gold, silver, zinc, copper, iron, borax, and rare earth deposits strengthened this belief, and would-be millionaires scoured the desert in search of wealth. Boom towns sprang up close to the mines, only to be reclaimed by the desert once the ore ran out and the people left. Mining still occurs in the desert today.

Ranching

Ranchers came to the Mojave Desert in the mid 1800s. At that time there was adequate rainfall which provided ample browse during fall and winter. Cattle were first brought to the area to feed the army and miners. As the Mojave Desert's climate continued to change, vegetation became scarcer and ranching became difficult. In spite of this, a small group of ranchers still graze cattle on open range in the Mojave Desert.

Unit V
*How Have Various
People Viewed the
Mojave Desert?*





Unit V
*How Have Various
People Viewed the
Mojave Desert?*

Railroads

Railroads played a key role in the development of the Mojave Desert. They provided the supplies that kept the mines, homesteads, and ranches operating. They also served as a means of shipping ore and beef. Most of the routes are still in use.

Homesteading

During the 1900s, a series of homestead acts brought an influx of settlers. Early homesteaders often came to the desert because of poor health or to get away from city life. During the Great Depression some settlers came to the desert to try and live-off-the-land. The desert could not sustain them and most of their homesteads were abandoned.

The Small Tract Act of 1938 offered five-acre “Jackrabbit” homesteads on vacant, surveyed public land. These tracts were intended to be used for health and/or recreational purposes. A person wishing to acquire one of these tracts could lease it for five years. If at the end of the lease a cabin had been built on the property, the land could be purchased for a small fee. The average price was about \$20 per acre. Many of these homesteads were built, but few became permanent residences. In 1950 the law changed and this ended homesteading in the Mojave Desert.

Military Use

The Mojave Desert has had a military presence since the 1800s. Since World War II it has provided a training area for desert warfare. The military’s use of the desert is not limited to the land itself. Its airspace is considered prime for testing and training flights. Because of this, low-flying military aircraft are frequently seen and heard.

Recreational Use

Today, people do not need to spend most of their time obtaining basic survival needs, thus there is more time for recreation. Recreational activities in the Mojave Desert include hiking, camping, off-highway vehicle travel, hunting, biking, bird watching, rock climbing, and a host of others. Some of these activities take their toll on native plants and animals. Finding a balance between engaging in these activities and protecting the delicate desert biome is one of the greatest challenges that public agencies, which manage a large portion of the Mojave Desert, encounter.

Glossary

arid — a climate that is lacking in moisture; dry.

biome — a group of ecosystems that are related by having a similar type of vegetation governed by similar climatic conditions.

bison — the name used to designate the native North American animal that is sometimes called buffalo.

browse — leaves, young shoots, and other vegetation.

European — an individual of European descent.

heavy metals — metals which have oxidized and are used in various industries including aerospace.

hostilities — acts of open warfare.

mammoth — a large, hairy, extinct species related to elephants.

mastodon — a large, extinct species related to elephants.

presidio — a Spanish military fort.

Unit V
*How Have Various
People Viewed the
Mojave Desert?*



Teacher's Guide

Lesson: Humans and the Mojave Desert

- Objectives:**
1. Students will learn about human history in the Mojave Desert by completing a network tree.
 2. Students will read a Mohave Nation folk tale about Amboy Crater and use it as a guide to create their own folk tale.

- Materials:**
- Unit V background information (optional to duplicate for students)
 - Activity I: Humans and the Mojave Desert Network Tree (duplicate for students)
 - Activity II: Legends, Folk Tales, and Stories (duplicate for students)
 - student journals

- Subjects:** social sciences, language arts

- Skills:** analyzing, interpreting, categorizing, predicting, writing, synthesizing and creating

- Method:**
1. Ask students what they know about the history of the Mojave Desert. List their responses on the board.
 2. Duplicate the background information for students to read. When completed, discuss it with the class. As an alternative, present it in lecture format while students take notes.
 3. Give students a copy of Activity I: Humans and the Mojave Desert. Instruct them to complete the network tree based on the background information.
 4. Have students compare the network tree about the history of the Mojave Desert to their initial responses about what they knew. Were there misconceptions? What did students find most interesting? What would they like to know more about?
 5. Introduce the legends, folk tales, and stories activity. Tell students that desert inhabitants often interpreted their experiences and feelings for the land through oral and written communication. The story was often used by American Indians. Legends and folk tales are stories that explain a natural phenomenon or observable characteristic of an animal or human. Tell students that they will be reading a story about the formation of Amboy Crater.



6. Give students a copy of Activity II: Legends, Folk Tales, and Stories. Have them read the story AH MOTT KAH PEE THOYAH. After students have read the story ask them the following questions.

On what was the story based?

What parts of the story were based upon real events?

What parts of the story were based upon cultural beliefs?

What other types of events would be good for developing such stories?

7. Ask students what they think might be other events or characteristics of an animal or human on which a legend or folk tale might be based.
8. Tell students that they will write their own story. Before writing, each student should tell you what event was chosen, and describe the real and fictional parts.
9. Once students have completed the activity, divide them into groups of three or four and have them read each other their stories. Tell them to choose the best story from each group to share with the class.
10. Have students journal their thoughts and feelings about creating these stories.

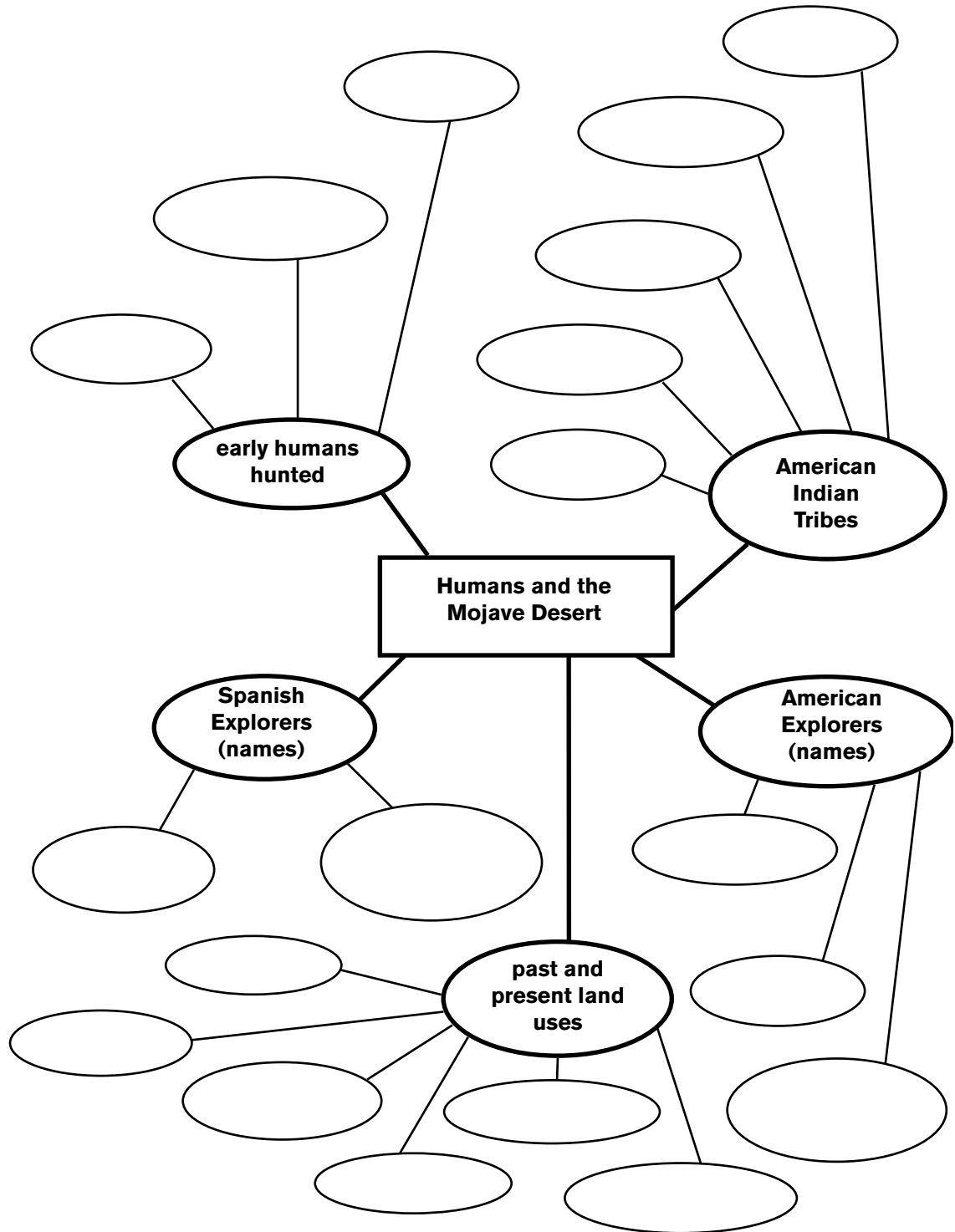


- Time*
- Considerations:*
1. background information: 5 – 10 minutes
 2. Activity I: 10 – 15 minutes
 3. Activity II: 30 – 40 minutes
 4. journaling: 10 – 15 minutes

- Extensions:*
1. Have students locate and share other Mojave Desert folk lore, legends, and myths.
 2. Have students read the journals of Captain John Fremont, Pedro Fages, or Father Francesco Gárces and report their findings to the class.

