The Geography of Water
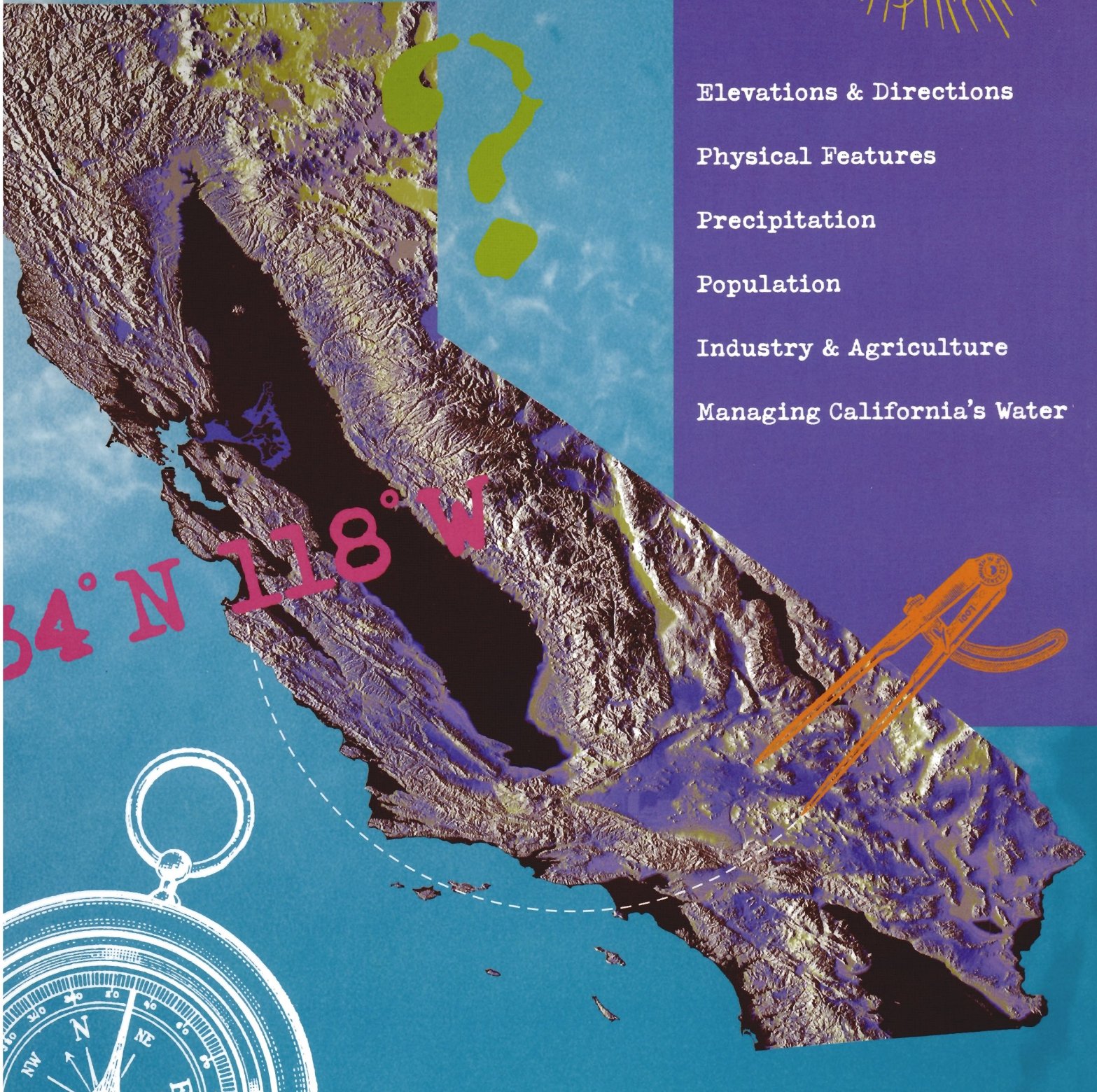
34°N 118°W

- Elevations & Directions
- Physical Features
- Precipitation
- Population
- Industry & Agriculture
- Managing California's Water

Elevations & Directions

General Objectives

Upon completion of Section 1, the student will be able to:

- place him/herself in the context of California geography by locating his/her city within the geography of the state.
- locate California's position relative to Oregon, Nevada, Arizona, Mexico and the Pacific Ocean.
- identify cardinal directions (north, south, east, west) on a map of California.
- identify secondary directions (northeast, southeast, northwest, southwest).
- locate his/her city relative to other cities, major mountains, the ocean, Mexico and Arizona using the cardinal directions as guides.
- read and use a legend for elevations in order to deduce possible weather patterns and potential travel routes.

Vocabulary

Before beginning study of Map #1, you may wish to introduce the following vocabulary:

- **atlas** – a bound collection of maps
- **cardinal directions** – north, south, east, west
- **coast** – the land next to the ocean
- **elevation** – the altitude of a place above sea level
- **latitude** – distance measured (in degrees) north and south from the equator (0° latitude) to a maximum of 90° at the north or south poles
- **legend** – explanation of symbols used on map (i.e. shading, colors, characters, etc.)
- **longitude** – distance measured (in degrees) east and west from the prime meridian (0° longitude) to a maximum of 180° in each direction
- **precipitation** – moisture in the form of rain, snow, sleet, or hail
- **surface water** – water on the surface of the earth, as distinct from water under the ground

Guided Questions

Note: These questions are intended for discussion and hypothesizing as a way to get students thinking about the map before they begin the actual study.

Question: *California is 825 miles long in its longest direction from north to south. What does this mean for the state's geography and climate?*
Answer: Because it reaches so far from north to south, California has great variety in landscape and weather.

Question: *Some of California's mountains are over 14,000 feet high. How does this affect the state's water supply?*
Answer: Such high mountains often receive large amounts of snowfall. When this snow melts in the spring and summer, the runoff becomes an important part of the state's water supply.

teacher guide

Question: *The southern one-third of California has relatively few high mountains when compared to the northern and central parts of the state. How does this affect the water supply of Southern California?*

Answer: Because there are few high mountains when compared to the northern and central parts of the state, there is less precipitation to provide runoff in the spring and summer.

Question: *If there is less precipitation in the southern part of the state, where do you think other sources of water might come from?*
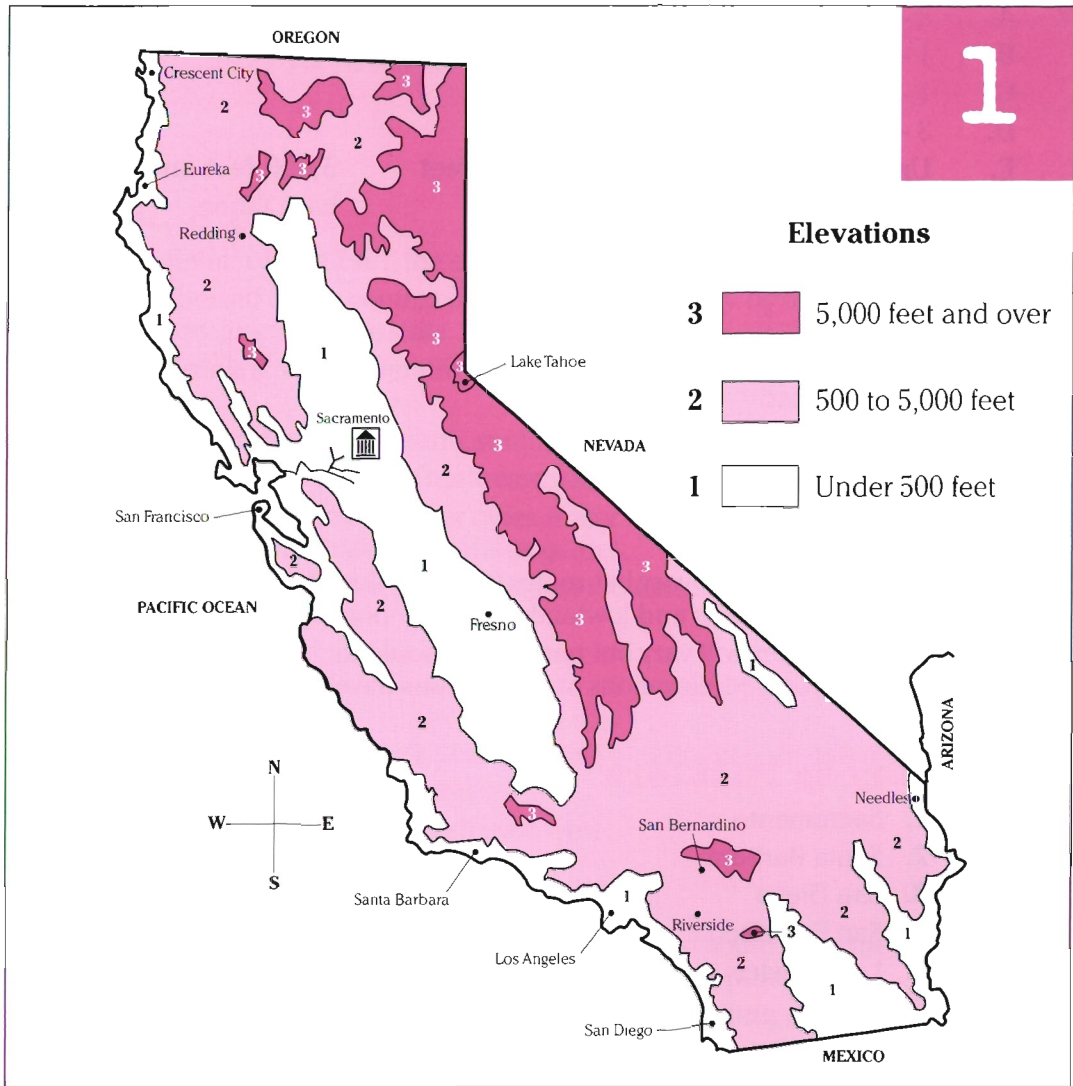
Answer: In addition to local runoff provided by the few mountains in Southern California, this region must also rely on imported water, groundwater, recycled water and conservation measures.

