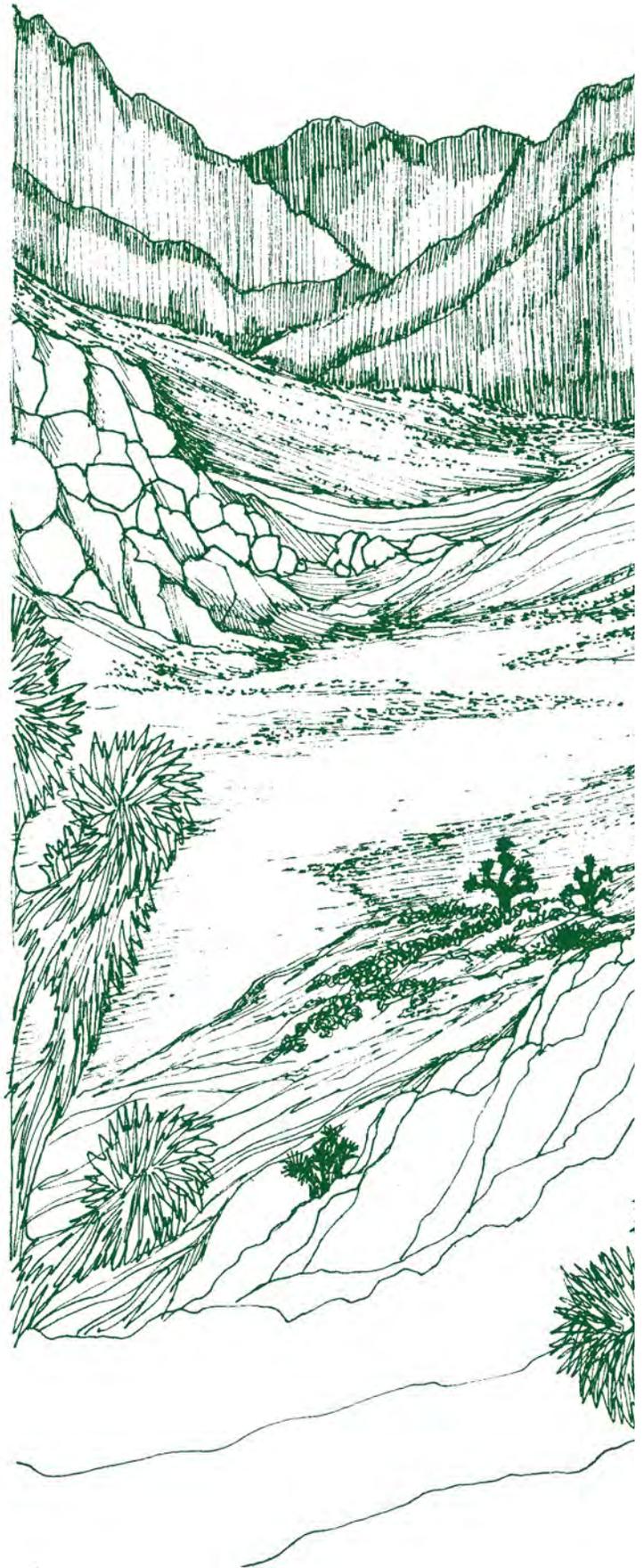
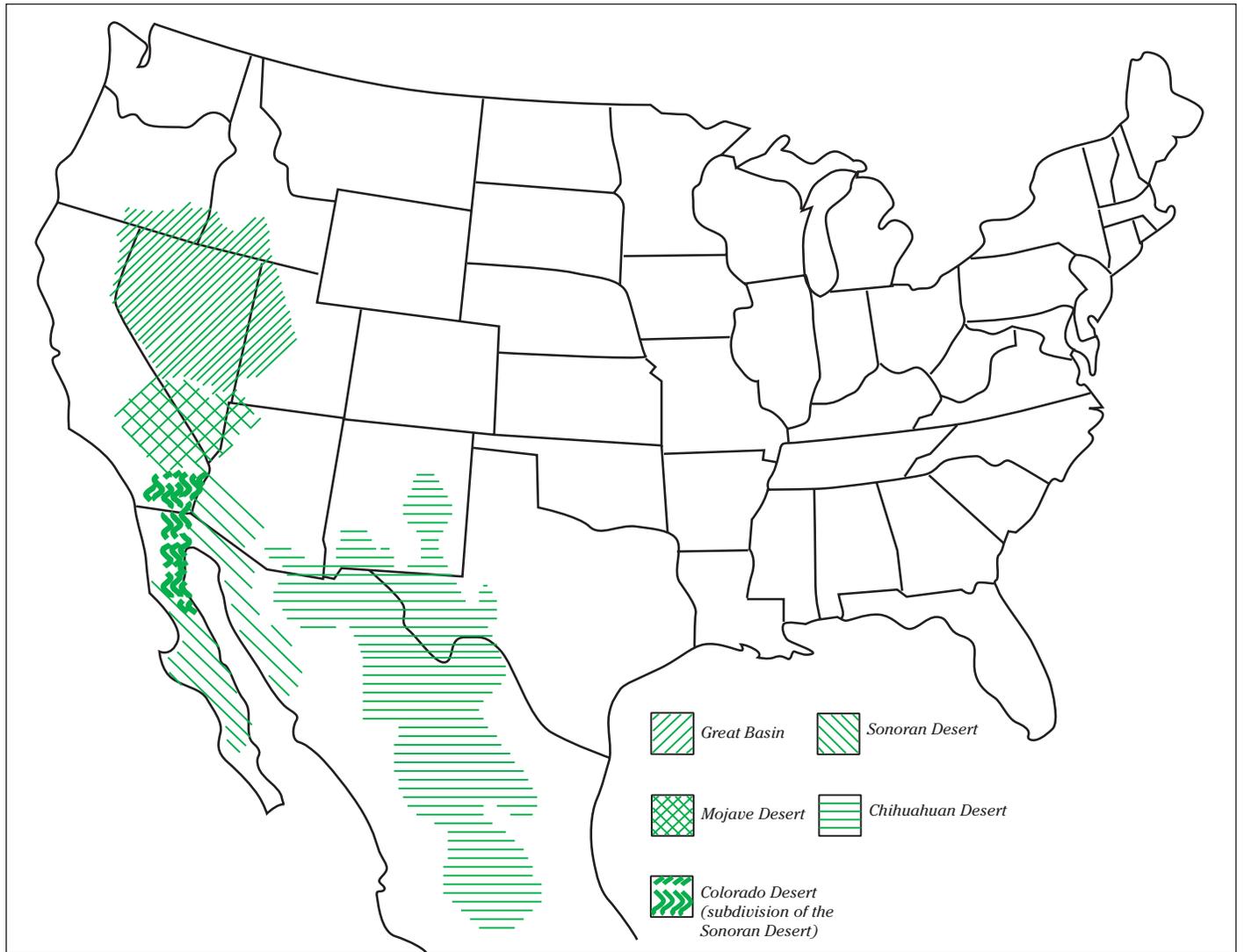