Activity I: Humans and the Mojave Desert Network Tree

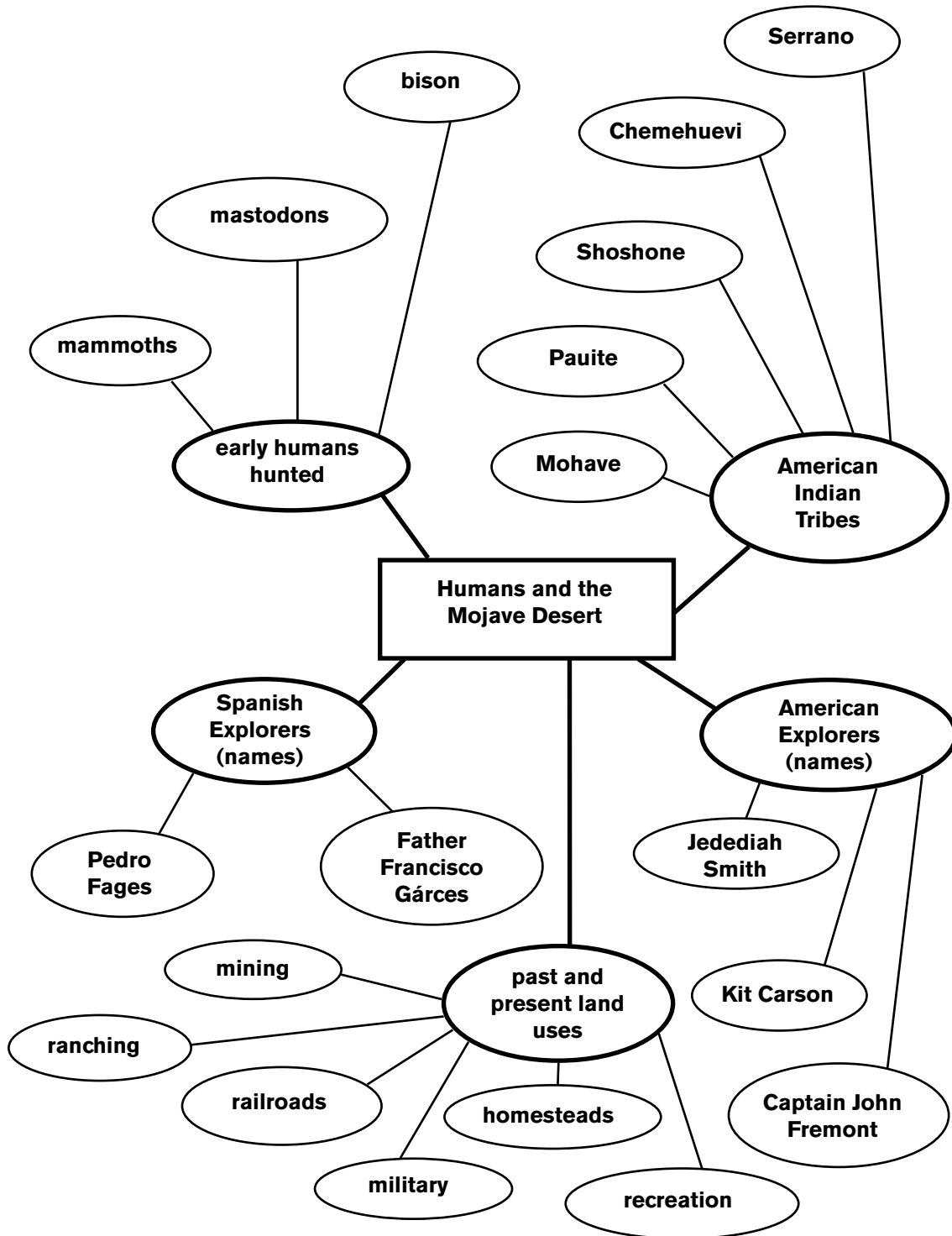
Use the background information to complete the following concept map.



Answer Key


Activity I: Humans and the Mojave Desert Network Tree

Use the background information to complete the following concept map.



Activity II: Legends, Folk Tales, and Stories

In this activity, you will read the Mohave Indian story about the Origin of Amboy Crater. Amboy Crater is an extinct volcano located 5 miles west of the town of Amboy. It is 2000 years old and can be seen by looking south while traveling on Highway 66.

AH MOTT KAH PEE THOYAH

A long time ago the people had various ways of making their living. Some of them fished, some were hunters, etc. There was a hunter by the name of AH MOTT KAH PEE THOYAH (he can go down under the earth) who hunted birds and rabbits for a living. He would go to any thick forest or brush and would build a fire in a circle all around the thick brush or trees—carefully built so no animals could escape from the fiery trap.

Then he went to the center of the place that the fire was encircling and sang a song that caused him to sink into the earth. Here is his song: AH MOTT KAH PEE THOYAH, KAH PEE THOYAH, EEHAH VEE ROPES, AH MOTT THEE THON EETHON EE EE. This means, “When my name is sung I go farther and farther down into the ground.” When the song was finished the first time he sank down into the ground above his knees. Then he repeated the the song four times and he was out of sight under the ground. When he thought the fire had burned itself out he then came up out of the ground and he would find lots of rabbits, deer, mountain sheep, etc., that had stayed in the brush that were cooked and ready to eat. He would gather all that he desired and then be on his way home. After he had used up all the meat from the last kill he would start out and find a new location to hunt. That was his method of hunting.

Once, after a hunt performed using his unique process, he came back up out of the ground he found a fox there looking over all the dead animals. AH MOTT KAH PEE THOYAH said, “You may have all you want, Mr. Fox. I’m giving you all you want.” The fox shook his head and said “No! That stuff stinks. I don’t eat such smelly stuff. I hunt and I kill in my own way.” Then the fox thanked the fire hunter and left, but, before he left he asked, “What do you sing and how do you hunt with fire?”

AH MOTT KAH PEE THOYAH told him that he simply started a fire around himself in a complete circle and then sang a song four times and that caused him to go under the ground so he wouldn’t get burned. The fox said, “Just for curiosity’s sake, I’d like to have you demonstrate for me.” So to accommodate him the hunter sang the song for him, and the fox memorized the song and went on his way without taking any of the food he had been offered.

The next day the fox decided that now since he now knew the secret to the fire hunter’s success he would hunt the same way. So he chose as his location to hunt the land just south of Amboy, California, where the volcanic crater is located today. He worked fast, and got the fire thoroughly started all around him, then

he went in to the center of the ring of fire and began to sing the song that AH MOTT KAH PEE THOYAH had taught him the day before. But, he didn't go down a single inch into the ground. In desperation, he repeated the song four times and still nothing happened. In death he was still making a tremendous effort to send himself down into the ground just like the fire hunter had done, for just as you have probably surmised, the fire had gotten out of control and cremated the fox on the spot.

But, the fire didn't stop. It kept burning more and more and soon the earth itself started to burn. Then the rocks began to burn and the rocks melted and flowed over the desert like a stream of boiling tar. The melted rock kept running until it reached Newberry, and it didn't stop there. It even kept on running until it reached Barstow.

AH MOTT KAH PEE THOYAH came along and saw what had happened and he stopped the fire. When the fire had subsided there was a great big crater left and is still there today. Then the fire hunter changed himself into a little worm and he is in this form yet today.

Whenever you happen to be around sand hills or around any sandy place, you can easily find the marks on top of the sand where he travels around under the sand. Also, you will find little crater-shaped holes where he gets down under the ground looking for insects. Now he still goes down - not head first - but backwards into the sand, just as he did when he was a man.

This is a very true story, but if you don't believe it, just look around sandy places and you can see the tiny craters. Then try to find the little worm AH MOTT KAH PEE THOYAH. He is there but you won't find him for he is already buried under the earth and is laughing at you.

Used with permission from *That All May Know The Lore Of The Mohave Nation*. Barnes, J. A. (Ed.). Davidson, H. (narrator), 1966. San Bernardino County Museum Association. Vol XIII, No 3&4.

Assignment

American Indian lore does not fit everyone's cultural viewpoint of reality so there are some things that you may not understand from the story that you just read. Keep in mind that people hearing your stories hundreds of years from now may not understand what you were originally trying to say.

Now that you have read the Mohave Nation version of how Amboy Crater was formed, you are ready to try your hand at composing your own story. The only rule is that it must explain a natural phenomenon or animal behavior. Examples of natural phenomena could include the formation of volcanoes, mountains, lakes, or other prominent features; descriptions of why earthquakes or landslides occur; or an explanation of what makes lightning or wind. An example of a specific animal behavior could include an explanation of why raccoons wash their food before eating it. Before you begin writing, check with your teacher to make sure that your topic is okay. Be creative.



Unit VI: What Are the Choices?

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WHAT ARE THE CHOICES?

We ask a lot of our deserts. We expect them to provide beautiful surroundings for recreation and wildlife habitats. At the same time, we might expect them to provide for grazing, mining, landfill sites, and a host of other activities. As the population grows and more people use the deserts, it is becoming difficult to satisfy all of our needs.

In this unit, students will read and discuss information on one of the four Mojave Desert issues provided. They will use this information to propose solutions to these real-life problems. Each issue will have these six components: 1) problem, 2) issue, 3) players and positions, 4) beliefs 5) values, and 6) solutions.

Components of an Environmental Issue

Most interactions between you and the environment are complex. A simple task such as eating is the result of a long chain of events. Many of these events deal with the consumption of resources. These in turn deal with environmental concerns which sometimes evolve into environmental issues. In this unit, environmental issues are divided into the following components.


PROBLEM: A condition in which something we value or think is important is at risk. Environmental problems involve the interaction of humans and the environment and also threaten some aspect of human well being or something humans value. A problem might include what to do in the aftermath of a natural disaster such as a flood or earthquake, or what to do with the refuse of large metropolitan areas.

ISSUE: A problem, or its solution, for which differing beliefs and values exist, usually involving two or more parties who do not agree. In many cases, environmental problems remain unsolved because those involved are unable to agree on how to solve the problem. It is important that students understand the different beliefs and values of the disagreeing parties; if they do not, they will not understand the concept of an environmental issue.

PLAYERS and POSITIONS: The individuals and/or groups that are involved in an issue, and where they stand on the issue.

BELIEFS: The ideas about an issue that are held to be true by the players. They do not have to be true, the players just need to believe that they are. A belief is strongly tied to the player's values.