Notes to the Teacher

The purpose of this map, in addition to the above objectives, is to orient the student in a general way to the physical geography of California and his/her location within the state. The "steps" in the lesson (I, II, III, etc.) build one upon the other and should be taken in order. You may wish to do only one or two of the Roman Numeral items during each day's geography lesson. This map and the attendant questions and activities will prepare the student for the tasks to be undertaken in the following maps. Therefore, the students should be instructed to save each map as they will be asked to compare it with the maps which follow.

Extensions

- **Take a photo of your school or class.** Hang the colored wall map (provided with this packet). Put a pin in the map in the exact location of your city. Tie a piece of yarn or colored string to the pin. Place the photo near the map and stretch the string to the photo and pin it to one corner of the photo. This will show exactly where your school is located in California.
- **Obtain a compass.** Use the compass to identify and label various walls and areas of the classroom according to the cardinal and secondary directions. For example, locate the wall that is facing north and place a sign reading "NORTH" on that wall, locate an object (or wall) that is facing southeast and place a sign reading "SOUTHEAST" on the object (or wall).
- **Create a map of your school.** Place an indicator for the cardinal directions on the map. Create a legend for elevations and shade or crosshatch the map to indicate the various elevations of the school grounds. Discuss the relative locations of various buildings in the school. For example, the cafeteria is northwest of our classroom. The office is east of the flagpole.
- **Create a Geography Treasure Hunt.** Using a compass, write directions to a particular location from which the student is to return with some specific object. For example: Start at the classroom door. Walk twenty paces northwest. Turn due north. Walk ten paces. Turn due east. Walk forty paces. Turn northeast. Walk ten paces. Enter the door in front of you. Ask the person in the room to give you the secret message. (The directions might be to the main office where the secretary is to give the student a sealed envelope which is to be brought back to the classroom. In the envelope might be a gold star on a piece of paper announcing 10 points of extra credit.)
- **Relate Geography to all aspects of social studies.** For example, if you are studying the missions, ask the students questions such as, "What direction did Father Serra travel when he went from the Mission San Diego to the Mission San Gabriel?" Or, "When the founders of Los Angeles went across the desert to the area which is now Los Angeles, in what direction were they traveling?"

OREGON

Crescent City
2
3
3
2
3

Eureka
3
3

Redding •
2

1
3
3
3 — Lake Tahoe

Sacramento 🏛
3
NEVADA
2

San Francisco
2
1

PACIFIC OCEAN
2
2
Fresno •
3

N
2
3
1
W—E
S
2

3
San Bernardino
3
Needles •
2

Santa Barbara
1
Riverside
3
2
1

Los Angeles
2
2

San Diego
1

MEXICO

ARIZONA

Elevations

3	▉	5,000 feet and over
2	▨	500 to 5,000 feet
1	▢	Under 500 feet

Answer Key to Questions

I.   You may wish to review the finished (colored) map with the class.

II.   **A.**   Answers will vary depending upon location of school
   B.   3 – The Pacific Ocean
   C.   1 – North of Los Angeles
   D.1.   Answers will vary depending upon location of school
   D.2.   Answers will vary depending upon location of school
   D.3.   South
   D.4.   Answers will vary depending upon location of school
   E.   3 – from west to east
   F.   4 – Oregon

III.   **A., B.** Answers will vary depending upon location of school

IV.   **A.**   4 – southeast of Eureka
   B.   2 – northeast of Fresno
   C.   4 – southeast of Los Angeles

V. **A.** 3 – northeast
   B. 1 – Northern California
   C. 1 – Northern California
   D. 3 – southeastern part
   E.

Under 500 feet	500 to 5,000 feet	5,000 feet and over
Fresno	Redding	Lake Tahoe
Eureka	Riverside	
Crescent City	San Bernardino	
Needles		
Sacramento		
San Francisco		
Santa Barbara		
Los Angeles		
San Diego		

VI. **A., B., C.** Responses will vary, but routes should follow the lowest elevations through valleys and lowlands wherever possible.
   D. Responses will vary, but paragraph should include information on cities passed, elevations and directions traveled.

Answer Key to Puzzlers

A. **1.** Sacramento
   2. Santa Barbara
   3. San Diego
   4. San Francisco
   5. Los Angeles
   6. Eureka

B. **1.** Eureka
   2. Sacramento
   3. San Francisco
   4. Santa Barbara
   5. Los Angeles
   6. San Diego

C. **1.** Arizona
   2. Oregon
   3. Nevada
   4. Mexico
   5. Pacific Ocean

D. **1.** Nevada and Arizona
   2. Mexico
   3. Oregon
   4. Pacific Ocean

Physical Features

General Objectives

Upon completion of Section 2, the student will:
- be able to identify 25 physical features located in California and their positions relative to one another.
- have an understanding of the overall physical geography of the state and the difference between Northern, Central and Southern California.
- learn the approximate elevations of some of California's major mountain ranges and valleys.
- gain a rudimentary understanding of the movement of surface runoff (rain and melting snow).
- become familiar with using an atlas.
- be able to compare two maps to identify various features of the state.

Vocabulary

Before beginning study of Map #2, you may wish to introduce/review the following vocabulary:
- **coast** – the land next to the ocean
- **desert** – an arid region
- **inland sea(s)** – landlocked body of salt water
- **mountain peak(s)** – the pointed top of a mountain
- **mountain range(s)** – a series of connected mountains
- **runoff (surface runoff)** – the flow of water from the land into rivers, lakes and oceans

Guided Questions

Note: These questions are intended for discussion and hypothesizing as a way to get the students thinking about the map before they begin the actual study.

Question: *Look carefully at your map before you start to fill in the blanks. You will notice that the northern two-thirds of California is shaped somewhat like a "bowl" with mountains almost all the way around the central valleys. When water runs off of the mountains and down into these valleys, how do you suppose that it finally gets to the Pacific Ocean?*
Answer: It runs out to sea through San Francisco Bay since there are mountains on all other sides.

Question: *From looking at your unfinished Physical Features map, where do you think that most of California's agriculture takes place?*
Answer: In the central valleys (Features 15 and 16 on Map #2) because these areas receive runoff from the surrounding mountains.