DESERTS

Never-ending sand dunes. Scorching temperatures. Vultures circling over the remains of an unlucky traveler. These are images the word “desert” brings to mind for many people. December and January trigger phone calls to desert parks from potential visitors hoping to escape the chill of winter. They are amazed to hear of nighttime temperatures below freezing. Snow in the desert is an impossibility to them. Isn't the desert always hot and dry?



DESERTS



What Is A Desert Anyway?

Check five sources and you will probably find five, slightly different definitions. Some sources define a desert as an area receiving no more than ten inches of precipitation annually. However, many areas receiving this amount of *precipitation* are not deserts. This simple definition is not complete.

Both the timing and type of precipitation determine the environment established. In a desert, rain isn't evenly

distributed throughout the year. Weather patterns often create short, violent downpours. Flash floods, characteristic of some desert areas, are produced. Much of the water runs off before it can soak into the soil.

A lot of moisture is also lost to evaporation. Many deserts lie in areas of high pressure systems where there is little cloud cover. At least 90% of the sun's rays reach Earth, producing seasonal hot temperatures. (For comparison, the surface of more humid lands, covered with more vegetation,

receives only 40% of possible solar radiation.) The hot, dry air causes any available water to evaporate quickly. When temperatures are extremely hot, rain can evaporate before it reaches Earth.

The conditions producing high daytime temperatures reverse the process after sundown. Approximately 90% of the day's accumulated heat radiates back toward the sky. In moister climates only about 50% of this heat is lost. These conditions produce the wide range of daily temperatures

characteristic of deserts. This range is often fifty degrees or more.

The rapid heating and cooling of air create another characteristic of most deserts — strong winds. These winds, circulating air which is often hot and dry, increase the already high rate of evaporation. Evaporation in American deserts ranges from 70" – 160" per year.

A desert then is not so easily defined. All these characteristics — seasonal, high temperatures; low, sporadic rainfall; a high rate of evaporation; wide temperature ranges; strong winds — are part of the definition.

Where Are The Deserts?

Draw a line around the world, starting mid-center between Joshua Tree and Death Valley, and you will touch or come close to many of the world's great deserts — Mojave, Great Basin, Sahara, Arabian, Iranian, Gobi. Most deserts occur between the latitudes of 15° – 40° on either side of the equator. They are found around the world on every continent, covering approximately 20% of the Earth's land area.

Sand dunes cover only about 10% of this area. Some deserts are very mountainous. Most are hot, with warm daytime temperatures much of the year, but others are cold, getting over half their moisture from snow.

Why Are Deserts Where They Are?

Deserts can be divided into four types — subtropical, coastal, interior, rain shadow — depending on the conditions creating them.

Subtropical deserts lie along the Tropic of Cancer (23°N latitude) and the Tropic of Capricorn (23°S latitude). Near the equator hot, moist air rises.

It cools, dropping heavy rains on tropical areas. The resulting cooler, drier air then descends, creating zones of high atmospheric pressure as it moves away from the equator. The descending air hinders cloud formation and precipitation. It also warms up, absorbing any available moisture. The Sahara, the world's largest hot desert, is a subtropical desert about the size of the United States.

Coastal deserts are also in areas of high pressure. Damp, chilly fog forms when air, chilled by water contact as it blows toward shore, meets warm air over land. Although humidity is high, atmospheric disturbances that can cause rainfall are not present. Two coastal deserts, the Atacama of Chile and the Namib in southern Africa, are among the driest places in the world.

Interior deserts, like the Gobi, exist because they are too far from moisture-laden, ocean winds. By the time these winds reach the center of a large landmass, the air is very dry.

Rain shadow deserts are created when mountain ranges lie parallel to moist, coastal areas. Prevailing winds moving inland cool as air is forced to rise over the mountains. Carried moisture falls on slopes facing the winds. When the winds move over the crest and down the far side, they are very dry. Descending air also makes it hard for additional clouds and precipitation to form. Without another source of moisture, rain shadow deserts are formed on the far side of these mountain ranges (see Discovery Activity Page #1).