VALUES: The relative worth a player places on something. Values are often drawn from personal experiences and background. Table 1 is a list of value descriptors. Each definition describes a specific value. The definitions, as well as the list itself, should not be considered complete.



Unit VI
What Are the Choices?

SOLUTIONS: The various strategies proposed to resolve an issue. A solution is acceptable when the public is involved in the decision-making process, the interested public sectors reach a compromise, the compromise meets objectives for managing the resource, and the compromise conforms to law.

Adapted with permission from *Investigating Environmental Issues and Actions*, Hungerford, Litherland, Peyton, Ramsey and Volk, 1996. Champaign, IL: Stipes Publishing Company.

Table 1 Value Descriptors

<i>Value</i>	<i>Definition</i>
Aesthetic	the appreciation of form, composition, and color through the human senses.
Ecological	pertaining to natural biological systems and principles.
Economic	the use and exchange of money, materials, and/or services.
Educational	concerning the accumulation, use, and communication of knowledge.
Egocentric	pertaining to a focus on self-centered needs and fulfillment.
Environmental	pertaining to human activities in terms of quality of natural resources, e.g., plant and animal species, air, water, soil, etc.
Ethical/Moral	pertaining to present and future human responsibilities, rights and wrongs, and ethical standards.
Ethnocentric	pertaining to a focus on the fulfillment of ethnic/cultural goals.
Health & Safety	the maintenance of positive human physical conditions.
Legal	relating to national, state, or local laws; law enforcement; law suits.
Political	the activities, functions, and policies of governments and their agents.
Recreational	pertaining to human leisure activities.
Religious	the use of belief systems based on faith or dogma.
Scientific	concerning the process of empirical research; knowledge gained by systematic study.
Social	pertaining to shared human empathy, feelings, and status.
Technological	concerning the use of technology for human/societal goals.

Used with permission from *Investigating Environmental Issues and Actions*. Hungerford, Litherland, Peyton, Ramsey and Volk, 1996. Champaign, IL: Stipes Publishing Company; pg 34.

Unit VI
What Are the Choices



Teacher's Guide

Lessons for Selected Environmental Issues

Determine which of the four issues, each as a different activity, is best suited for your class. The issues are groundwater of Death Valley, Eagle Mountain Landfill, the impact of burros on Lake Mead National Recreation Area, and accessibility in Mojave National Preserve. It is suggested that you choose an issue that has relevance to your students.

- Objectives:**
1. Students will analyze and propose one or more solutions to an environmental issue.
 2. Students will journal their thoughts and feelings about proposals to resolve environmental issues.

- Materials:**
- Activity I: The Groundwater of Death Valley (duplicate for students)
 - Activity II: Eagle Mountain Landfill (duplicate for students)
 - Activity III: The Burros of Lake Mead (duplicate for students)
 - Activity IV: Accessibility in Mojave National Preserve (duplicate for students)
 - Analysis of The Groundwater of Death Valley (teacher's guide)
 - Analysis of Eagle Mountain Landfill (teacher's guide)
 - Analysis of The Burros of Lake Mead (teacher's guide)
 - Analysis of Accessibility in Mojave National Preserve (teacher's guide)
 - What are the Issue's Components? (duplicate for students)
 - student journals

- Subjects:** social sciences, science, language arts

- Skills:** analyzing, comparing and contrasting, defining problems, identifying attributes and components, interpreting, synthesizing, and creating

- Method:**
1. Explain that a good way to understand an issue is to identify its components. As a class, go over the components of an environmental issue (problem, issue, players and positions, beliefs, values, and solutions).
 2. Next, divide the class into groups of four students and give each person a copy of one of the activities. Each activity is based on a real environmental issue. Also give each student a copy of What are the Issue's Components?
 3. Give students time to read the activity.
 4. Explain that each group should identify the components of the issue and propose a solution for it. They are to designate a spokesperson who will identify the components of the issue and share the group's solution with the



rest of the class. Each group should be ready to explain how this solution was selected. Point out that there is not a right or wrong answer and that usually the only workable solution is a compromise. You can assess students' performance by observing how well each group linked its solution with the beliefs and values of the players involved in the issue.

5. After all the groups have made presentations, have the class come up with the pros and cons of each proposed solution. If possible, guide the students in suggesting solutions that might combine two or more of the original proposed solutions and have the students vote on a possible solution. It is very likely that not all students will agree on one solution, so more than one solution may be the outcome.
6. Have students journal their responses to the proposed solution.

*Time
Considerations:*

1. components of an environmental issue: 10 – 20 minutes
2. group preparation: 40 – 50 minutes
3. presentations: 50 minutes
4. class solution: 15 – 20 minutes or longer
5. journaling: 10 – 15 minutes

Extensions: After completing one issue, you could have the students repeat the lesson using a different issue.

NOTE: The players and positions are based on a review of available references and may not accurately represent all of those involved in a particular issue. The beliefs and values provided in the teacher's guide are based on interpretations of available references. These interpretations are not necessarily complete and are meant only as examples to assist the teacher in helping students explore the issue. Also, the solutions suggested in the teacher's guide are not meant to be the only possibilities.



Activity I: The Groundwater of Death Valley

As we all know, water runs downhill. At minus 282 feet (-88 m), Death Valley has the lowest elevation in the United States. This makes Death Valley the discharge point for most of the groundwater in the region. The drainage area that provides groundwater to Death Valley is an aquifer referred to as the Death Valley Groundwater Flow System.

The Death Valley Groundwater Flow System covers 15,800 square miles (40,922 km²) and includes most of southern Nevada and a portion of eastern California. Although surrounded by mountain ranges, the principal recharge sources are located in the northeastern part of the region.

The mountains there receive the greatest precipitation and are the major source of water in the Death Valley Groundwater Flow System. Although the region is exceptionally dry today, thousands of years ago the climate was much wetter. At that time, rain and snow in the high mountains of central Nevada provided abundant water to the surrounding basins. This water seeped into the porous carbonate bedrock and began an underground flow toward the southwest. Traveling slowly through the fractures and pore spaces of the rocks, the water ends its subterranean journey in the Death Valley region.

In the Death Valley Groundwater Flow System, natural discharge occurs near Beatty, Ash Meadows, Tecopa, Furnace Creek, and at the edges of Death Valley playa. Springs, seeps, and playas are the natural discharge areas in the system. These discharge areas provide essential habitat for plants and wildlife and supply water for human use, even though most of the water that is discharged is lost through evaporation.

Changes in groundwater systems are indicated by variations in water levels in wells and in flow rates at springs. In the Death Valley groundwater system variations are caused by seismic activity, which can alter the natural plumbing system, and by artificial discharge through pumping groundwater. Pumping too much water from wells causes groundwater levels to decline and springs to decrease their flow rates. This usually indicates that there is a decrease in the water storage capacity of the groundwater system.

Death Valley National Park staff is concerned about the negative impacts of unlimited pumping on the park's water rights and water related resources. The United States Geological Survey (USGS) and several consulting firms have conducted studies on the Death Valley Groundwater Flow System. The studies indicate that: 1) the Death Valley groundwater system encompasses a large area; 2) discharge rates exceed recharge rates; 3) a major change in either discharge or recharge rates would have an impact on the park; and 4) any pumping of groundwater should be closely monitored to ensure that the groundwater is not overdrafted. Park officials believe that the largest threat to its water resources is from the appropriation of water for mining and other forms of development outside their boundaries. Several entities including the City of Las Vegas (Las



Vegas Valley Water District now the Southern Nevada Water Authority) have made application to withdraw water from and adjacent to the Death Valley groundwater system and Death Valley National Park has responded by filing protests.

The Southern Nevada Water Authority (SNWA) is concerned about providing water to all of its customers which now includes 1,000,000 residents as well as the hotels and casinos. Las Vegas now has 10 of the world's largest hotels and in two years will have more than a dozen of the world's largest hotels. The service area for the SNWA is one of the fastest-growing areas in the country and the demand for water is high. The Las Vegas area's water problems stem principally from the unequal distribution of water from the Colorado River. Because southern Nevada had a small population and little promise of growth at the time the Colorado River Agreement was written, Nevada receives less water than Arizona and California. In 1989 SNWA, seeking additional water, applied to the Nevada State Engineer for all previously unappropriated water rights in a large part of the state. The vast area that would be affected by those water rights would impact the Death Valley Groundwater Flow System. Although SNWA is diligently seeking water from other sources, if they are unsuccessful they will pursue these applications.

Recently an organization called Amargosa Resources Corporation filed applications for large quantities of groundwater from the Amargosa Valley which is currently 220% over appropriated. The corporation further requested that the State Engineer revoke all water permits in the valley which have not been used for a period of five years (a condition of a water permit) to make water available for their applications.

The Amargosa Water Committee is a group of farmers concerned about having their water rights forfeited and/or taken away by the State Department of Water Resources. They believe that the Amargosa Resources Corporation is trying to repeat the actions of Los Angeles and have adopted the slogan "Remember the Owens Valley." Recently, all farmers had to prove in hearings that they were using their agricultural water rights. In order to keep their water rights, they are now forced to use every drop of water available to them.

Canyon Resources has begun a cyanide heap leach gold mining operation at the Briggs Mine 2 miles (3.2 km) from the west boundary of Death Valley National Park. Cyanide processing requires a lot of water and Canyon Resources has a permit to pump 1 billion gallons (3.785 billion liters) of water a year for ten years. Company personnel state that their withdrawal of water will not have a major impact on the groundwater in Death Valley National Park.

The Timbisha Shoshone Tribe has been federally recognized since 1983 but owns no land. Section 705b of the California Desert Protection Act of 1994 requested that the Secretary of the Interior conduct a study to identify lands suitable for a reservation. Tribal leaders state that in the past the federal government has taken their lands and water rights and asks that at least part of them be returned. The Timbisha are also opposed to the Briggs Mine, stating



that it is on ancestral land and will deplete water resources in the Panamint Mountains. They filed a lawsuit with the State of California to halt mining. They also filed a protest with the U.S. Department of the Interior (DOI) concerning the lack of direct consultation with tribal leaders before the mining permit was approved.