teacher guide
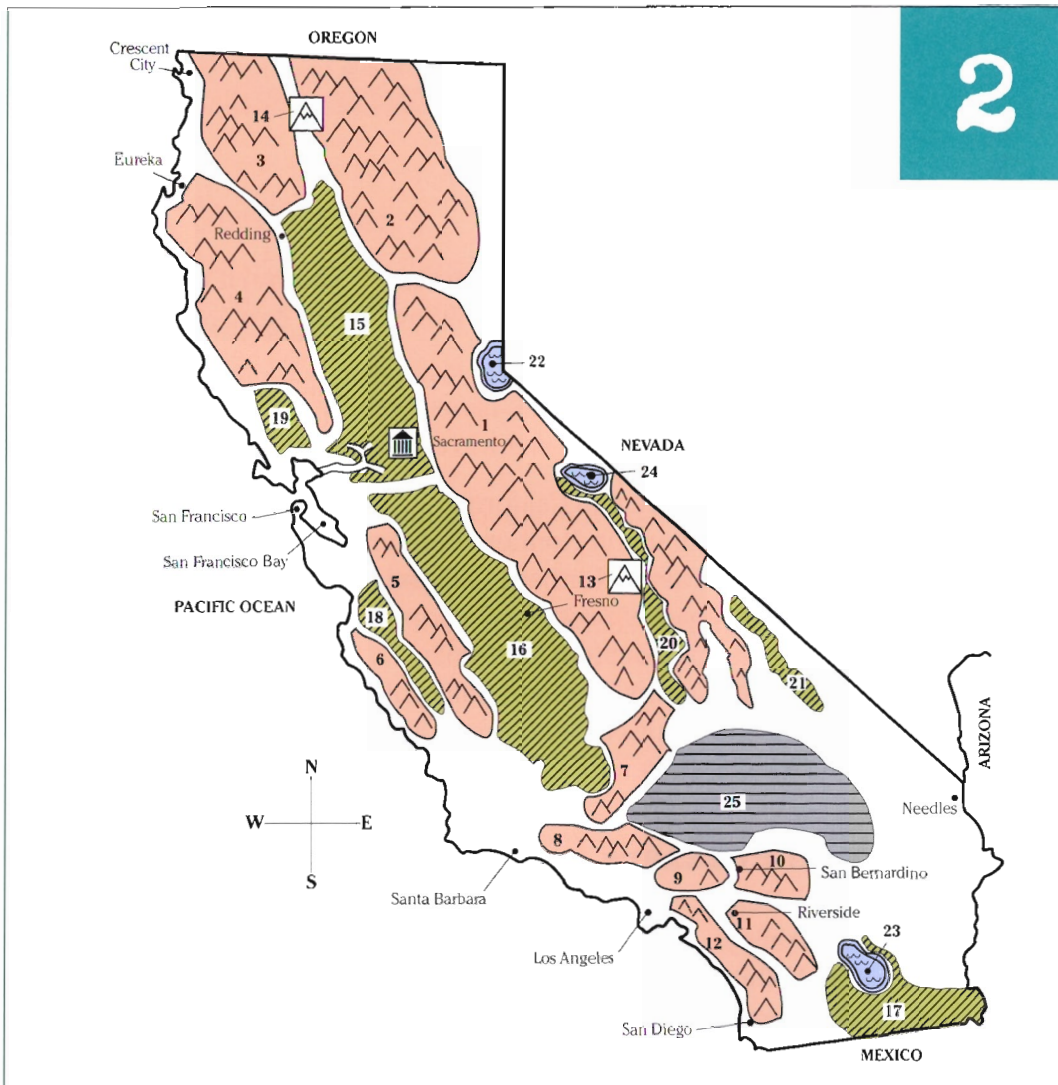
Notes to the Teacher

The primary purpose of this map is to give the student "place names" for some of the physical features which were introduced on Map #1. Building on Map #1, the student will gain a sense of the "texture" of the state and will form a base upon which to move into the learning involved in the maps which follow. Map #2 also requires that the student practice some deduction and critical thinking skills as he or she puts together information from two maps in order to answer questions.

It is difficult to give definitive boundaries for Northern, Central and Southern California, however, you may choose to use the following general guidelines: Draw an imaginary line from the Delta across to Lake Tahoe; everything north of this line may be considered Northern California, Central California includes the central valleys and coast (north of the Tehachapi Mountains), and Southern California is the region south of the Tehachapi Mountains.

To complete Map #2, you may choose to have each student work individually, or you may arrange the class into "study groups" and have each group research and label a certain number of physical features. (This arrangement might be especially useful if you have a limited number of classroom atlases.) For example: Group I: Features numbered 1-5; Group II: Features numbered 6-10; Group III: Features numbered 11-15; Group IV: Features numbered 16-20; Group V: Features numbered 21-25.

Extensions

- **Write a "Pioneer" Journal.** This may either be a written exercise or one that students do orally as a group in class. When the students have finished Map #2 and the related questions, suggest to them that they are settlers in early California. They have to travel from the Salton Sea to Sacramento to help in the formation of the state's new government in the capital. All they have as they travel is a horse, a blanket to sleep on, food in their saddlebags, a few pots and pans, a knife and a fork. They also have a compass and a journal to write in. As they travel to Sacramento, they should write in their journals so that everyone will know what the journey was like and how they got from one place to another. They should tell what direction they are traveling, what mountains they see along the way or have to cross over, and what valleys or deserts they have to travel through. They should also tell about anything else they see (landmarks) which will help to guide future travelers along the way.

- **Construct a Relief Map of California.** As a class project use Maps #1 and #2 as guides to construct a relief map. Materials you will need: a large square of 1/2" or 3/4" plywood, light gauge chicken wire, papier mache, poster paints, scraps of wood to support the chicken wire at various points. When the map is finished, label it with numbers 1-25 and create a legend such as the one on the study map.

OREGON

Crescent City

Eureka

Redding

Sacramento

NEVADA

San Francisco

San Francisco Bay

PACIFIC OCEAN

Fresno

N
W — E
S

Needles

ARIZONA

Santa Barbara

San Bernardino

Riverside

Los Angeles

San Diego

MEXICO

14
3
2
15
22
19
1
24
5
13
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16
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20
21
7
25
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11
12
23
17

Physical Features

Mountains and Mountain Ranges

1. Sierra Nevada Mountains
2. Cascade Range
3. Klamath Mountains
4. Coast Ranges
5. Coast Ranges
6. Santa Lucia Mountains
7. Tehachapi Mountains
8. Transverse Ranges
9. San Gabriel Mountains
10. San Bernardino Mountains
11. San Jacinto Mountains
12. Peninsular Ranges

Mountain Peaks

13. Mount Whitney
14. Mount Shasta

Valleys & Basins

15. Sacramento Valley
16. San Joaquin Valley
17. Imperial Valley
18. Salinas Valley
19. Napa Valley
20. Owens Valley
21. Death Valley

Lakes and Inland Seas

22. Lake Tahoe
23. Salton Lake
24. Mono Lake

Desert

25. Mojave Desert

Answer Key to Questions

I.   You may wish to review the finished (colored) map with the class.

II. **A.**   3 – Southern California
    B.   Owens Valley
    C.   Sacramento Valley, San Joaquin Valley
    D.   1 – Imperial Valley

III. **A.**   Coast Ranges, Tehachapi Mountains, Sierra Nevada Mountains
          (in any order)
    B.   Mt. Shasta
    C.   1 – Sierra Nevada Mountains
    D.   Mt. Whitney 14,495 feet (above sea level)
          Death Valley 258 feet (below sea level)
    E.

	Latitude	Longitude
San Gabriel Mountains	35°	118°
Mount Shasta	42°	122°
Mono Lake	38°	119°

IV. **A.** 3 – under 500 feet

B. 1 – True

C. 2 – 500 to 5,000 feet

D. 2 – under 500 feet in elevation

E. 2 – Owens Valley

F. 3 – Sacramento

V. **A.**

Northern California	**Central California**	**Southern California**
Cascade Range	San Joaquin Valley	San Bernardino Mountains
Lake Tahoe		Salton Sea
Napa Valley		Tehachapi Mountains
		Mojave Desert

B. 1. A – in a valley in Central California

2. E – in the mountains in Northern California

3. D – near the coast of Northern California

4. C – near the coast of Southern California

5. B – in a valley in Southern California

6. C – near the coast of Southern California

7. E – in the mountains in Northern California

8. A – in a valley in Central California

Answer Key to Puzzlers

A. 1. Mojave Desert

2. Death Valley

3. Mount Whitney

4. Salton Sea

B. Decoder messages will vary.

C.

Sacramento, San Joaquin, Imperial, Salinas, Napa, Owens, Death.

Precipitation

General Objectives

Upon completion of Section 3, the student will:

- gain an understanding of the distribution of average annual precipitation throughout California and will be able to distinguish the "wet" and "dry" areas.
- understand the relationship between elevation and precipitation (by comparing Map #3 and Map #1).
- understand which of California's major physical features (mountains, valleys) receive higher or lower levels of average annual precipitation (by comparing Map #3 and Map #2).
- gain a clear understanding of the different levels of precipitation which occur in Northern, Central and Southern California.

Vocabulary

Before beginning study of Map #3, you may wish to introduce/review the following vocabulary:

- **aqueduct** – an artificial channel constructed to transport water
- **average annual precipitation** – average amount of rain or snow that falls in a region per year
- **border** – line (often imaginary) separating states, countries, etc.
- **irrigation** – water applied to land to produce crops
- **legend** – explains the symbols used within the map (i.e. shading, colors)
- **mountain range** – a series of connected mountains
- **precipitation** – moisture in the form of rain, snow, sleet, or hail
- **symbol for inches** – (")
- **valley(s)** – low region between uplands, hills or mountains (usually following the course of a stream)
- **water (hydrologic) cycle** – the movement of water from the atmosphere to the earth's surface (land or ocean) and back again (a poster has been included for your use)

Guided Questions

Note: These questions are intended for discussion and hypothesizing as a way to get the students thinking about the map before they begin the actual study.

Question: *Look at your unfinished map. Since you have already studied elevations and physical features in California, where do you think most of the precipitation in California takes place?*

Answer: At the higher elevations which are mostly located in northeastern California. The high mountains receive more precipitation in the form of snow and often also receive more rainfall.

Question: *Based on what you have learned from Maps #1 and #2, where do you think California's driest areas (areas with least precipitation) are located?*

Answer: In southeastern California. This is where the Mojave Desert is located (Map #2, Feature 25) and this is where the fewest high mountains are found.

Notes to the Teacher

The primary purpose of this map is to give the student a clear idea of the distribution of precipitation throughout our state. Building on Maps #1 and #2, the map, questions and activities will also show the relationships between elevations, physical features and precipitation. This map also forms a foundation for study of Maps #4 (Population), #5 (Agriculture and Industrial Expansion) and #6 (Water Management).