The Mojave Desert

The Mojave Desert is a rain shadow desert. It is defined by a combination of latitude, elevation, geology, and indicator plants. It is situated between the Great Basin Desert to the north and the Sonoran to

GLOSSARY

endemic — belonging exclusively or confined to a particular place.

environment — all those factors, both living and non-living, which make up the surroundings of an organism.

evaporation — the process by which water changes into vapor.

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

gneiss — a *metamorphic* rock where intense pressures and temperatures have caused minerals to segregate giving the rock a banded appearance.

groundwater — water stored beneath the surface of the ground, coming from *precipitation* and surface water that has percolated down.

metamorphic — changed by great pressure, stress, and/or chemical changes, usually at depth in the crust, from pre-existing rocks.

native — a plant or animal that evolved or was transported to an area through natural means.

Precambrian — all geologic time prior to the Paleozoic Era (prior to 570 million years ago).

precipitation — water received on the Earth directly from clouds as rain, hail, sleet, or snow.

the south (mainly between 34° – 38°N latitudes). Elevations are generally between three and six thousand feet, although Death Valley National Park includes both 11,049-foot Telescope Peak and the lowest point in the United States, at Badwater, 282 feet below sea level.

Temperatures are a function of both latitude and altitude. Although the Mojave Desert has the lowest absolute

DESERTS

elevation and the highest maximum temperature (134°F in Death Valley), it is north of the Sonoran Desert and its average elevations are higher. As a result, its average temperatures are lower than those of the Sonoran.

The Mojave Desert is in what some geographers call the Basin and Range Province, a landscape of alternating mountain ranges and their adjacent basins. Common rock substrates include *Precambrian gneisses* and granites. Slopes are often composed of *metamorphic rocks*, such as gneisses.

Mojave Desert vegetation is dominated by low, widely spaced shrubs. Vegetation in the desert's northern half closely resembles that of the Great Basin Desert, as that in the southern half does the Sonoran. However, nearly one quarter of all Mojave Desert plants are *endemics*. Synonymous with the Mojave Desert is the Joshua tree. Other endemics are Parry saltbush and Mojave sage. A more widely distributed plant, the creosote bush, dominates much of the land surface, often in close association with species of bur-sage.

Creating Desert Wastelands

Deserts are growing by an estimated fifteen million acres a year. But this desert growth is not reason for desert lovers to celebrate. These desert lands are being created through desertification, the process in which land supporting life is transformed into land supporting very little or no life at all.

Probably the main cause of desertification in the United States is overgrazing. Unlike *native* desert animals, livestock can strip land of most of its cover. Before natural vegetation can grow back, soils erode, leaving the area unable to support most of the life that once lived there.

As technology has improved, making

more water available for irrigation, farming in desert areas has increased. This, along with human population growth and its water demands, has depleted *groundwater* supplies faster than they can replenish themselves. In some cases, desert plant and animal communities can no longer be supported.

As the popularity of driving off-road vehicles across the desert increases, so does the damage done to plants and fragile desert soils. Deserts are mined for copper, silver, gold, and other minerals, leaving tremendous scars on the land.

Many people seem to have a desert wasteland mentality. They view deserts as lifeless, valueless areas. Resource destruction, that might concern them if done elsewhere, may not bother them when desert areas are the victims. Desert education is necessary to increase appreciation of these biologically and aesthetically rich lands.

Activity 1 Desert Puzzler

OBJECTIVES: Explain the creation of a rain shadow desert. Name one desert created this way.

MATERIALS: Discovery Activity Page #1, graph paper, poster board, puzzle made from an enlargement of Discovery Activity Page #1.

SUBJECT: Science.

SKILLS: Analysis, problem solving.

METHOD: Atmospheric and geophysical conditions work together to create deserts where they are. Understanding the rain shadow effect will help explain to your group how the Mojave Desert was formed. To the west of the Mojave Desert lie the San Gabriel, San Bernardino, and San Jacinto mountain ranges, running parallel to the Pacific

Coast. These mountain ranges create the rain shadow effect described in the introduction to this unit.

1. Enlarge the rain shadow diagram on the activity page on a piece of poster board. Cut it into pieces to create a puzzle. If you have a large group, you may want to make more than one puzzle. Laminating or covering the pieces with clear contact paper will extend their life.

2. Give a copy of the activity page to each student. Use the diagram to explain rain shadow deserts.

3. Leaving their activity pages behind, have students stand in a circle, surrounding the area where the puzzle will be assembled. Give puzzle pieces to members in your group. Ask participants to step in one at a time. Each may either attempt to place the puzzle piece in the right location or move a piece already placed. After the puzzle is completed, have a volunteer explain how the rain shadow effect creates dry areas.

EXTENDING THE EXPERIENCE:

Contact areas on both sides of the mountain ranges and in the mountains to collect rainfall totals for the past three years (such as Los Angeles, Big Bear, and Joshua Tree and Death Valley national parks in California; and Las Vegas and Lake Mead National Recreation Area in Nevada). Graph the data and discuss.

Activity 2 Sun And Water

OBJECTIVES: On a monthly basis, compare average maximum temperatures and rainfall of a desert park with those of a park in a different climate. Plot given data to make graphs.

MATERIALS: Discovery Activity Pages #2 and #3, map of the United States, pencils and colored pencils or crayons.

SKILLS: Comparison, computation, inference.

SUBJECTS: Math, science.

METHOD: Graphs are a way of making data come alive visually. Your group can learn more about desert climates by using graphs to compare temperatures and rainfall in desert parks with those of parks in other areas.

1. Pass out copies of the activity pages. Discuss what is meant by “average high temperature” and “average monthly rainfall.” Find each park’s location on a United States map. If anyone has been to one of the parks ask for a brief description. Try to find pictures of each park in books or other reference materials.