What are the Issue's Components?

PROBLEM:

ISSUE:

*PLAYERS &
POSITIONS:*

*BELIEFS/
VALUES:*

SOLUTIONS:



Teacher's Guide

Analysis of the Groundwater of Death Valley

PROBLEM:

The loss of natural springs, wildlife habitats, and potable water supplies in Death Valley National Park by groundwater removal.

ISSUE:

Should there be set limits on groundwater withdrawal from the Death Valley groundwater system and how do individual water rights compare with those of the federal government and large municipalities?

PLAYERS & POSITIONS:

1. The National Park Service (NPS) staff does not want an increase in the amount of water pumped from the Death Valley groundwater flow system.
2. The Southern Nevada Water Authority (SNWA) wants to obtain more water, either by pumping large amounts of water from the Death Valley groundwater system or getting more Colorado River water.
3. Amargosa Resources wants to obtain water rights to sell to others. They have asked the State Engineer to forfeit unused water rights in the Amargosa Valley.
4. The Amargosa Water Committee does not want to lose its right to pump water from the Death Valley groundwater system at a higher rate than it actually has in the past.
5. Canyon Resources wants to continue pumping water at the present rate for its cyanide processing operation and maintains that it has the right to extract ore from the Briggs Mine.
6. The Timbisha Shoshone Tribe wants ownership of ancestral lands and attached water rights in and around Death Valley National Park.

BELIEFS/VALUES:

1. National Park Service personnel believe they are responsible for preserving natural resources and the local ecosystem. They believe this includes the groundwater that flows into the park. Their beliefs might be based on aesthetic, ecological, educational, environmental, legal, political, recreational, and scientific values.
2. Southern Nevada Water Authority personnel believe they are responsible for providing water for their customers. Their beliefs might be based on economic, educational, ethical/moral, health and safety, legal, scientific, and technological values.



3. Amargosa Resources personnel believe they have the right to obtain any unused water rights in the Amargosa Valley through forfeiture. Their beliefs might be based on economic, legal, and political values.
4. Amargosa Water Committee members believe SNWA and the federal government are trying to take away their water rights. Their beliefs might be based on economic, ethical/moral, legal, political, and social values.
5. Canyon Resources personnel believe they are operating a legal mining venture. Their beliefs might be based on economic, legal, and technological values.
6. Timbisha Shoshone Tribal members believe they should be able to live on ancestral lands and have the rights associated with living on their own land. Their beliefs might be based on aesthetic, ecological, environmental, ethical/moral, legal, political, and religious values.

SOLUTIONS:

Solutions will vary from group to group. Remind students there is not a right or wrong solution and that most solutions result in a compromise which meets the objectives for managing the resource.

SOURCES:

Amargosa Water Committee Newsletter; May 18, 1993.

Appraisal of the Water Resources of Death Valley California-Nevada;

Open-File Report 77-728; G. A. Miller; 1977; United States Department of the Interior Geologic Survey.

The Desert News; Volume 4, Issue 12; June 15-30, 1994.

Precious Death Valley Water Eyed; Las Vegas Review-Journal/Sun; May 23, 1993.

Preliminary Assessment of Ground Water at Sites in and near Death Valley National Park, Nevada and California; Pal Consultants, Inc.; San Jose, CA.

Rural Water War Begins to Boil; Gateway Gazette; May 13, 1993.

Statement for Management, Death Valley National Monument; November, 1990.

Timbisha Ask to Halt Briggs Mine; Robert Paton; Concentric Network Corporation [On-line].

Timbisha Shoshone Death Valley Land Restoration Project; Concentric Network Corporation [On-line].

Water Resources Center Brochure (no date).

Mel Essington, Mining Engineer, Death Valley National Park.



Keri Coughlin, Interpretation, Death Valley National Park.

UPDATE:

In April 2004, hearings were held by the Nevada State Engineer to determine if the first set of water-right applications should be granted to SNWA. The decision of the State Engineer is expected by the end of 2004. The extent and timing of the impacts on Death Valley are unknown at this time. However, the park is working with SNWA, the USGS, U.S. Fish and Wildlife Service, Bureau of Land Management, and State of Nevada to develop a monitoring and mitigation plan that will enable impacts to be observed while they are still minimal and distant from Death Valley.



Activity II: Eagle Mountain Landfill

The site for the proposed Eagle Mountain Landfill was originally named the Iron Chief Mine and owned by the Southern Pacific Railroad. It was bought by the Henry J. Kaiser Corporation in 1943. As time went by the Kaiser Corporation increased ore extraction, constructed a railroad spur to the mine site, and established a townsite for employees. Kaiser Corporation also built a steel mill in Fontana, 150 miles (249.4 km) west in San Bernardino County, to process the iron ore into steel. The mine closed in 1983 when the Kaiser Corporation went bankrupt due to a drop in the price of iron ore. A series of large open pits still exists at the site.

In 1989 Mine Reclamation Corporation (MRC) submitted a proposal to use the abandoned mine site as a landfill. There are two components to the proposal: the development of a nonhazardous municipal solid waste landfill, and the renovation and repopulation of Eagle Mountain townsite. Most of the refuse would be transported by rail from Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, San Diego, and Ventura counties. MRC estimates that the site will hold 708 million tons (719,328 million kg) of solid waste and that it would take 117 years to fill at the rate of 20,000 tons per day (20,320,000 kg).

The proposed site is bordered on the north, west, and southwest by Joshua Tree National Park and the Eagle Mountains, and on the east and southeast by Chuckwalla Valley. The park's southern boundary is 1.5 miles (2.4 km) from the site. The proposed landfill covers 4,654 acres (1883.5 ha) but only 2,164 acres (875.8 ha) would be used for actual waste disposal. The remaining 2,490 acres (1007.7 ha) would be used as a buffer zone.

MRC states that the landfill will create over 1,200 new jobs, that it will replace unsafe landfills, and that it will take the place of landfills that have either closed or will close in the near future. MRC also states that cities and counties need new places to deposit their solid waste and that the project will generate an average of 11.8 million dollars a year during the first 20 years for Riverside County. MRC plans to put in a multi-layered liner to prevent leakage of toxic liquids into the water table. In order to ensure that visitors to Joshua Tree National Park will be unaware of the landfill, MRC agrees to: 1) cover the refuse with soil on a daily basis so that odors will not be noticeable; 2) establish visibility-monitoring stations so that changes in air pollution levels will be recorded; 3) shield all lights; 4) ensure that there will be no wind-blown debris; 5) establish raven/predator monitoring for a minimum of 10 years; 6) fence all active sites; 7) install new water sources for bighorn sheep; 8) fund an Environmental Mitigation Trust for acquisition, research, monitoring, and increased management; 9) monitor water withdrawal; 10) monitor noise; and 11) provide office and living space at the landfill site so that park service personnel can monitor landfill activities and perform research.

Joshua Tree National Park personnel are concerned about negative impacts on the park's ecosystems, wilderness values, and air and water quality. The landfill



will be located next to one of the more remote, pristine areas of the park. Wildlife specialists know that landfills attract ravens who transport refuse and prey on baby tortoises. Other concerns include the destruction of some habitat of the bighorn sheep, the California leaf-nosed bat, and the desert tortoise.

Bureau of Land Management (BLM) personnel are concerned that the land exchange and the right-of-way access conform to regulations and are in the best interests of the public. The BLM is the federal agency responsible for the Environmental Impact Statement.

The Riverside County Board of Supervisors is composed of elected officials who have voted to approve the permit for the landfill. They are also responsible for zoning variances in the vicinity of the landfill.

Members of Desert Environmental Response Team, an environmental citizens group, cite possible groundwater contamination, potential air pollution, and being located next door to a national park as their major concerns about the establishment of the landfill. They question the motives of a large corporation who wants to dump refuse from distant cities into the desert. They believe that desert communities have small populations, are politically weaker than large cities, and may not have the political clout to prevent the establishment of the landfill.

The president of the Desert Water Agency states that the landfill will repair the massive scar on the desert landscape caused by the ore extraction mining. He believes that it will not harm the local water table.

Eagle Mountain Landfill Opposition Coalition is concerned about the desert becoming a wasteland for southern California cities. The coalition states that the exhaust from trash-hauling trains and trucks will increase air pollution and that MRC will be unable to prevent blowing trash. Groundwater pollution is also of major concern.

A group of residents from Lake Tamarisk, which is close to the landfill site, feels that it will be good for the local economy and favor it for that reason.

The Desert Citizens Against Pollution group states that there is no way that MRC can keep its promises to the national park or any of its other neighbors. This group is convinced that increased air and water pollution will be caused by the establishment of the landfill.



Teacher's Guide

Analysis of Eagle Mountain Landfill

PROBLEM:

What should be done with the open pit mine at Eagle Mountain? *or* What should be done with refuse from cities in southern California?

ISSUE:

Should the abandoned mine site at Eagle Mountain become a nonhazardous municipal solid waste landfill?

PLAYERS & POSITIONS:

1. Mine Reclamation Corporation wants to establish the landfill.
2. The National Park Service does not want the landfill unless MRC can assure that it will not adversely affect Joshua Tree National Park.
3. Bureau of Land Management wants to approve the land exchange and accept the Environmental Impact Statement for the establishment of the landfill.
4. Riverside County Board of Supervisors has approved the permit and zoning changes for the landfill.
5. Desert Environmental Response Team does not want the landfill to be approved.
6. The president of the Desert Water Agency wants the landfill to be approved.
7. Eagle Mountain Landfill Opposition Coalition does not want the landfill approved.
8. A group of Lake Tamarisk residents wants the landfill approved.
9. The Desert Citizens Against Pollution group does not want the landfill approved.