Extensions

- **Make a rain gauge.** Cut the top off of a 1-quart milk carton and bury the carton in the ground so that about one inch sticks up above the surface. Measure the depth of water in the carton with a ruler after a rainfall. This will give the students an idea of how precipitation is measured over a given period of time. (Make sure that the rain gauge is located in a spot where it will not collect water from sprinklers. You should mark the gauge with a visible flag or sign so that no one trips on it.)
- **How's the Weather?** Create a lesson around the weather page of a major California newspaper. This will allow the students to compare levels of precipitation at various locations throughout the state.
- **Compare Precipitation Levels from West to East.** Use an atlas of the United States to investigate precipitation levels across the country. Compare the wet and dry areas in California with the wet and dry areas in other parts of the U.S.
- **Examine Precipitation Levels Around the World.** Use a world atlas to investigate precipitation levels around the world. How do the world's "wettest" regions compare with California's wettest regions in terms of inches of average annual precipitation?
- **Create a Desert Diary.** Create a writing assignment in which the students tell what life would be like if they were members of a desert tribe which lived in an area where there was very little water. How would their daily lives change? What special things would they have to do in order to use every drop of water in the most efficient manner?
- **Investigate the World's Rain Forests.** Use an atlas and other sources to investigate the world's rain forests. Why are these areas called the "lungs" of the world? Discuss the water cycle in relation to this concept.

Answer Key to Questions

I.   You may wish to review the finished (colored) map with the class.

II. **A.**   2 – northwest

  B.   3 – southeast

  C.   4 – 30" to 90"

  D.   1 – 10" to 20" per year

  E.

City	Average Annual Precipitation (")
Eureka	30" to 90"
Crescent City	30" to 90"
Redding	20" to 30"
Lake Tahoe	30" to 90"
Sacramento	10" to 20"
San Francisco	20" to 30"
Fresno	0" to 10"
Santa Barbara	20" to 30"

Average Annual Precipitation
(Rain & Snow)

Legend:

5 90" to 120"
4 30" to 90"
3 20" to 30"
2 10" to 20"
1 0" to 10"

Map labels: OREGON, NEVADA, ARIZONA, MEXICO, PACIFIC OCEAN, Crescent City, Eureka, Redding, Lake Tahoe, Sacramento, San Francisco, Fresno, Santa Barbara, San Bernardino, Riverside, Los Angeles, Needles, San Diego

Compass: N, S, E, W
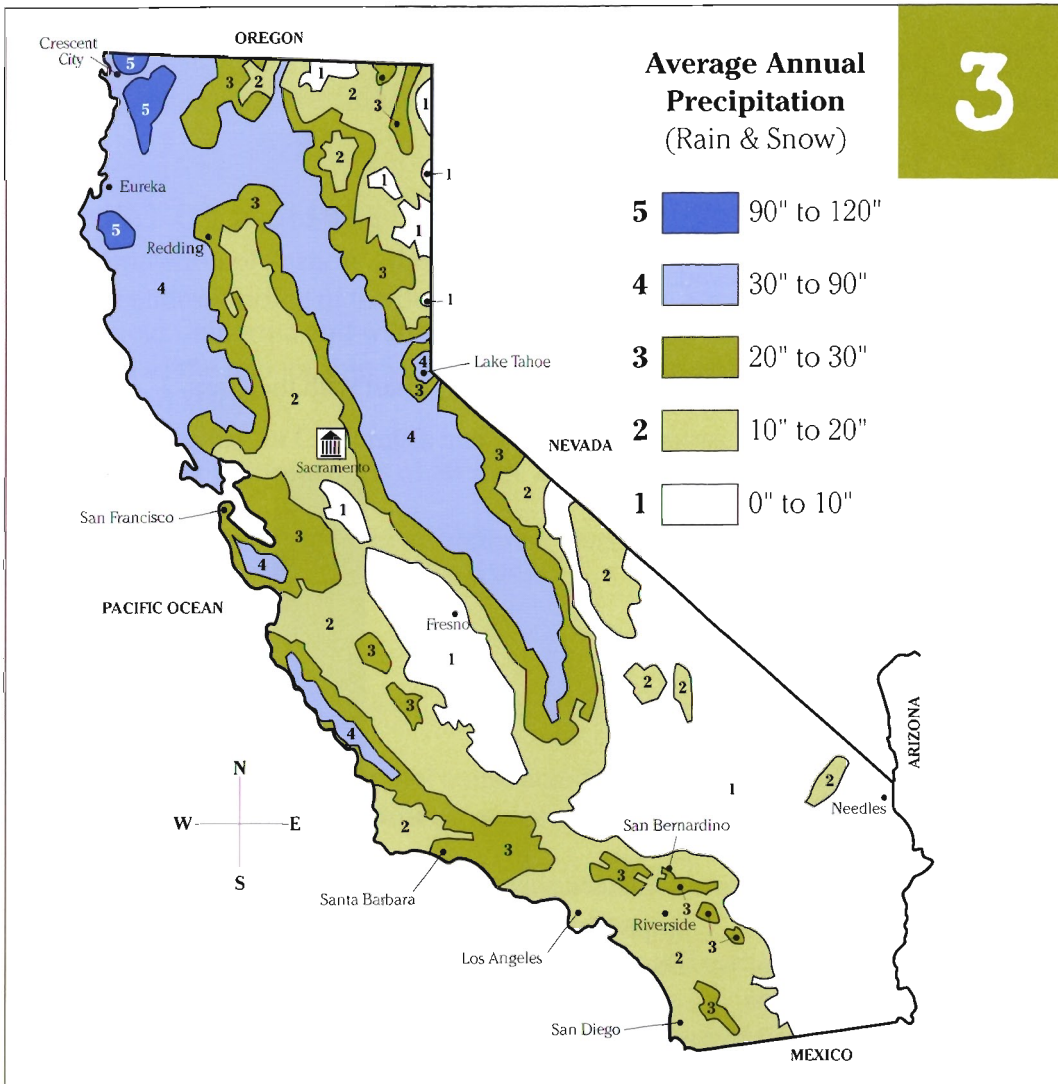
City	Average Annual Precipitation (")
Los Angeles	10" to 20"
San Bernardino	10" to 20"
Riverside	10" to 20"
San Diego	10" to 20"
Needles	0" to 10"

F.
Crescent City
Eureka
Lake Tahoe
Redding
San Francisco
Santa Barbara
Los Angeles
Riverside
Sacramento
San Bernardino
San Diego
Fresno
Needles

3

III. **A.** 2 – on the mountains

B. 3 – Sierra Nevada Mountains

C. 3 – San Joaquin Valley

IV. **A.** 4 – San Francisco

B. 2 – from north to south

C. 3 – San Francisco

D. 1 – the Sierra Nevada Mountains

E. 3 – Sacramento Valley

V. You may wish to review the finished (colored) chart with the class.
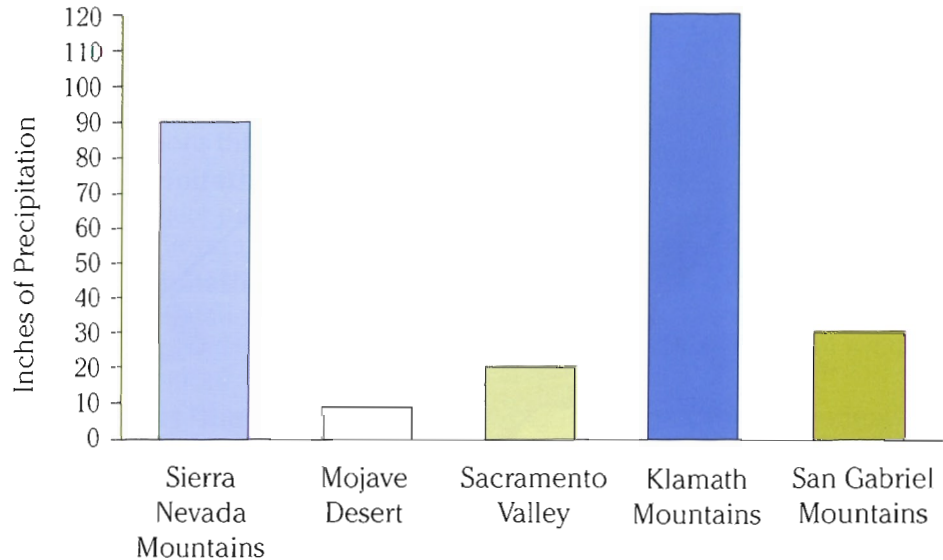
Answer Key to Puzzlers

A. **1.** The San Joaquin Valley is located between <u>the Sierra Nevada Mountains</u> to the east and the Coast Ranges to the <u>west</u>. The elevation of the <u>San Joaquin Valley</u> is <u>under 500 feet</u>. This location receives between <u>0" to 10"</u> of precipitation each year.

2. <u>San Diego</u> is a coastal city just <u>north</u> of the Mexican border. This city receives an average of <u>10" to 20"</u> of precipitation each year.