2. Have students select one Mojave Desert park and one non-desert park for the graphing activities. Using the grid for Average Daily High Temperatures and a colored pencil or crayon, write in the name of the desert park chosen and plot its temperature data. Mark each month’s average high with a dot, and then connect the dots with a red line. Using black, do the same for the non-desert park.

3. Do the same for average monthly rainfalls, using a bar graph format on the grids provided. Fill in the name of the park chosen on each grid.

4. When the graphs are completed, ask the following questions: In which month is there the greatest difference in average daily high temperatures between the two parks chosen? During which months does the group think most people visit the two parks? Explain the choices. What is the average total yearly rainfall for the parks? How can it be helpful to have records of average temperatures and rainfall?

EXTENDING THE EXPERIENCE: Check for temperature and rainfall

averages for your own area. Local newspapers can be a good source of information. How does your area compare with those listed? Get these statistics for other desert areas of the world. A good source of information is a reference book found in many libraries — *The Weather Almanac*, edited by James A. Ruffner and Frank E. Bair.

Activity 3 Where And What Are Deserts?

OBJECTIVES: Name two deserts in the world. Describe how they are alike and/or different.

MATERIALS: Discovery Activity Pages #4 and #5, desert pictures or postcards, file cards, map of the world, scissors, yarn.

SUBJECTS: Language arts, science, social studies.

SKILLS: Comparison, description, discussion, drawing, listing, mapping, writing.

METHOD: Deserts exist all over the world. Although most share some characteristics, they also have some surprising differences. In this activity, your group will locate the deserts of the world and discuss their characteristics.

1. Brainstorm to create a list of words your group associates with deserts. Pass out copies of the activity pages. Referring to a map of the world posted on a bulletin board, locate the deserts. Place file cards with the deserts’ names around the map’s perimeter. Identify each with a piece of yarn running from its map location to the card listing its name.

2. Collect pictures of as many deserts as possible. Postcards are a good source. Put them next to the deserts’ names. If a

photo is found that cannot be cut out to display, have a student make a drawing of it.

3. Discuss the facts given about each desert. Help the group come up with three adjectives describing each desert, using “hot” or “cold” plus two more words. List these on file cards under each desert’s name.

4. Go back to the words the group first listed. See how many of these match the adjectives under each desert’s name. You can use this as a discussion starter for the activity about people’s desert perceptions found in the Extending the Experience section.

5. Based on what the group now knows, come up with a list of characteristics most deserts share. Post this as part of your bulletin board display.

6. Two deserts are numbered on the deserts map, but are not on the deserts chart. Challenge your students to find these deserts’ names and facts about them. Have them write this information on the back of Discovery Activity Page #4. (20: Monte, 21: Thar)

EXTENDING THE EXPERIENCE:

Following this activity are quotes about deserts from a variety of sources. Read these quotes to your students, discussing the range of feelings displayed. If your group does not live in a desert area, ask them about their desert perceptions. If you do live in the desert, ask non-natives of the area if they remember any perceptions they once had about deserts. If available, read *Gila Monsters Meet You at the Airport* (see listing in the resources unit).

Try to find a class in a different climate area with whom to correspond. Ask members of this class to describe their ideas of what deserts are like. If some of their perceptions are wrong, share correct desert information with them. At the same time, ask your group

DESERTS

to share perceptions of the other class' geographic area.

Activity 4 Roadrunners And Lizards

OBJECTIVES: List two true statements about deserts.

MATERIALS: Playing field.

SUBJECTS: Language arts, physical education.

SKILLS: Listening, psychomotor skills.

METHOD:

1. Write statements about deserts, some true and some false.
2. Divide your group into two equal teams, the Roadrunners and the Lizards.
3. Line up the two teams facing each other, about two feet apart.
4. About fifteen feet behind each team, draw a home base line.
5. Read a statement. If the statement is true, the Roadrunners chase the Lizards, trying to tag them before they reach their home base line. If the statement is false, the Lizards chase the Roadrunners. Anyone caught must join the other team.
6. Continue playing until all statements are read.

Fun Facts — DESERT QUOTES

“It remained as a symbol of thirst and death, infested with horror, repelling all who viewed it from afar on the surrounding mountains. At a casual glance, nothing seemed to live here except the few plants which had clawed deep into the earth, defying wind and heat alike, . . . to store up some vestige of sustenance for their long vigils in the midst of almost total aridity. But this was deceptive. The desert nurtured a whole world of living things of its own.”

Edward Maddin Ainsworth

Beckoning Desert, 1962

“The pale moon, occasionally overshadowed by clouds, threw a ghostly light over the desert, and skeletons of animals glistening in her beams, strewed the way, adding horror to the scene.”

Gwinn Harris Heap

Journal of the Expedition of E.F. Beale, from Missouri to California, in 1853

“The popular conception is that a desert is all sand, — barren, desolate, unfruitful, shifting sands, where the heat is frightful and where nothing can live save horrid toads, lizards, snakes, chuckwallas, and gila monsters.

“To most people the . . . desert is not only a place devoid of interest, but absolutely to be shunned, feared, dreaded. If they must journey across it, they do so as hastily as possible in the fastest train, surrounded by all the luxuries modern travel can give; the blinds of the car drawn down if the journey is made by day, and with a sigh of relief and thankfulness if it is made by night.

“But in the material sense the . . . desert is a place of fascination and surprises.

On every hand are strange, wonderful, and beautiful things, — things that are unknown to cities and to the unobservant anywhere.”