BELIEFS/VALUES: (Student answers might reflect some of the following)

1. Mine Reclamation Corporation believes the landfill can be constructed without any negative impact on the surrounding area. MRC's values might be characterized as economic, educational, environmental, health and safety, political, scientific, and technological.
2. National Park Service personnel believe they are responsible for preserving natural resources and the local ecosystem of Joshua Tree National Park. They believe the landfill may adversely affect the park. Their beliefs might be based on aesthetic, ecological, educational, environmental, political, recreational, and scientific values.



3. Bureau of Land Management personnel do not express favor or disfavor with the landfill. They are concerned with the land exchange and right-of-way issues. Their beliefs might be based on economic, ethical/moral, health and safety, political, and technological values.
4. Members of the Riverside County Board of Supervisors believe they are to make decisions that will benefit the majority of people in the county. Their beliefs might be based on ecological, environmental, ethical/moral, health and safety, legal, and political values.
5. Desert Environmental Response Team members believe the landfill will cause an increase in air and water pollution, the site is too close to a national park, and MRC wants to profit at the expense of the local landholders. The membership display aesthetic, ecological, environmental, educational, ethical/moral, health and safety, legal, and scientific values.
6. The president of the Desert Water Agency believes the landfill will heal an ugly scar, and it will not harm the local water table. He displays aesthetic, educational, environmental, scientific, and technological values.
7. Eagle Mountain Landfill Opposition Coalition members believe the desert is becoming a dumping ground for other areas, and the landfill will increase both air and water pollution in the area. They display aesthetic, ecological, environmental, ethical/moral, and health and safety values.
8. The residents of Lake Tamarisk believe the development of the landfill will be good for the local economy. They display economic, egocentric, and political values.
9. Desert Citizens Against Pollution members believe MRC can not keep its promises about keeping all refuse out of the park and preventing air and water pollution at the site. They display aesthetic, ecological, environmental, ethical/moral, and health and safety values.

SOLUTIONS:

Solutions will vary from group to group. Remind students that there is not a right or wrong solution and that most solutions result in a compromise that meets the objectives for managing the resource. There are several possible solutions, including 1) no action which would leave the site as is; 2) reduce the volume of daily accepted waste which would increase the lifespan of the landfill; 3) bring in all refuse by rail which would prohibit any trucking of solid waste to the site; and 4) locate alternative landfill sites that are not near national parks, wilderness areas, or pristine endangered desert tortoise populations.

SOURCES:

Clarify Eagle Mountain. The Desert Sun; May 22, 1996.

Deal to help protect park. The Desert Sun; December 24, 1996.

Eagle Mountain: Round two. The Press Enterprise; August 4, 1996.

Earth day report: Residents rate valley. The Desert Sun; April 22, 1996.

Economic impact stressed in return of landfill proposal.

The Press Enterprise; June 10, 1996.

Executive summary environmental impact statement/ environmental impact report Eagle Mountain landfill and recycling project. CH2MHILL; January 1997.

Historic resource study : A history of land use in Joshua Tree National Monument.

Linda Greene. 1983. U.S. Department of the Interior, National Park Service.

Landfill critics fear for Joshua Tree. The Desert Sun; August 8, 1996.

Landfill hearings planned. Hi-Desert Star; August 3, 1996.

Landfill proposal back for hearings. The Desert Sun; August 4, 1996.

MRC, park agree on new landfill. The Desert Sun; December 21, 1996.

Parks survey finds opposition to mega-landfill. The Desert Sun; October 5, 1996.

Residents comment on landfill. Hi-Desert Star. August 8, 1996.

Report: Landfill would bring in millions. The Desert Sun; May 20, 1996.

Doug Romoli - Bureau of Land Management.

UPDATE:

Eagle Mountain Landfill has remained in the forefront as an issue at Joshua Tree National Park. The area of the landfill has changed hands and the issue is waiting several court decisions.

In 1997, the proposed dump received approval from the Riverside County Board of Supervisors. Shortly thereafter, Eagle Mountain Landfill became the subject of federal lawsuits.

The Center for Community Action and Environmental Justice (CCA EJ) and the Desert Protection Society filed a federal lawsuit in 1999 to reverse the land swap that is needed to build the landfill. In connection with federal land swaps, the General Accounting Office (GAO) states that the “program is so riddled with problems and abuses that Congress should consider banning trades altogether.” The Eagle Mountain land swap with Bureau of Land Management (BLM) conveys 3,481 acres of public land to Kaiser and the original BLM interest in the town-site for fee title (land owned only by Kaiser) for 2,846 acres of land that is in ten separate parcels that are non-contiguous along the Eagle Mountain Railroad line. Kaiser would reserve a 200 foot-wide easement across these parcels to reactivate and maintain the rail line to the landfill. The lawsuit is waiting the judge’s decision.

In August of 2000, the Los Angeles County Sanitation Districts will purchase both Eagle Mountain and another landfill for \$41 million to ship garbage from Los Angeles County. This sale will go through once all legal challenges are resolved. During the same year, Supervisor Bob Buster recommended withholding the Board of Supervisors consent for the transfer from MRC/Kaiser to Los Angeles Sanitation District until financial, environmental, enforcement and legal matters are studied further. The supervisors allowed the sale to go through by a three to two vote.

The National Park Conservation Association (NPCA), represented by the Earthjustice Legal Defense Fund, filed a lawsuit in federal district court



challenging the BLM's approval of the land exchange. This lawsuit is similar to the suit filed by the CCAEJ and Desert Protection Society. The lawsuit is waiting the judge's decision.

All litigants contend that the lawsuits will be in their favor based on a 2000 Federal Appeals Court ruling that reversed a similar land swap in Imperial County that stated the swap undervalued the land cost at \$350 per acre. The Eagle Mountain town site was sold for \$106 per acre while the 3,481 acres were sold for \$77 per acre.

A 60-day notice of intent to sue Kaiser, the BLM and other parties by the Center for Biological Diversity, Citizens for Chuckwalla Valley, Sierra Club, and Public Employees for Environmental Responsibility has been filed. They are proposing to sue based on actions taken and yet to be taken that will harm the legally protected desert tortoise and critical habitat for them.

The Citizens for the Chuckwalla Valley and the Center for Community Action and Environmental Justice have developed the "Give It Back!" campaign to return 29,775 acres in the Eagle Mountain area to Joshua Tree National Park. Originally, the land was part of Joshua Tree National Monument when it was established by presidential proclamation in 1936. The land was withdrawn in 1950 to see if it was more valuable for mining and mineral use. Part of the land was given to Kaiser for the development of the west coast steel industry. However, written in the original withdrawal of the land from the monument, it stated that the land was to revert back to the U.S for application to other public land law. The campaign wants the land returned to Joshua Tree National Park and have it designated as a National Historic Landmark for its "interpretive value, and its unique role in American culture in the creation of the steel industry on the West Coast."



Activity III: The Burros of Lake Mead

The burros which live in the vicinity of Lake Mead National Recreation Area are descendants of the Nubian and Somali wild ass, *Equus asinus*, of northeastern Africa. They were domesticated over 5,000 years ago in Africa and used as beasts of burden. Spanish explorers brought burros to North America in the 16th century. Burros proved valuable as pack animals and a means of transportation during the settlement of the southwest. Their use increased during the 1850s as prospectors searched for gold and silver. As other forms of transportation began to be used and mining declined, burro use decreased. Either through escaping from captivity or through abandonment, many burros ended up fending for themselves in the desert. They adapted quite well and multiplied quickly.

Today, there are so many burros that they are having a negative impact on the area, and National Park Service (NPS) officials are facing the dilemma of what to do with them. Some of the negative impacts of large populations of burros are soil compaction and erosion in areas of extensive trail networks, damage to vegetation by trampling and overgrazing, and pollution of water sources by burro feces and urine. If nothing is done, burro impacts will expand to other areas.

One purpose of national parks is to provide the opportunity for visitors to enjoy environments that have evolved through natural processes with minimal human impact. According to National Park Service management policies, burros are an exotic (non-native) species because they were introduced into the area as a result of deliberate or accidental action by humans.

The purpose of the Bureau of Land Management (BLM) is to provide for the multiple use and sustainability of the land for the American people. Congress passed a law which identifies the burro as a living symbol of the historic and pioneer spirit of the West. The law states that burros contribute to the diversity of life forms within the nation, enrich the lives of the American people, and are fast disappearing from the scene. This law requires the BLM to protect burros on public land managed by them. BLM managed land is adjacent to NPS managed land at Lake Mead National Recreation Area.

A group called Wild Burro Rescue, an animal protection organization, wants to assist in the design of a rescue plan for burros to prevent the sale of wild burros for slaughter or any other management plan that would result in death. The group would like to see burros monitored and managed in national parks. This would require a change in NPS policy regarding exotic species.

The Maricopa Audubon Society advocates the removal of all burros from Lake Mead National Recreation Area and adjacent Bureau of Land Management lands. This group strongly endorses all efforts to remove as many burros as possible.



Some residents of Chloride, Arizona believe that when the boundaries were drawn for Lake Mead National Recreation Area they included burros already existing in their natural habitat and that these burros should be left alone. They feel the biggest threat to the habitat is cattle who are grazing where the burros reside.

The Wild Horse Organized Assistance group would like to see burro controlling measures such as fencing and zero burro zones. Zero burro zones are defined as areas where all burros are removed to protect sensitive resources and critical habitats. The group wants to be sure the safety of the burro is considered when removal is necessary.

A group of citizens in Bullhead City, Arizona feels that all of the burros should be removed from Lake Mead National Recreation Area as they are destroying the natural beauty and habitat of native plants and animals. These citizens feel burros will not be wiped out because the Bureau of Land Management is required to maintain herds on their lands.