3. Sacramento is located <u>northeast</u> of San Francisco. The elevation of this city is <u>under 500 feet</u>, and the average annual precipitation is <u>10" to 20"</u>.

4. The elevation of the <u>Klamath Mountains</u> is 500 to 5,000 feet. Parts of this mountain range receive between <u>90" to 120"</u> of annual precipitation. The Oregon border is <u>north</u> of these mountains and the Cascade Ranges are located to the <u>east</u>.

5. Lying near the California/Nevada border is <u>Mono Lake</u>. Just <u>north</u> of the Owens Valley, this lake lies at an elevation of <u>500 to 5,000 feet</u>.

Population

General Objectives

Upon completion of Section 4, the student will:

- gain a clear understanding of the distribution of California's population.
- will learn the names and locations of California's eight most populated and eight least populated counties.
- employ basic math skills in order to determine where the majority of California's people choose to live.
- employ critical thinking skills to determine how California's population distribution relates to the state's physical features and various levels of precipitation.

Vocabulary

Before beginning study of Map #4, you may wish to introduce/review the following vocabulary:

- **county** – administrative divisions within states
- **latitude** – distance measured (in degrees) north and south from the equator (0° latitude) to a maximum of 90° at the north or south pole
- **longitude** – distance measured (in degrees) east and west from the prime meridian (0° longitude) to a maximum of 180° in each direction
- **physical geography** – the natural environment (i.e., landforms, climate, water, etc.)
- **population** – the number of inhabitants of a place
- **precipitation** – moisture in the form of rain, snow, sleet, or hail

Guided Questions

Note: These questions are intended for discussion and hypothesizing as a way to get the students thinking about the map before they begin the actual study.

Question: *Compared to the other 49 states, do you think that California has a large population or a small population?*

Answer: California has a large population (over 32,000,000 people) compared to the other states. Almost 12% of all the people living in the United States live in California.

Question: *Why do you suppose that so many people choose to live in California?*

Answer: Probably because the climate is so nice and the California coastline offers much in terms of scenic beauty and recreation. In addition to mild, dry winters, Southern California offers a diverse job market and available housing.

teacher guide

Notes to the Teacher

The primary purpose of this map is to give the student an idea of the distribution of population throughout our state. It should be emphasized to the students that the counties on the map are only 16 of the total 58 counties in California (the eight most populated, and the eight least populated).

By comparing this map to the previous ones, the student will understand the relationships among population, physical features and precipitation levels. As some of the questions related to this map require certain mathematical skills, you may wish to review those skills (especially percentages) with the students before they undertake the study.
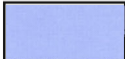
Extensions

- **Compare U.S. Population.** Use a United States atlas to compare California's population with the populations of other states. Involve mathematical skills by posing such questions as: Where does California rank among all of the states in terms of population? What percent is California's population of the total U.S. population?

- **Examine Your School Population.** Guide your students in a similar investigation of the population of your school. What is the total population of the school? What percent is their class of the total school population? How many teachers are there in the school? What percent of the total school population are teachers? What is the ratio of teachers to students?

- **Learn Your County/City Population.** Guide the students in an investigation of the population figures for the city and county in which they live. What is the approximate population of their county (use Map #4, if applicable)? What is the approximate population of their city? What percent is their city of the total county population?

- **Investigate Population Trends.** Have the students investigate population trends in their county. Is the population of the county increasing, remaining the same or decreasing? (Contact the local chamber of commerce or county offices for information.) If the population is decreasing, what accounts for this? If the population is increasing, how will future needs for such things as water and power be met? How will additional services for such things as trash disposal and road maintenance be supplied? (You may consider writing a "class letter" to the appropriate county offices for such information and answers.)

- **Research Who Supplies Important Services.**   Invite the students to consider such questions as: Where does our county's water supply come from? Where do we get our electricity? Who is responsible for the quality of our water, our air, our roads, etc.? Write to your local water and power agencies for information and background. Contact county offices for information.

- **Ask about the Pluses and Minuses.** Ask the students to consider whether the population of their county is relatively large or relatively small compared to other California counties. What are the advantages and disadvantages to living in a county with a large population? What are the advantages and disadvantages to living in a county with a small population? What are the advantages and disadvantages to living in a county with a population which is growing? What are the advantages and disadvantages to living in a county with a stable or decreasing population?

2
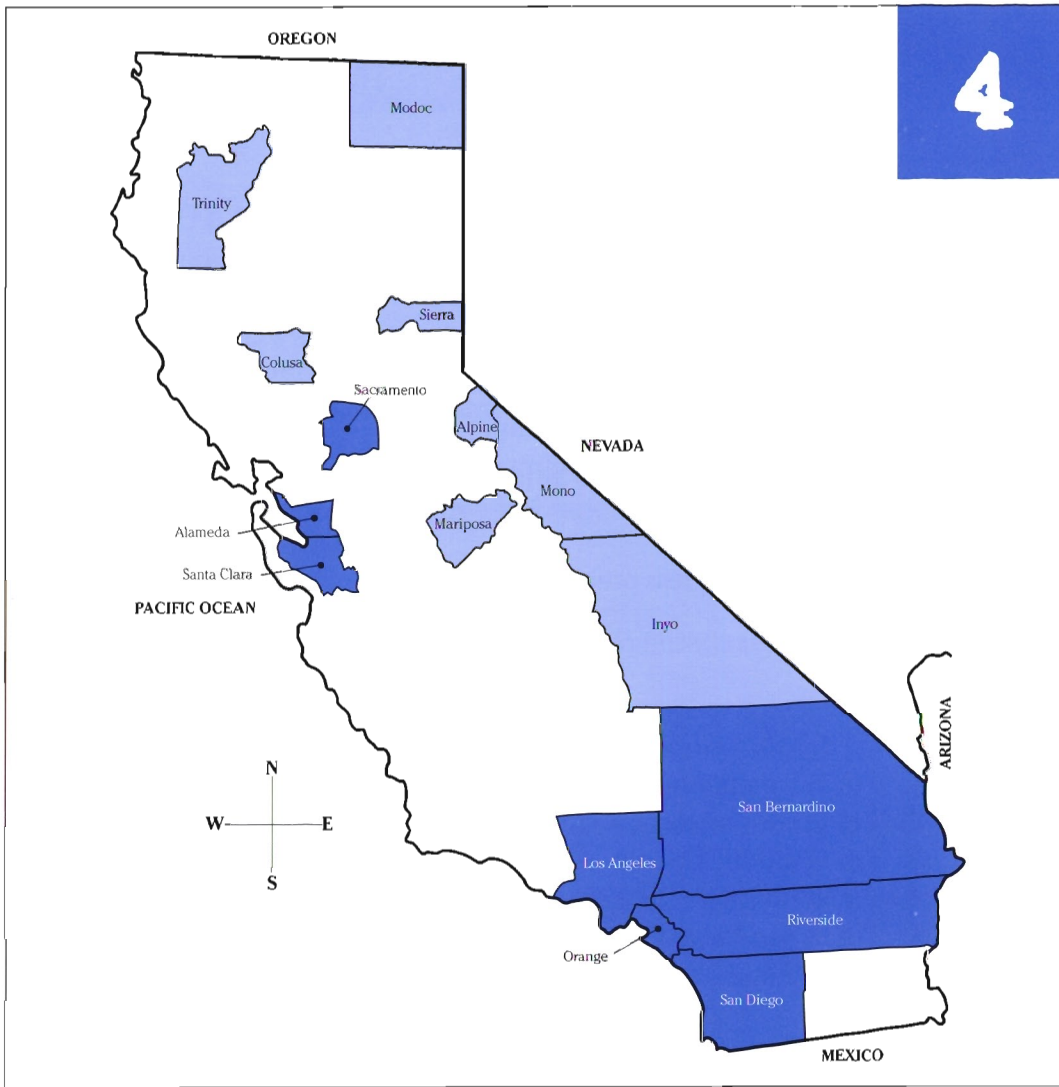
California's Eight Most Populated Counties

	Over 1 million

Los Angeles............9,500,000
Orange...................2,600,000
San Diego 2,700,000
Santa Clara 1,600,000
San Bernardino......1,500,000
Riverside 1,300,000
Alameda 1,300,000
Sacramento............1,100,000

California's Eight Least Populated Counties

	Under 20,000

Alpine.............................1,180
Sierra 3,360
Modoc 10,150
Mono 10,400
Trinity 13,400
Mariposa 16,000
Colusa..........................18,300
Inyo..............................18,350

* Source: California Department of Finance, Demographic Research Unit, 1997

Answer Key to Questions

I. You may wish to review the finished (colored) map with the class.

II. A. Five
B. Eight
C. Alpine County
D. Los Angeles County
E. 2 – Riverside County
F. 1,100,000

III. A.

Sacramento County	1,100,000
Alameda County	1,300,000
Santa Clara County	1,600,000
Modoc County	10,150
Trinity County	13,400
Total	4,023,550

B.	Los Angeles County	9,500,000
	San Bernardino County	1,500,000
	Orange County	2,600,000
	Riverside County	1,300,000
	San Diego County	2,700,000
	Total	17,600,000

C. 2 – More people live in Southern California

D. .296, or 29%, or 30% (if you round off)

IV. A. Under 500 feet (Sacramento County)
B. 2 – South of the Tehachapi Mountains
C. 4 – 20" to 30"
D. 1 – 10" to 20"
E. 4 – in regions with less precipitation

V. A. 38° latitude   119° longitude

Answer Key to Puzzlers

1. I'm in Sacramento County
2. I'm in Los Angeles County
3. I'm in Modoc County
4. I'm in Riverside County
5. I'm in San Diego County
6. I'm in Santa Clara County

Industry & Agriculture

General Objectives

Upon completion of Section 5, the student will:

- be able to identify the top ten counties in California with the fastest-growing industries and the biggest agricultural production.
- have a sense of the relationship between agricultural and industrial growth in relation to elevation, physical features, precipitation and population (comparing Maps #1, #2, #3, #4).