George Wharton James

The Wonders of the Colorado Desert, Vol. I, 1906

“The desert is the opposite of all that we naturally find pleasing. Yet I believe that its hold upon those who have once fallen under its spell is deeper and more enduring than is the charm of forest or sea or mountain.”

J. Smeaton Chase

California Desert Trails, 1919

“This is the most beautiful place on Earth.”

Edward Abbey

Desert Solitaire, 1968

Fun Facts — DESERT QUOTES

“We are struck by the appearance of Yucca trees (Joshua trees), which give a strange and southern character to the country and suited well with the dry and desert region we were approaching. Associated with the idea of barren sands, their stiff and ungraceful forms make them to the traveller the most repulsive tree in the vegetable kingdom.”

Captain John Fremont

A Report on the Exploring Expedition to Oregon and North California, in the Years 1843–44

“The most conspicuous form of plant life on the Mojave Desert is a yucca known as the Joshua tree, a weird, fantastic form growing to a height of about twenty feet, with long stiff bristling green daggers all over its limbs in lieu of leaves, and with its branches bent and twisted into strange shapes. In patches of the desert this plant grows in sufficient profusion to form one of those paradoxes in which the region abounds — a desert forest, and a dreary, unearthly forest it is.”

Charles Keeler

Southern California, 1899

“It is stern, harsh, and at first repellent. But what tongue shall tell the majesty of it, the eternal strength of it, the poetry of its widespread chaos, the sublimity of its lonely desolation? And who shall paint the splendor of its light; and from the rising up of the sun to the going down of the moon over the Iron Mountains, the glory of its wondrous coloring?”