Arizona Desert Bighorn Sheep Society members feel that all burros should be removed from public land but realize the difficulty of keeping burros from neighboring BLM managed herds from entering portions of Lake Mead National Recreation Area. They would like to see the elimination of burros from areas where they pose a threat to natural resources or public safety and fencing of sections of the park to prevent entry by burros.



Teacher's Guide

Analysis of the Burros of Lake Mead

PROBLEM:

The degradation of land and habitats by burros in the Lake Mead National Recreation Area.

ISSUE:

Should the National Park Service totally remove the burros, establish burro-free zones, monitor and manage the burros, or abandon burro management in the Lake Mead National Recreation Area?

PLAYERS & POSITIONS:

1. The National Park Service's management policies do not recognize the burro as a native or historic species and they cause extreme resource damage. The NPS wants to stop the damage done by burros.
2. The Bureau of Land Management's management policies provide for the protection of the burro under federal law. The BLM maintains viable burro herds.
3. Wild Burro Rescue would like to see the NPS change its policies on burros or remove them in a manner that does not harm them.
4. The Maricopa Audubon Society would like to see all of the burros removed using any method necessary.
5. A group of citizens from Chloride, Arizona would like to see the burros left alone.
6. The Wild Horse Organized Assistance group would like to see the park service establish burro-free zones.
7. A group of citizens from Bullhead City, Arizona would like to see all of the burros removed from the recreation area.
8. The Arizona Desert Bighorn Sheep Society would like to see all burros removed but recognize that BLM burros frequently cross jurisdictional boundaries. They would like the establishment of zero burro zones.

BELIEFS/VALUES:

1. National Park Service personnel believe they are responsible for preserving natural resources within Lake Mead National Recreation Area. This belief is based on aesthetic, ecological, educational, environmental, legal, political, recreational, and scientific values.
2. Bureau of Land Management personnel believe in managing the land for the use of all while maintaining sustainability. They display aesthetic, ecological, economic, educational, environmental, legal, political, recreational, and scientific values.





3. The Wild Burro Rescue group believes in animal protection and the rights of the burros to live in the recreational area. Their members display environmental, and ethical/moral values.
4. Members of the Maricopa Audubon Society believe burros are not part of the natural habitat and should be removed. They display aesthetic, ecological, and environmental values.
5. The group of residents from Chloride, Arizona believes the burros were there before the recreation area was, are part of the habitat, and thus should be left alone. This group believes local ranchers want the burros out so they can graze their cattle on public lands. This group displays ecological, environmental, and ethical/moral values.
6. The Wild Horse Organized Assistance group believes the best plan includes fencing and limiting the access of burros. This group also believes during the removal process the burros' safety is of utmost importance. This group displays environmental, and ethical/moral values.
7. The group of citizens from Bullhead City believes burros are destroying the recreation area and should all be removed. These citizens display aesthetic, economic, environmental, and recreational values.
8. The Arizona Desert Bighorn Sheep Society believes burros are destroying the habitat of bighorn sheep and should be removed. They also believe that total removal is out of the question and the park should establish zero burro zones. Their beliefs might be based on aesthetic, ecological, environmental, and political values.

SOLUTIONS:

Solutions will vary from group to group. Remind students that there is not a right or wrong solution and that most solutions result in a compromise that meets the objectives for managing the resource.

SOURCES:

Draft Environmental Impact Statement For Burro Management; May 1994; Lake Mead National Recreation Area; National Park Service - U.S. Department of the Interior.

Final Environmental Impact Statement For Burro Management; February 1995; Lake Mead National Recreation Area; National Park Service - U.S. Department of the Interior.

UPDATE:

A total of 1561 burros have been removed from Lake Mead National Recreation Area since 1995 when the burro management plan was implemented.

Approximately 156 burros per year have been removed since the initiation of the plan. Before the plan approximately 90 burros were removed per year from the park. The population numbers have been brought down to a manageable size. Lake Mead's goal was to manage for a population of no more than 300 burros. Through the implementation of the burro management plan, Lake Mead has met that goal.



Activity IV: Accessibility in Mojave National Preserve

The California Desert Protection Act became law on October 31, 1994. One of the things it did was create the 1.6 million acre (647,511ha) Mojave National Preserve, located in the heart of the Mojave Desert. The primary difference between a national park and a national preserve is that activities such as hunting are allowed in national preserves but not in national parks. Both are created by an Act of Congress.

As a result of its location at the juncture of the Mojave, Great Basin, and Sonoran deserts, Mojave National Preserve includes unique ecosystems and transitional desert zones. Congress recognized this when establishing the preserve and stated “the Mojave Desert area possesses outstanding natural, cultural, historical, and recreational values meriting statutory designation and recognition as a unit of the National Park System.” The National Park Service (NPS) is charged with protecting and preserving all National Park System units for the enjoyment of current and future generations.

Another provision of the California Desert Protection Act was the creation of 3,667,020 acres (1,484,043 ha) of wilderness. There are 22 wilderness areas totaling 695,000 acres (281,267 ha) within the preserve. Most of these areas have centers within five miles (8 km) of existing roads, which makes them some of the most accessible in the nation.

According to the 1964 Wilderness Act, wilderness areas include lands that appear natural or undisturbed; offer a feeling of quiet or solitude; contain ecological, geological, or other features of scientific, scenic, or historic value; and cover at least 5,000 acres (2024 ha). In wilderness areas people are visitors who do not remain. All wilderness areas have specific restrictions which include no bicycles, hang gliders, motorized or mechanized vehicles, equipment, boats, or aircraft. NPS managed wilderness areas have specific restrictions including: no target shooting and no collecting of firewood, rocks and minerals, plants, or any other artifacts.

Motor vehicles are allowed in Mojave National Preserve as long as they travel on established roads and are “street” legal. One of the favorite routes of off-highway vehicle (OHV) enthusiasts is the Mojave Road. This road follows a route first used by American Indians and later by explorers to cross the Mojave Desert. Access is available along the entire length of the road. A newer route favored by OHV enthusiasts is the East Mojave Heritage Trail. This trail, which crosses public lands that are now Congressionally designated wilderness, has been closed to off-highway vehicles in those places where it crosses wilderness.

The California Desert Protection Act authorizes both mining and grazing in Mojave National Preserve. Mining claims in place prior to October 31, 1994, can continue if there are valid existing rights and the NPS grants approval for new plans of operation. Congress specifically stated that the number of authorized grazing permits is to remain at the October 31, 1994, level. Ranchers who want grazing permits must obtain NPS approval. Since the establishment of

the preserve, the NPS has issued grazing permits and approved mining plans of operation.

Citizens who own land in national park units are referred to as inholders. Lanfair Valley, where the majority of landowners live is located in the center of the Mojave Preserve. Legislation provides them “the right of adequate access for the reasonable use and enjoyment of their lands.” Lanfair Valley Property Owners Association members want assurance that they will have access to their land even if they must cross Congressionally designated wilderness.

National Park Service personnel are concerned about following the directives established in the California Desert Protection Act and are investigating the best ways to implement them. Besides providing for the preservation of natural resources and local ecosystems for the enjoyment of present and future generations, the NPS is directed to oversee mining and grazing, establish regulations for hunting, and ensure the rights of private landholders.

The goal of Citizens For Mojave National Park is to have the Mojave National Preserve redesignated a national park by Congress. This group was established in 1977 and has been a driving force in having the area become part of the National Park System. In the past, these citizens monitored the actions of the Bureau of Land Management. Now they continue to monitor the actions of the National Park Service. The group wants to ensure that accessibility in wilderness is limited to pack animal, horseback riding, or walking; and would like the law changed so hunting, mining, and grazing are prohibited.



The citizens group, Friends of the Mojave Road, maintain the historic route through the Mojave Desert. These citizens also developed the East Mojave Heritage Trail. While they are pleased with accessibility over the entire length of the Mojave Road, they are disappointed that those sections of the East Mojave Heritage Trail that cross wilderness have been closed.

The California Desert Coalition is an off-highway vehicle support group which is concerned about accessibility. These citizens state that in 1964 the United States Geological Survey defined five classes of road. They are: 1) primary highway, federal and state; 2) secondary highway, state and county; 3) light duty, paved or improved; 4) unimproved, unsurfaced, including track roads in desert areas designated on maps by two parallel dashes; and 5) trails or roads passable only with a 4-wheel-drive vehicle, also often called jeep trails. The Coalition states that with the establishment of wilderness areas, the last two classes of road have been done away with so that the government can create “roadless” wilderness areas. This group also states that the passage of the California Desert Protection Act was another ploy by the federal government to limit accessibility on public lands.

San Bernardino County is considering taking legal action against the BLM and the NPS to claim old, established roads as public right-of-way under the provisions of Revised Statute 2477 (R.S. 2477). This legislation was originally passed by Congress as Section 8 of the Mining Act of 1866 and states, “The right-of-way for the construction of highways over public lands, not reserved for public uses, is hereby granted.” Although R.S. 2477 was repealed in 1976,

existing rights-of-way granted by it are still valid. The intention of the law was to provide for access roads to mines, which would later become public roadways. Many counties throughout the southwest are using R.S. 2477 to claim access through designated wilderness. San Bernardino County is following this precedent and claiming public right-of-way on many old, established roads which cross sections of newly created wilderness.



Analysis of Accessibility in Mojave National Preserve

PROBLEM:

The protection of wilderness areas in the Mojave National Preserve.

ISSUE:

Should people with mining interests, grazing interests, hunting interests, recreational interests, and land ownership within the boundaries of the Mojave National Preserve continue to have access even if they must cross designated wilderness areas to do so?