Vocabulary

Before beginning study of Map #5, you may wish to introduce/review the following vocabulary.

- **agriculture** – cultivation of land to produce crops
- **county** – administrative divisions within states
- **economy** – how resources of a community, state, country are managed
- **expansion** – as related to the growth of industry
- **industry** – manufacturing or technically productive enterprise

Guided Questions

Note: These questions are intended for discussion and hypothesizing as a way to get the students thinking about the map before they begin the actual study.

Question: *If you compare Map #5 to Map #2, you will notice that six of the top ten agricultural counties in California are located in the Sacramento and San Joaquin Valleys (features 15 and 16 on Map #2). Why do you suppose these valleys are so good for agricultural production?*

Answer: As water runs off of the surrounding mountains it carries fine, rich soil and nutrients down into the valleys where it deposits them. These soils are very good for agricultural production. Of course, the water running into the valleys (especially the Sacramento Valley) also helps agricultural production.

Question: *If you compare Map #5 to Maps #2 and #3, you will see that two of the top ten agricultural counties (Riverside and Imperial) are located in Southern California. Why is it surprising that these counties can support so much agriculture?*

Answer: These counties are located in areas which receive very little precipitation. Because agriculture requires large quantities of water, it is surprising that these counties can support so much agriculture.

Question: *Where do you suppose these two counties get enough water to support such high agricultural production? (Refer to wall map to help students answer this question.)*
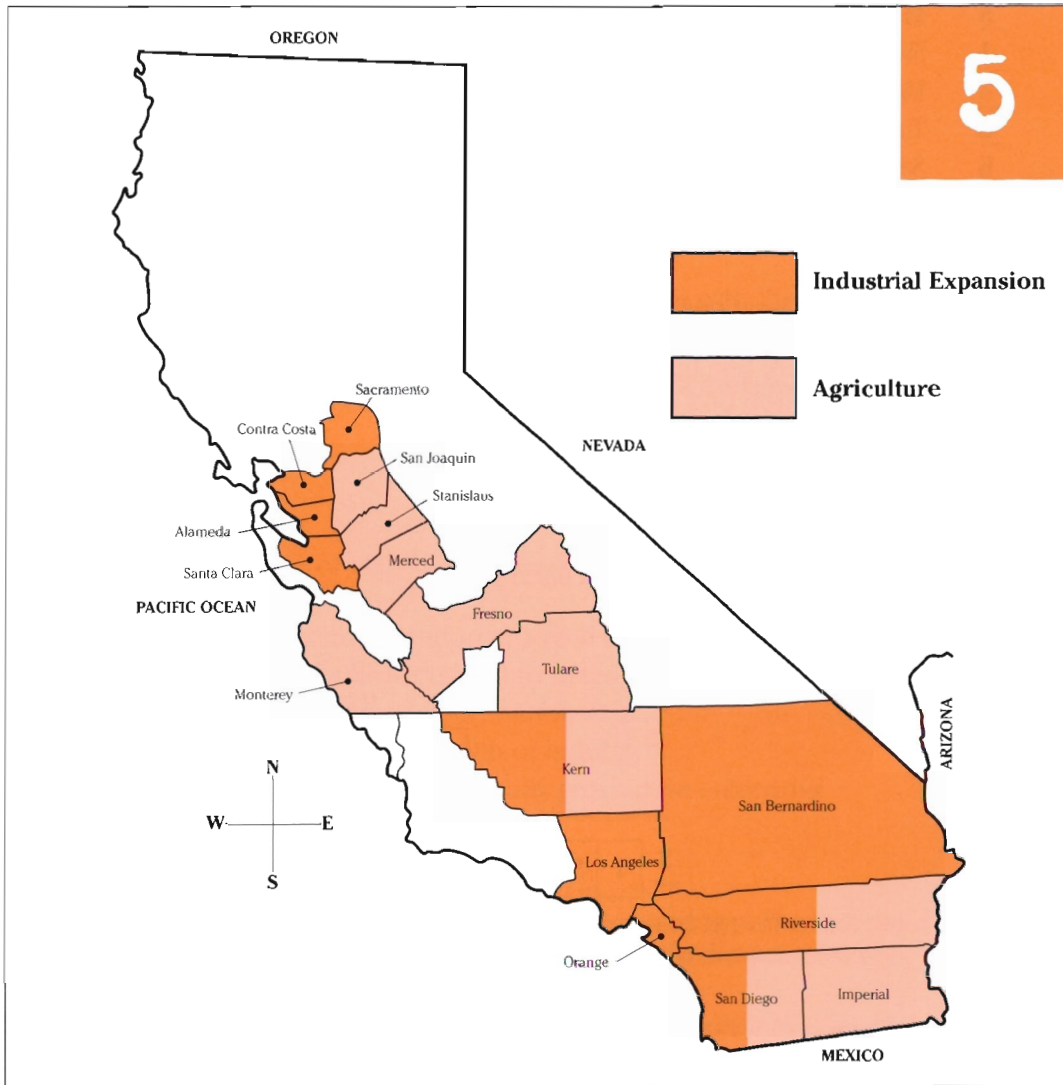
Answer: They have to "import" much of their water via aqueducts and canals (especially from the Colorado River). This question will be addressed in detail in Map #6.

Notes to the Teacher

The primary purpose of this map is to illustrate the distribution of the centers of agriculture and industry in California. The student must compare this map to the four preceding maps in order to understand how industry and agriculture relate to elevations, physical features, levels of precipitation and population distribution. It should become apparent that industry tends to relate to large population centers, but that large agricultural production does not require large populations. It may surprise students that many of the top agriculture-producing counties are located in areas which receive very little annual precipitation. This will be addressed in Map #6 which illustrates how water is managed in California.

Extensions

- **Learn as much as you can about your county**. Refer to a recent California Almanac or Atlas to help answer the following questions. Is your county among those illustrated on Map #5? If so, where does it rank among the top ten industrial and agricultural counties? What are the major industries? What are the major agricultural products, if any? What is the population of the county? What is the "county seat"?

- **Make a large map of your county.** Indicate the boundaries of the county and the names of the bordering counties. Indicate the major cities in your county (including the county seat). If agriculture takes place in your county, indicate where and name the types of crops grown. If your county has industry, indicate the areas where the industries are located and name the items manufactured. Add whatever other information you can find to the map: average annual precipitation, elevations, physical features, population figures, and whatever else is of interest to the students.

- **Call in the Experts.** Invite a representative from one of your county's major industries to come to the classroom. Ask the individual to discuss the manufacturing process, the kinds of jobs included in the industry, the raw materials needed for the industry, and the by-products and pollution of that industry. Contact the nearest agricultural district and invite a representative to discuss the types of crops grown, how those crops are grown (water requirements, fertilizers or supplements used), what those crops are used for (food, fabric, animal fodder).

- **Map the Crops.** Ask students to do their own mapping exercise by researching a particular crop (e.g., grapes), and on a map of California draw grapes in each county growing that crop. Information on leading crop production can be obtained by visiting the California Department of Food and Agriculture's website at www.cdfa.ca.gov or by calling (916) 654-0462.

Answer Key to Questions:

I. Check students' maps to see if they have colored each county appropriately. Three of the counties (San Diego, Riverside, Kern) should be colored with two shades to indicate that they are among the top agricultural and industrial counties.