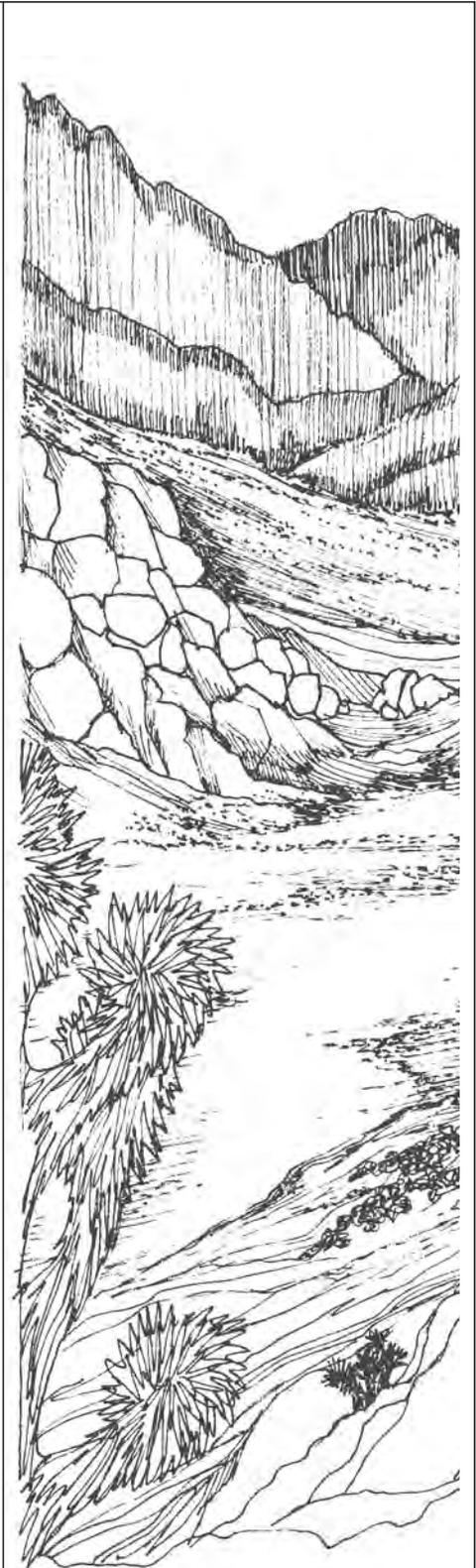
John C. Van Dyke

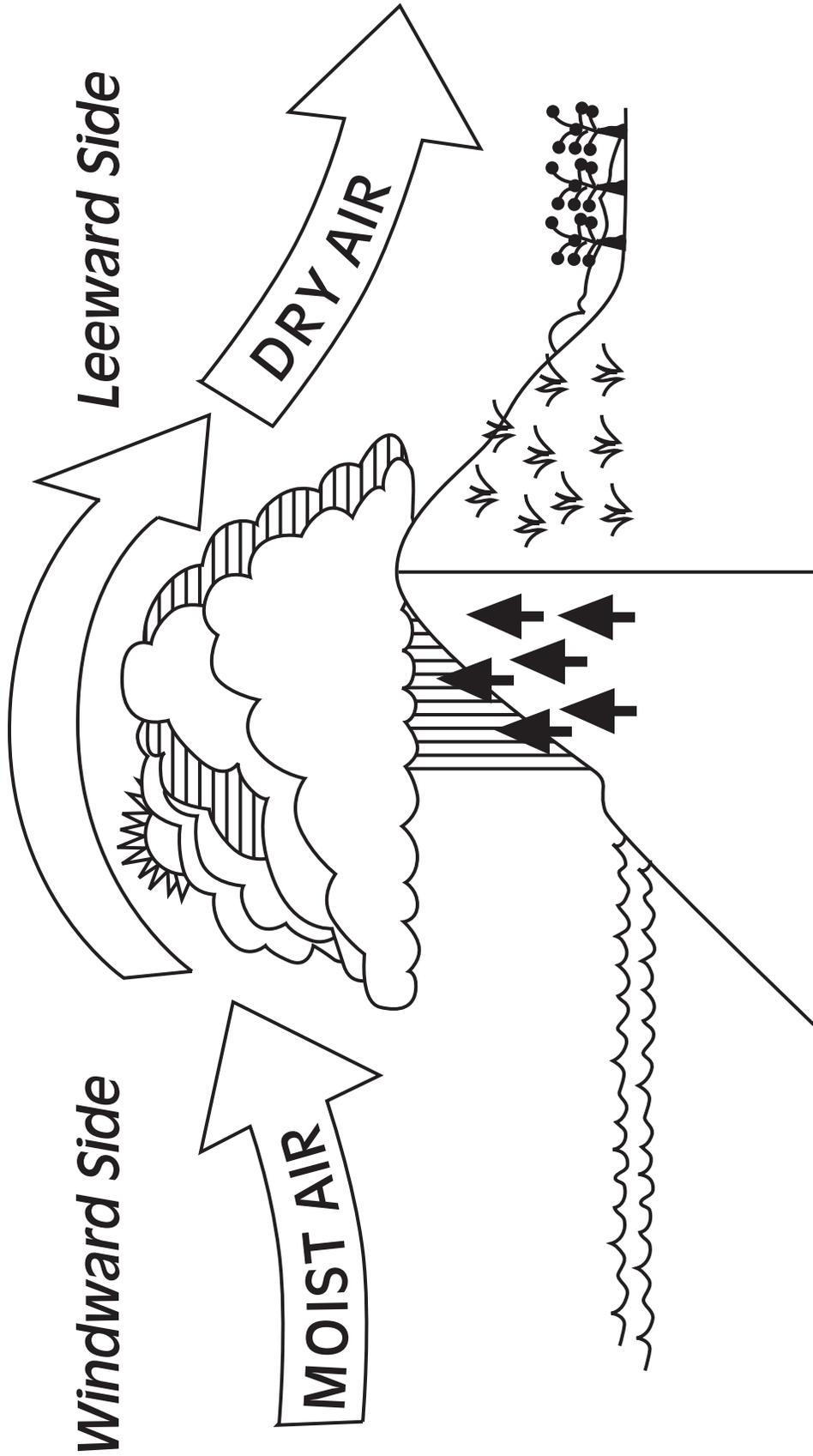
The Desert, 1901

“From time immemorial the desert has been cast in the role of a sinister adversary. Brooding in parched silence, the desert has been pictured as a furnace trap which lures its victims to their deaths. We hear stories of stranded motorists who, with sun-cracked skins and blackened tongues, stagger feebly to a highway and are rescued, or else fall in heat-induced delirium and leave their bleached bones for subsequent travelers to find.”

Erle Stanley Gardner

The Desert is Yours, 1963





Rain Shadow Deserts

Rain shadow deserts are created when mountain ranges lie parallel to moist, coastal areas. Winds moving inland cool as air is forced to rise over the mountains. Clouds form and carried moisture falls on slopes facing the winds. When the winds move over the crest and down the far side, they are very dry. Descending air also makes it hard for additional clouds and precipitation to form. Without another source of moisture, rain shadow deserts are formed on the far side of these mountain ranges.

Discovery Activity Page #2

Average Daily High Temperature

(IN ° FAHRENHEIT)