PLAYERS & POSITIONS:

1. The Lanfair Valley Property Owners Association wants continued access to their property even if owners must cross wilderness.
2. The National Park Service will allow accessibility as provided for by law.
3. The Citizens for Mojave National Park want Mojave National Preserve to be redesignated a national park; strict limitations on accessibility in designated wilderness; and to change the law so that mining, grazing, and hunting would be prohibited.
4. The Friends of the Mojave Road want the East Mojave Heritage Trail to remain open along its entire route, including those sections that cross wilderness.
5. The California Desert Coalition wants all established desert roads open and disagrees with the road classification criteria used by the National Park Service.
6. San Bernardino County wants old, established roads kept open even if they cross designated wilderness.



BELIEFS/VALUES:

1. The Lanfair Valley Property Owners Association believes that because property owners were there before the NPS, they should have continued access to their property even if it means crossing designated wilderness. Its beliefs might be based on economic, legal, political, and recreational values.
2. National Park Service personnel believe they are responsible for preserving natural resources, cultural resources, and local ecosystems. They believe this includes monitoring and restricting accessibility to places within wilderness. Their beliefs might be based on aesthetic, ecological, educational, environmental, legal, political, recreational, and scientific values.

3. The Citizens for Mojave National Park group believes that the Mojave Desert is a unique place; that it should receive national park status; that wilderness areas should be accessed only by pack animal, horseback, or on foot; and that mining, grazing, and hunting should be prohibited in Mojave National Preserve. Its beliefs might be based on aesthetic, ecological, educational, environmental, legal, and political values.
4. The Friends of the Mojave Road group believes the best way to appreciate the beauty and culture of the area is to experience it. This group believes the East Mojave Heritage Trail offers this experience and wants accessibility along its entire length. They believe that the classification of established roads is unclear and needs to be defined. Their beliefs might be based on aesthetic, educational, environmental, ethical/moral, legal, recreational, and social values.
5. The California Desert Coalition group believes the federal government is deliberately limiting access to public lands by calling them wilderness. They believe that the classification of established roads is unclear and needs to be defined. Their beliefs might be based on economic, legal, political, and recreational values.
6. San Bernardino County personnel believe they have the right-of-way on old, existing roads as provided by law. Their beliefs might be based on economic, legal, and political values.



SOLUTIONS:

Solutions will vary from group to group. Remind students that there is not a right or wrong solution and that most solutions result in a compromise that meets the objectives for managing the resource.

SOURCES:

Kirsten Talken; Mojave National Preserve.

Mojave Desert Heritage and Cultural Association.

Mojave National Preserve Monitor.

Northern and Eastern Mojave Planning Team Members; Dennis Schramm and David Moore; Mojave National Preserve.

Revised Statute 2477 and Access into Designated Wilderness.

When a Road is not a Road; Don Fife and Ralph Pray; California Desert Coalition.

UPDATE:

Much of the controversy surrounding the issue of accessibility has died down over the past 10 years. Although some routes have been closed, there are 2200 miles of roads still open in the park. Many desert enthusiasts who initially thought they would no longer be able to drive to their favorite areas have discovered that most popular routes are open.

Two changes have limited traditional access. In the past, ATVs (quads) and dirt bikes were allowed on “open routes.” Now, only licensed, street legal vehicles are allowed on these roads. The second change is in the level of enforcement. When the area was managed by the BLM, driving off of established routes was prohibited; however, there were too few rangers to effectively enforce the rule. The NPS has aggressively enforced the rule, especially in the northwest corner of the park where it is most often ignored.

Wilderness boundaries were developed so that Lanfair Valley Property Owners would have access to their lands. Their concern has been resolved.

Citizens for Mojave National Park continued to play a watchdog role regarding management of Mojave until they disbanded in 2003.

The citizens group Friends of the Mojave Road is still active, although their focus has broadened, and they are developing a museum and archive.

The off-highway vehicle support group, California Desert Coalition, is not currently active on issues pertaining to Mojave National Preserve.

The RS 2477 issue, in which some western county governments have attempted to assert right-of way-claims to existing dirt roads and routes, is inactive at this time, although it has the potential to resurface. In 1995, Congress froze rule-making action on the part of the Bureau of Land Management, the agency responsible for evaluating claims.



Unit VII: What Can We Do?

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WHAT CAN WE DO?

Before you begin with the environmental action project, it is important to understand the difference between an environmentalist and an environmental educator. An environmentalist advocates a position concerning an environmental issue. On the other hand, an environmental educator uses information and educational processes to help people analyze differing points of view usually present in an environmental issue so they can arrive at their own solution. Environmental educators should be “value-free” when enabling others in the decision-making process. Thus, when you are assisting students in examining all points of view you need to be an environmental educator and not share your own values and decisions on the issue.

Making a Difference

Now that your students have categorized players and positions, beliefs and values, and arrived at possible solutions for a Mojave Desert Issue, they are ready to decide if they want to utilize their skills in deciding on possible actions they could take. It is important to let your students know they really can make a difference. There are many action stories where groups of students have made a difference. Sharing one of these true stories might help students realize they too can make a difference.

One action story involves a group of students at a Needles, California elementary school who adopted the desert tortoise. After a period of in-depth research, they became “Tortoise Talkers” and took their message to other schools, school board meetings, and community gatherings. They made posters, submitted articles to the local newspaper, made a video, and raised funds through aluminum can drives and selling T-shirts. In a proposal which they presented to the Bureau of Land Management, they suggested the development of an open-use area for off-highway vehicles so these vehicles would not damage the tortoises’ habitat.

Another action story involved a group of students at a Barstow, California elementary school who learned about local desert flora and fauna. As a result, they decided to plant an outdoor area for viewing desert plants at their school. After receiving a small grant from a local service organization, the students planted a “desert garden” which they proudly display to others.

If these local elementary schools can make a difference, imagine what a high school class can do. A group in New Orleans, Louisiana started an oil recycling program to help prevent water pollution. Another group in Miami, Florida developed a butterfly garden, a pond, an organic vegetable garden, and planted over 1,000 plants and shrubs at various locations throughout their school. Still another group in Spokane, Washington took an undeveloped park and turned it into a wildlife field study area. Your students’ actions can make a difference and create a true success story too.



Unit VII
What Can We Do?

Action Approaches

Even though each action project is unique, the majority fall into one or more of the following categories: the educate and inform approach, the persuasive approach, the economic approach, the hands-on or ecomanagement approach, and the political action approach.

Educate and inform projects focus on teaching others about an issue. This can be accomplished through any method of communication such as plays, songs, or workshops. Convincing others to support your course of action can be accomplished through creating posters, conducting debates, or writing letters to the editor of the local newspaper. Strategies that encourage consumers to shop with the environment in mind or to raise funds to support a specific organization that focuses on your issue are examples of the economic approach. Projects that physically improve the environment, such as planting trees, landscaping school grounds, or cleaning up the local neighborhood are examples of the ecomanagement approach. Contacting local lawmakers through letter writing or attending public meetings are examples of the political action approach.

Steps to Action

The first step is to find an issue. Your students might use one of the four major issues addressed in this guide. If they do not choose one of the issues in this curriculum guide, the next step involves creating a list of possibilities and narrowing the choice. This is accomplished through brainstorming sessions to list issues and researching possible issues that are currently in the news. Be sure to use an issue from the Mojave Desert. One of the best ways to find an issue is to have students collect information from newspapers, magazines, local interest groups, or anywhere else. Remind students that action projects do not need to address something that is widely perceived as an issue.

Students should think about projects they might find interesting, and how much time they have. They will need to consider questions like: Is the project very complicated? Will we have access to information and resources? Will the project require a lot of outside help? Once they have addressed these issues they should be ready to make their choices.

The next step involves learning everything about the issue of choice. Allow students enough time to research not only the issue, but everything related to it. This is best accomplished by assigning tasks to cooperative learning groups. Once this is completed, organize presentations and class discussions that allow students to analyze players and positions, beliefs and values, and possible solutions.

Next, guide the students into creating an action plan by having them decide on a desired solution. Remind students they should understand all sides of an issue before deciding on a strategy. Once the action plan is completed, guide students into developing specific actions and a possible timeline. Reviewing the chart “Some Action Methods to Consider” (Table 1) may help in deciding on possible actions. Clearly list the tasks that need to be accomplished in order to meet each objective.



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Assist students in understanding how people, organizations, businesses, and government can work together to solve environmental problems by reviewing the Action Matrix (Table 2). Once this is completed, help students evaluate the impact of their own activities related to their selected environmental action project by completing Activity I: The Action Matrix.

Now it is time for action. Remind students to keep careful records of what they have done, when they did it, who they contacted, and so on. They also need to keep track of who is doing what so that efforts are not duplicated. They will need to periodically access the project to see where they are and if they are on track. Having to rethink or change a desired solution and objectives may be necessary. Successes, no matter how small, should be publicized. It is very important that every student realize that all tasks, no matter how trivial they seem, are important and that any tasks which are done inadequately can impact the entire project.



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Table 1 Some Action Methods to Consider

Write Letters

- to gain information
- to identify a problem that requires a solution
- to request help from an agency, organization, or business
- to thank people for their support of an issue

Interview by telephone or in person

- to gather information, both facts and opinions
- to ask someone to assist you

Conduct a survey

- to collect opinions
- to collect facts from people
- to make people aware of a problem
- to find out who will support or oppose an action

Write petitions

- to find out how many people would sign in support
- to obtain written support

Obtain a proclamation

- to garner recognition from a mayor, city council, or governor for your efforts
- to alert others to a special event you are holding

Serve on a community committee

- to gain student representation

Educate others

- prepare a flyer that can be mailed or student delivered throughout the community
- prepare a play that can be given to other students
- prepare a display for a local mall

Get media coverage

- contact local radio stations, television stations, and newspapers
- prepare and send news releases to media
- create public service announcements (PSAs)
- hold a press conference

Do fund raising

- sell products or commercially prepared food
- have a yard sale
- hold a dance, fair, or carwash
- ask for cash donations from local businesses
- ask for in-kind donations of time and materials
- apply for a grant from the government or a corporation

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As the action project draws to a close, it is time to begin assessing it. This is an excellent time to have students evaluate the success of the project and to evaluate feelings about their involvement. Activity II: Discussion Questions for Assessing Projects is designed to help them with this process. Students should analyze any long-term impact their project could have by looking at the action matrix again. A group discussion that allows students to reflect upon their feelings is the best place to begin this process.