II. **A.** Three
B. San Diego, Riverside, Kern (in any order)
C. 1 – south of Sacramento

III. __10__ Imperial County
__7__ Stanislaus County
__3__ Kern County
__8__ Riverside County
__9__ San Diego County

3

5   Merced County
1   Fresno County
4   Monterey County
2   Tulare County
6   San Joaquin County

Ex. Cred. $17,344,371,000

IV.   **A.**   1 – lower elevations (under 5,000 feet)
      B.   4 – San Joaquin Valley
      C.   1 – on the western side of the state
      D.1.   Kern County c
      D.2.   Monterey County a
      D.3.   Riverside County b
      E.   Five
      F.   1 – 0" to 20" of precipitation each year
      G.   4 – Los Angeles County

Answer Key to Puzzlers

Crossword solution:

Across
3→ INDUSTRY
5→ FRESNO COUNTY
8→ EXPANSION
10→ KERN
11→ SAN JOAQUIN

Down
1↓ LOS ANGELES
2↓ AGRICULTURE
4↓ TULARE
6↓ RIVERSIDE
7↓ SACRAMENTO
9↓ IMPERIAL
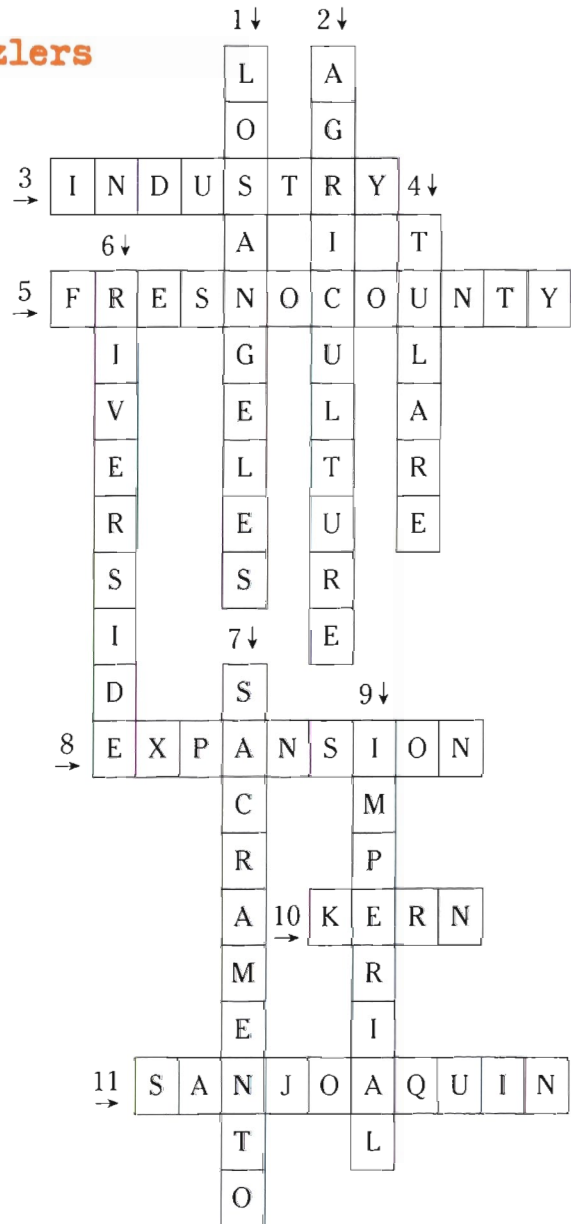
Managing California's Water

General Objectives

Upon completion of Section 6, the student will:

- be able to identify some of the major natural water systems in California.
- be able to identify some of the major artificial water delivery systems in California.
- understand some of the important relationships between California's water distribution and elevations, physical features, precipitation, population, and economy (agriculture and industry).
- understand the importance of managing water efficiently.

Materials Needed for "California Water Wheel" Activity (per student):

- Scissors
- One brass push-brad

Vocabulary

Before beginning study of Map #6, you may wish to introduce/review the following vocabulary.

- **aqueduct** – an artificial channel constructed to transport water
- **canal** – an artificial waterway for irrigation (smaller than an aqueduct)
- **delta** – a landform resulting from deposit of river sediment into a larger body of water (usually the ocean)
- **gravity** – force of attraction toward the center of the earth
- **managing water** – ability to meet the water needs of a state by regulating the use of all sources of water (i.e., imported water, groundwater, conserved water, reclaimed water and local runoff)
- **reservoir** – a place where water is collected and stored
- **water delivery systems** – canals and aqueducts built to move water from where it falls to where it is needed

Guided Questions

Note: These questions are intended for discussion and hypothesizing as a way to get the students thinking about the map before they begin the actual study.

Question: *Look at Map #6. Are most of the large natural rivers located in Northern, Central or Southern California?*

Answer: Most of the large natural rivers in California are located in the northern and central parts of the state.

Question: *Look at Map #4. Since most of California's population is located in the southern half of the state where there are few rivers and very little precipitation, how does this region maintain adequate supplies of water?*

Answer: Southern California has to "import" much of its water in aqueducts and canals as illustrated in Map #6. Additionally, there is a combined effort to manage a variety of water sources such as imported water, groundwater, conserved water, reclaimed water and local runoff.

Question: *Map #4 also shows that there are relatively large populations around the San Francisco Bay area. Where does this region get adequate supplies of water?*

Answer: They also have to "import" much of their water through aqueducts, and be aware of managing water efficiently. All the large urban areas in California, except Sacramento, have to import their water from other areas.

Notes to the Teacher

The primary purpose of this map is to illustrate California's major natural water systems and the major artificial systems which collect, transport and deliver water to areas of need. Study of this map will make clear to students how agriculture, industry and large populations can be sustained even in some of the state's driest areas.

Not all of the state's water delivery systems are illustrated on Map #6. The California Aqueduct is shown, but other portions of the State Water Project (such as the North and South Bay Aqueducts) are not. Federal projects such as the Delta/Mendota Canal and the Friant Kern Canal (both parts of the federal Central Valley Project) are not shown, but they do serve some of the counties mentioned in Map #5.

This is the culminating map of the series. The student's attention should be drawn to the relationships among the state's elevations, physical features, precipitation levels, large population centers, center of agriculture and industry, and water systems (both natural and artificial). Students should also become aware of the fact that much of their water is imported and that they are responsible for using water wisely and efficiently.

Extensions

- **Conduct a class discussion.** Lead your class in a discussion asking them to imagine that all of the artificial water delivery systems were magically erased from Map #6. How would the disappearance of those systems affect your county or local area? How would they affect the entire state? What would happen to the population? What would happen to agriculture and/or industry in the area? How would your daily life be affected?
- **Investigate population growth.** Ask students to research why the population of Southern California grew and why it continues to grow. What resources are available that draw people to this region? Students might look at what types of jobs are available and where these jobs are located. Ask students to draw their own map of California showing where industries with high rates of employment are located.
- **Review newspaper articles.** Ask students to check their local newspaper for articles that address water-related issues. Have them write a brief summary of the article and attach the actual article to the written summary. Ask students to underline or highlight the interest groups or stakeholders identified in the article. You might also ask students to do an oral report on the article.
- **Compose a class letter.** Address a letter to your local water agency asking each student to contribute to the letter by posing questions he or she would like to have answered. Such questions or topics might include: Where does our water come from? How does the water get to our homes or school? Who makes sure the water is safe to drink? Will we always have enough water? What are some ways to conserve water? What percent of the water in our area is used for agriculture? Industry? Residential use? Is reclaimed water being utilized in our area?
- **Take a field trip.** Arrange a field trip to your local water agency, filtration plant or reclamation facility.
- **Efficient Water Management.** Ask students to create a list of ways they can help make better use of the water we have. What are things they can do at home or at school to use water wisely?
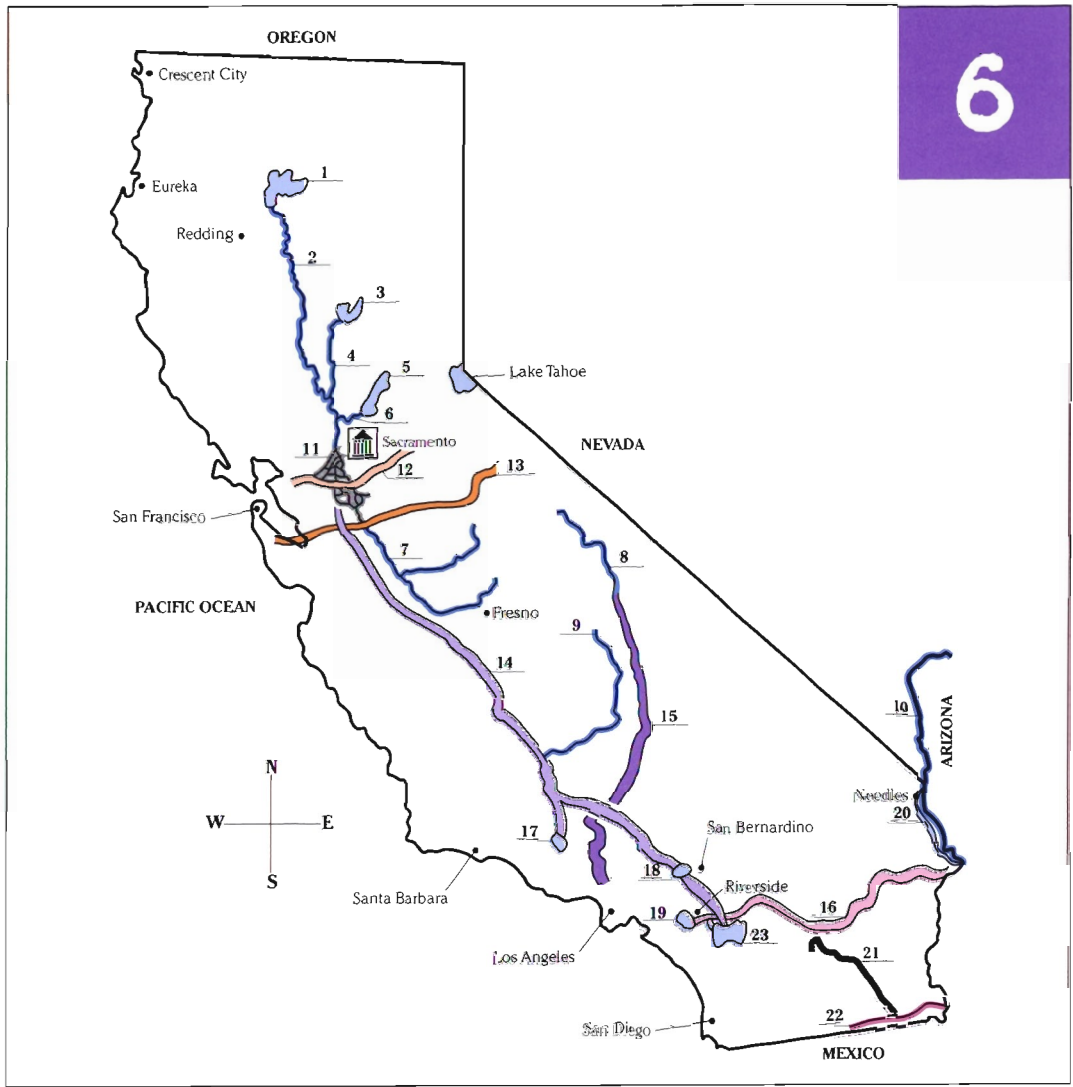
1. Lake Shasta
2. Sacramento River
3. Lake Oroville
4. Feather River
5. Folsom River
6. American River
7. San Joaquin River
8. Owens River
9. Kern River
10. Colorado River
11. The Delta
12. Mokelumne Aqueduct
13. Hetch Hetchy Aqueduct
14. California Aqueduct (State Water Project)
15. Los Angeles Aqueduct
16. Colorado River Aqueduct
17. Castaic Lake
18. Lake Perris
19. Lake Mathews
20. Lake Havasu
21. Coachella Canal
22. All American Canal
23. Eastside Resevoir