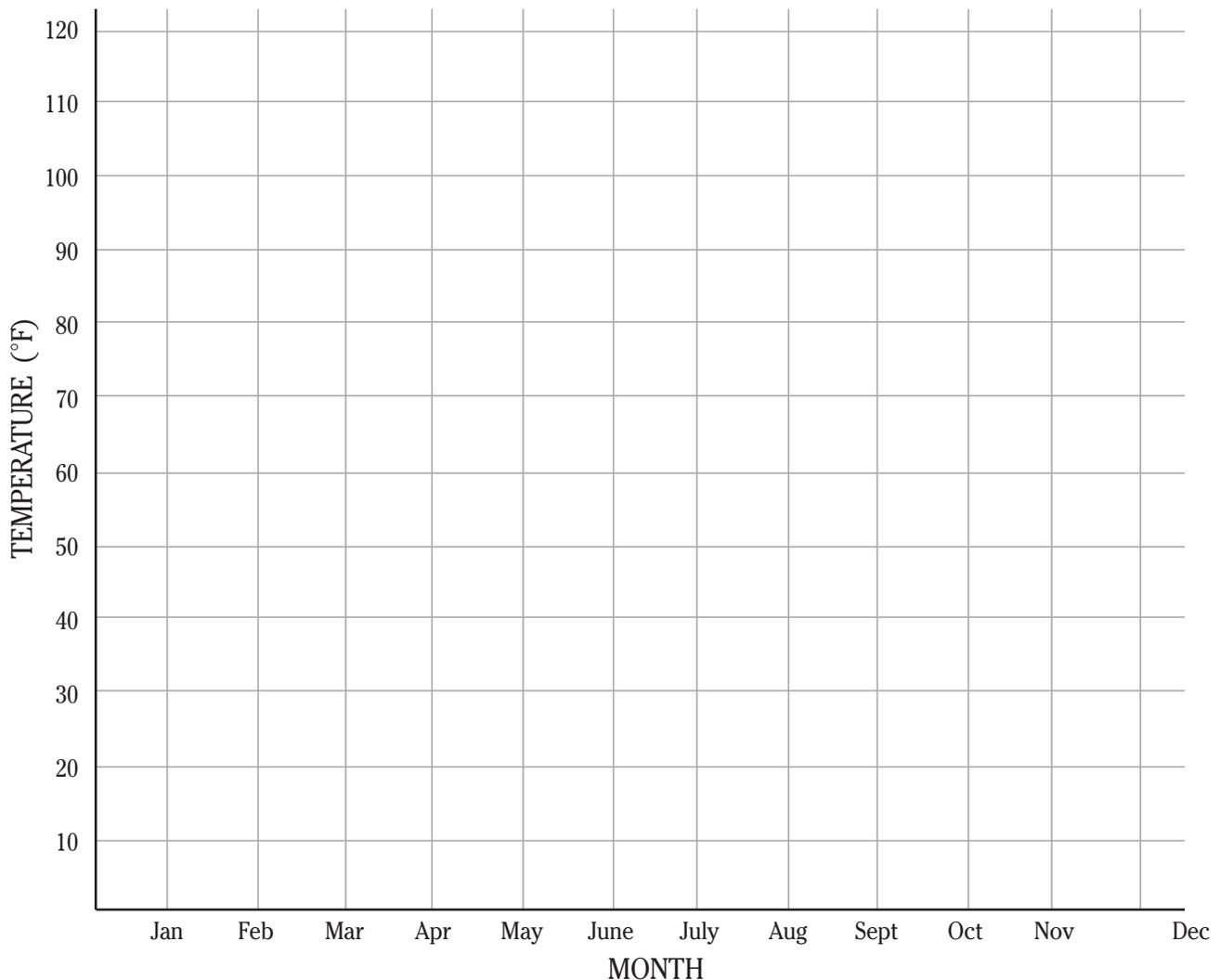
MOJAVE DESERT PARKS

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Death Valley (California)	65	72	80	87	99	109	115	113	106	92	76	65
Joshua Tree (California)	63	68	75	83	90	101	105	103	94	86	72	62
Lake Mead (Nevada, Arizona)	54	60	67	76	85	96	102	99	93	80	65	56

NON-DESERT PARKS

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Acadia (Maine)	31	32	39	50	61	70	76	74	66	57	46	35
Great Smoky Mountains (Tennessee)	48	51	60	70	76	82	84	84	78	70	59	51
Yosemite (California)	47	55	59	66	73	82	90	90	85	74	58	46

Red Line=
Black Line=



Discovery Activity Page #3

Average Monthly Rainfall (IN INCHES)

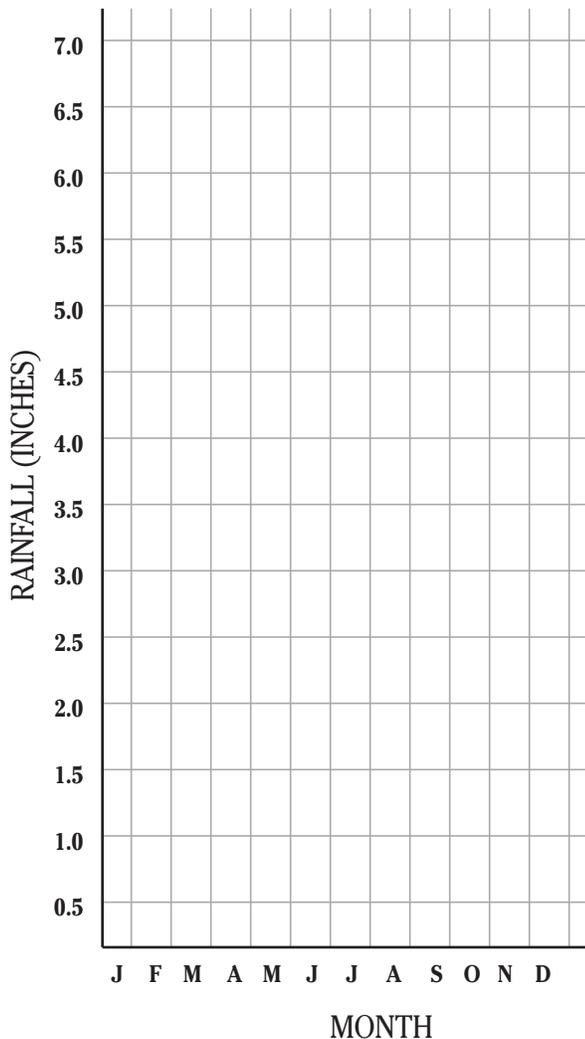
MOJAVE DESERT PARKS

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Death Valley (California)	.2	.3	.2	.1	.1	.1	.1	.1	.1	.1	.2	.2
Joshua Tree (California)	.4	.4	.3	.1	.1	.1	.5	.7	.3	.3	.3	.5
Lake Mead (Nevada, Arizona)	.6	.5	.7	.4	.2	.1	.5	.8	.5	.4	.5	.4