How to Use the Action Matrix

The action matrix is a helpful tool for students trying to predict the possible impacts of their actions. Possible uses of the matrix include the following:

Filling in the Cells: The exercise of completing the matrix can give students a sense of diversity of possible actions.

Developing an Action Strategy: Students can use this matrix to plan their approach to an issue, and to help decide which problem-solvers they want to influence.

Mapping Specific Cases: Students can dissect an approach into its specific actions and demonstrate that environmental issues are not solved by one action or one party. Most environmental successes are a combination of small steps that build on each other.

Analyzing the Dynamics of Action: In their action plan, students may discover gaps. In evaluating their efforts, they can also discuss potential barriers in the way of a project, and can keep referring to the matrix both during and after a project.

The vertical axis lists categories of people and organizations with the potential to “solve” environmental issues. Since these parties do not usually take action on their own, but are prompted by the actions of “motivators,” the horizontal axis lists the same players in that role. The matrix is then filled with examples of actions taken by motivators to prompt responses from problem-solvers. For example, “students write letters to a business” could be an entry at the intersection of individual motivators and business (cell 13). If the students’ letters were encouraged by an environmental organization’s newsletter, that action would be reflected in the entry, “provide information,” at the intersection of environmental organization motivators and individual problem-solvers (cell 2). The categories listed as motivators and problem-solvers could be different from those presently listed to better reflect the nature of the problems your students are tackling.

Adapted with permission from Martha C. Monroe, first published in *Setting the Environmental Education Agenda for the 90s* (pages 141-147) by the North American Association for Environmental Education, 1990.



Unit VII *What Can We Do?*

Table 2 The Action Matrix

		MOTIVATORS ²			
PROBLEM SOLVERS ¹	Individual	Environmental Organization	Government	Business	
Individual	1 Educate yourself Change lifestyle Write letters to the newspaper Teach and talk to others	2 Provide information Persuade Advertise Create educational materials	3 Regulate Tax Provide incentives Provide information Create educational materials	4 Provide jobs Advertise Make and limit options Create educational materials	
Environmental Organization	5 Join group Write letters Give money Elect leaders Become a leader Influence group's agenda	6 Build coalitions Persuade people Inform people Create networks	7 Research Lobby Regulate Give grants Obtain tax status	8 Research Give donations and grants Provide jobs Give endorsements	
Government	9 Vote Write letters to a legislator Run for office Raise funds Speak at public hearings	10 Research Monitor Lobby Bring lawsuits Endorse Speak at public hearings	11 Make appointments Give grants Charge fees Provide checks and balances Implement regulations	12 Provide jobs File lawsuits Lobby Give money Advertise Operate as a PAC ³	
Business	13 Buy product Boycott product Write letters Buy stock Invest Report violations Draw media attention	14 Collect data Survey File lawsuit Lead boycott Create incentives Provide information Monitor	15 Create incentives File lawsuit Fine Regulate License Contract Zone	16 Compete with price Compete with quality File lawsuit Advertise Share technology Cooperate	

¹**Problem-Solvers:** People and organizations who can take action to solve environmental problems and who are prompted by the actions of motivators.

²**Motivators:** People and organizations whose actions motivate problem-solvers.

³**PAC:** Political action committee.

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Teacher's Guide

Lesson: Taking Action

- Objectives:**
1. Students will develop and implement an action plan for a Mojave Desert issue.
 2. Students will assess and evaluate their action project.

- Materials:**
- Table 1: Some Action Methods to Consider (optional as overhead or duplicate for students)
- Table 2: The Action Matrix (make overhead and/or duplicate for students)
- Activity I: The Action Matrix (duplicate for students)
- Activity II: Discussion Questions for Assessing Projects (duplicate for students)
- Unit 7 background information
- student journals.

- Subjects:** social sciences, language arts, science, art, math

- Skills:** analyzing, interpreting, categorizing, predicting, and writing

- Method:**
1. Ask students to brainstorm a list of possible Mojave Desert issues. Then ask them to seek out other local issues by reading the newspaper or watching local news stories.
 2. After reviewing possible issues, ask students if they would like to select an issue to develop a strategy to contribute toward the solution. (Now would be a good time to share some true action stories so that the students can see that their actions could make a difference!) If the answer is yes, you are ready to proceed.
 3. Use the Steps to Action section of the background information to assist students in developing and implementing a class action plan for a Mojave Desert issue. It is best to have the entire class focus on one issue. Be sure students learn about all the players, positions, beliefs, and values before selecting a solution for action.
 4. Guide the students in selecting one or more solution strategies based on the length of time available. You may find the list provided as Table 1 Some Action Methods to Consider to be helpful in selecting strategies that can be completed within your time frame.

5. Guide students in understanding the Action Matrix (Table 2) as a way to see how people, organizations, businesses, and government can work together to solve environmental problems.
6. Have students complete Activity I: the Action Matrix. This will help them evaluate options, develop action strategies, and analyze the dynamics of action for their own project.
7. Once students have completed the Action Matrix, it is time to implement the plan. Be sure to keep students on task throughout the process.
8. As the project draws to a close have students participate in Activity II: Discussion Questions for Assessing Projects. This should be done in cooperative groups of three to four students. Each group should share its findings with the class. Use group findings to compile a class assessment.
9. Once the assessment has been completed have students prepare journal entries which reflect upon the entire experience.

- Time*
- Considerations:*
1. background information: 5 – 10 minutes
 2. development of action plan: 20 – 30 minutes
 3. Activity I: 10 – 20 minutes
 4. implementation of action plan: 2 – 8 weeks (or longer)
 5. Activity II: 20 – 30 minutes
 6. journaling: 10 – 15 minutes



Activity I: The Action Matrix

Use this matrix to evaluate your proposed strategy for taking action. If necessary, change the categories under motivators and problem-solvers to fit your action strategy.

		MOTIVATORS ²			
PROBLEM SOLVERS ¹	Individual	Environmental Organization	Government	Business	
Individual	1	2	3	4	
Environmental Organization	5	6	7	8	
Government	9	10	11	12	
Business	13	14	15	16	



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Activity II: Discussion Questions for Assessing Projects

1. What did you want to accomplish?
2. What did your project accomplish? Explain. (Be sure to describe the project's accomplishments, even if they were not all part of the original objectives.)
3. What was the most successful part of your project? What was the least successful part?
4. Who was influenced or motivated by your actions? Who might those people, in turn, now influence? What would you like to see them do?
5. If you repeated the project, what, if anything, would you do differently and why?
6. How did you feel when you worked with others?
7. Have your feelings and opinions about the issue you worked on changed since you began the project? If so, how?
8. What are your new strengths or talents that you'll be able to apply to other situations that you would like to change?
9. What advice would you give to other students who are planning an action project?
10. Would you get involved in another environmental action project? Why or why not?



R E F E R E N C E S

- Bates, R. A., & Jackson, J. A. (Eds.). (1980). *Glossary of Geology*. Falls Church, VA: American Geological Institute.
- California Department of Education. (1993). *California Endangered Species Resource Guide*. Sacramento, CA: Author.
- Deal, K. (1987). *Cultural Resource Management Plan for Death Valley National Monument*. Tucson, AZ: National Park Service Conservation Center.
- Dilsaver, L. M. (Ed.). (1994). *America's National Park System: The Critical Documents*. Lanham, MD: Rowman & Littlefield Publishers, Inc.
- Fiero, B. (1986). *Geology of the Great Basin*. Reno, NV: University of Nevada Press.
- Gossard, G., Peterson, C., Savage, D. (1994). *Mojave Desert Discovery*. Twentynine Palms, CA: National Park Service.
- Gossard, G. H. (1992). *The Joshua Tree*. Tehachapi, CA: Yellow Rose Publishers.
- Greene, L. W. (1983). *Historic Resource Study: A History of Land Use in Joshua Tree National Monument*. Denver: National Park Service Center.
- Hunt, C. B. (1975). *Death Valley: Geology, Ecology, Archaeology*. Los Angeles: University of California Press.
- Kaufman, D. G. & Franz, C. M. (1993). *Biosphere 2000: Protecting our Global Environment*. New York: Harper-Collins College Publishers.
- Larson, P. (1977). *A Sierra Club Naturalist's Guide to the Deserts of the Southwest*. San Francisco: Sierra Club Books.
- Luzader, J. (1980). *Historic Resources Study: Lake Mead National Recreation Area*. Denver: National Park Service Center.
- McKnight, T. L. (1993). *Physical Geography: A Landscape Appreciation*. Englewood Cliffs, NJ: Prentice Hall, Inc.
- Muhn, J. & Stuart, H. R. (1988). *Opportunity and Challenge: The Story of the BLM*. Washington, D.C.: U.S. Government Printing Office.
- Norris, R. & Webb, R. (1990). *Geology of California*. New York: John Wiley and Sons, Inc.
- Pinto, D. G. (1989). *The Archeology of Mitchell Caverns*. Sacramento, CA: California Department of Parks and Recreation.
- Rae, C. (1989). *East Mojave Desert: A visitor's guide*. Santa Barbara, CA: Olympus Press.

- Reisner, M. (1986). *Cadillac Desert*. New York: Viking Press.
- Schad, J. (1988). *California Deserts*. Helena, MT: Falcon Press Publishing.
- Sharp, R. P. & Glazner, A. F. (1993). *Geology Underfoot in Southern California*. Missoula, MT: Mountain Press Publishing Company.
- Stewart, J. H. (1980). *Geology of Nevada*. Reno, NV: Nevada Bureau of Mines.
- Thelander, C. G. (1994). *Life on the Edge*. Santa Cruz, CA: Biosystems Books.