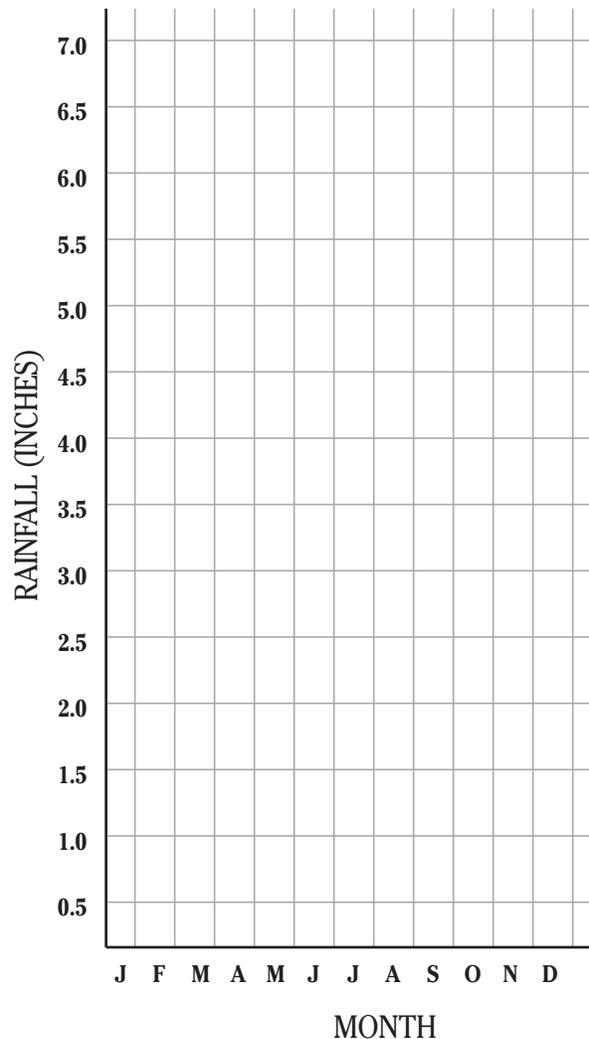
NON-DESERT PARKS

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Acadia (Maine)	4.4	4.14	3.8	3.8	3.9	2.9	3.0	3.0	3.8	4.2	5.5	5.2
Great Smoky Mountains (Tennessee)	4.5	4.2	5.6	4.5	4.4	4.6	5.1	4.5	3.7	3.0	3.7	4.2
Yosemite (California)	6.6	5.0	4.6	3.5	1.5	0.6	0.4	0.3	0.7	1.4	4.7	6.9

Average Monthly Rainfall
At _____



Average Monthly Rainfall
At _____



Deserts Of The World

NAME	TYPE	SIZE	HOT OR COLD DESERT	PHYSICAL FEATURES	EXAMPLES OF PLANTS, ANIMALS
1. Arabian	Subtropical	900,000 sq. mi.	Hot	Covered almost entirely by sand	<ul style="list-style-type: none"> Acacia, Oleander, Saltbush Camel, Gazelle, Oryz
2. Atacama	Coastal	54,000 sq. mi.	Cold (usually covered by a cool fog)	Covered by sand dunes and pebbles; one of the driest areas on Earth	<ul style="list-style-type: none"> Bunchgrass, Cordon Cactus Lizards
3-7. Australian (Great Sandy, Victoria, Simpson, Gibson, Sturt)	Interior Subtropical Rain Shadow	890,000 sq. mi.	Hot	Three areas are sandy; two are stony	<ul style="list-style-type: none"> Acacia, Eucalyptus Dingo, Kangaroo, Bandicoot
8. Chihuahuan	Subtropical	175,000 sq. mi.	Hot	High plateau covered by stony areas and sandy soil	<ul style="list-style-type: none"> Cacti, Creosote, Mesquite Coyote, Rattlesnake, Javelina
9. Gobi	Interior	450,000 sq. mi.	Cold	Covered by sandy soil and areas of small stones called "gobi"	<ul style="list-style-type: none"> Grasses Camel, Gazelle, Gerbil
10. Great Basin	Rain Shadow	158,000 sq. mi.	Cold	Covered by sand, gravel, and clay; contains many mountain ranges and basins	<ul style="list-style-type: none"> Sagebrush, Saltbrush Bighorn Sheep, Pronghorn Antelope, Jackrabbit
11. Iranian	Subtropical	150,000 sq. mi.	Cold	Covered by coarse gray soil, stony pavement, and salt flats	<ul style="list-style-type: none"> Grasses, Pistachio Tree Monitor Lizard, Oryz, Scorpion
12. Kalahari	Subtropical	200,000 sq. mi.	Hot	Covered by sand dunes and gravel plains	<ul style="list-style-type: none"> Acacia, Baobab Tree, Aloe Gazelle, Hyena, Jackal
13. Mojave	Rain Shadow	25,000 sq. mi.	Hot	Covered by sandy soil, gravelly pavement, and salt flats	<ul style="list-style-type: none"> Creosote Bush, Joshua Tree Bighorn Sheep, Chuckwalla, Jackrabbit
14. Namib	Coastal	52,000 sq. mi.	Cold (usually covered by a cool fog)	Covered by sand dunes along the coast and gravel farther inland	<ul style="list-style-type: none"> Aloe, Bunchgrass Lichen Darkling Beetle, Jackal, Web-footed Geck
15. Patagonian	Rain Shadow	153,000 sq. mi.	Cold	Covered by stony and sandy areas	<ul style="list-style-type: none"> Cacti, Grasses Puma, Rhea, Patagonian Fox
16. Sahara	Subtropical	3.5 million sq. mi.	Hot	Covered by mountains, rocky areas, gravel plains, and sand dunes. Some areas have no rain for years.	<ul style="list-style-type: none"> Acacia, Grasses Addax, Antelope, Fennec Fox, Jackal
17. Sonoran	Rain Shadow	120,000 sq. mi.	Hot	Covered by sand, soil, and gravelly pavement	<ul style="list-style-type: none"> Agave, Ocotillo, Saguaro Coati, Gila Monster, Javelina
18. Takla Makan	Interior	600,000 sq. mi.	Cold	Covered by sand dunes and rocky soil	<ul style="list-style-type: none"> Grasses Camel, Jerboa, Gazelle
19. Turkestan	Interior	215,000 sq. mi.	Cold	Mostly covered by sand dunes	<ul style="list-style-type: none"> Saxaul Tree, Sedges Gazelle, Gerbil, Saiga Antelope

Deserts Of The World