Answer Key to Questions

I. Check students' maps to see if they have colored each item appropriately.

II. **A.** 3 – in the mountains at high elevations
B. 2 – the Pacific Ocean
C. 2 – gravity

III. **A.** 4 – the Cascade Range
B. 3 – Sierra Nevada Mountains
C. 3 – the Delta
D. 3 – San Francisco
E. 4 – Tehachapi Mountains
F. 2 – Owens Valley
G. 4 – Mojave Desert
H. east; west

3

IV. **A.**   2 – Mokelumne Aqueduct
      B.   3 – Lake Shasta
      C.   south; west

V. **A.**   Los Angeles Aqueduct, Colorado River Aqueduct, California Aqueduct (in any order)
      B.   1 – True
      C.   Alameda
      D.1. Columns should be colored (any color)
      D.2. 1900 = 2 million, 1930 = 5 million, 1960 = 15 million, 1990 = 30 million, 1997 = 32 million, 2020 (projection) 49 million.
      D.3. Answers will vary.

VI. **A.1.** a – Mokelumne Aqueduct
      A.2. d – Coachella Canal
      A.3. b – California Aqueduct
      A.4. c – All American Canal
      B.   Lake Mojave, Lake Mathews
      C.1. False
      C.2. True
      C.3. True
      C.4. False
      D.   Use Water Wisely

Water Wheel

The Water Wheel has been designed to give students the opportunity to review geographical similarities and differences between some of California's counties. (The counties were chosen in order to include Northern, Central, and Southern California counties.)

You may want students to challenge each other by creating their own trivia questions regarding the data on the wheel, or you may want to use it to review important similarities and differences of regions within the state with an emphasis on available water supply.

You may also want to create your own water wheel using counties of your choice.

Additional Educational Resources

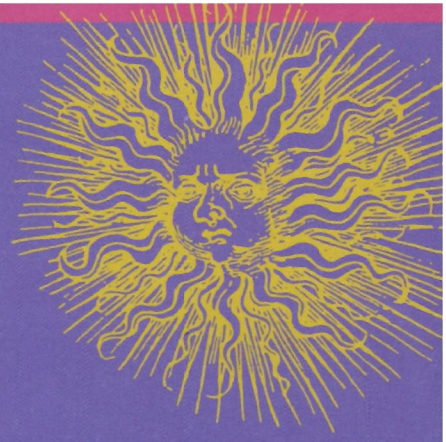Many supplemental items are available from Metropolitan Water District which will enhance and enrich the study of this entire unit in general and Map #6 in particular.

For additional information write to:

Education Programs
Metropolitan Water District of Southern California
Box 54153
Los Angeles, CA 90054

Or call: (213) 217-6926.

The Geography of Water

Water

34°N 118°W

Teacher
Introduction

Dear Educator:

Thank you for incorporating Geography of Water into your curriculum. This packet contains six segments which include important geographic themes as they relate to the geography of California. This unit centers around the use of maps to provide visual representation of the spatial distribution of various aspects of our state (i.e. landscape, water availability, population, industry, agriculture). These map exercises will assist your students with understanding where things are, and can provide clues as to why such distributions occur. These exercises will also help them identify state and regional patterns of natural and human environments that impact life in California.
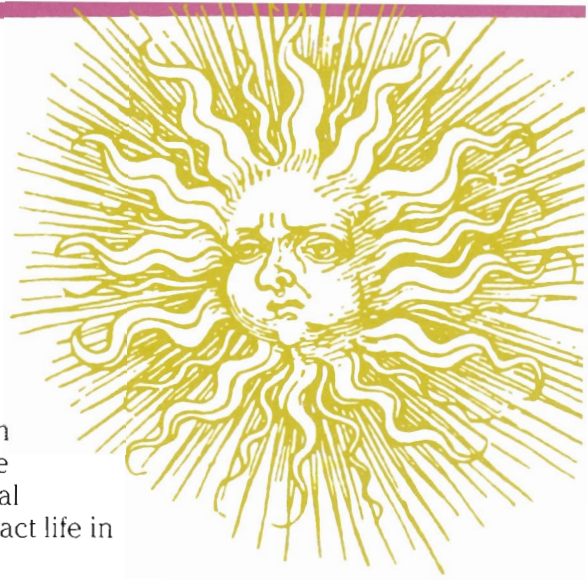
This Geography of Water unit is offered by Education Programs of the Metropolitan Water District of Southern California as a tool to teach students about the importance of water in the development, growth and sustainability of our state. Southern California is a semi-arid environment whose inhabitants and economy could not survive without the efficient management of all water sources (imported water, groundwater, conserved water, reclaimed water and local runoff). Metropolitan Water District provides more than 60 percent of the water used in Southern California.

In addition to the map exercises, there are "Extension" activities included in the Teacher Guides for each section. These are intended to be suggestions for further geographic and water-centered lessons.

Getting started: The left side of the folder contains Teacher Guides, a map of California's Water Resources and a Hydrologic Cycle poster. The right side of the folder contains the reproducible materials for your students. The following briefly explains the six sections of this packet (see individual Teacher Guides for further explanation).

Section 1: Elevations and Directions – identification of state elevations, cardinal directions.
Section 2: Physical Features – identification of mountains and valleys; physical differences between Northern, Central and Southern California.
Section 3: Precipitation – identification of "wet" and "dry" areas of state.
Section 4: Population – distribution of state's population.
Section 5: Industry and Agriculture – location of industry and agriculture within the state.
Section 6: Managing California's Water – identification of artificial water delivery systems, relationship to location of population, industry and agriculture.

The following table provides a brief outline of how this material meets the National Geography Standards.

Should you have any questions about this packet, please call Metropolitan Water District, Education Programs at (213) 217-6398.

Correlation to National Geography Standards

National Geography Standard	Application	Link to Water Resources
The World in Spatial Terms • Using maps to report information from a spatial perspective • Analysis of the spatial organization of people, places, and environments	Maps are used in each segment to show spatial distribution of precipitation, population, industry, etc.	Spatial organization of people and places have a direct correlation to the availability of water.
Places and Regions • Relationship between physical and human characteristics of places • Perception of places and regions	Regional differences of population, precipitation, industry, and agriculture are explored between Northern, Central and Southern California.	Areas with abundant water supplies do not always have higher populations, due to climatic preferences, availability of jobs and housing, etc.
Physical Systems • Physical processes shaping the patterns of earth's surface	Physical features of the state are explored in relationship to population, industry and agriculture.	Rainfall totals are compared between Northern, Central and Southern California in relation to population distribution, industry and agriculture.
Human Systems • Distribution of human populations • Patterns of economic interdependence on earth's surface • Spatial patterns of human settlement	Maps facilitate student learning of distribution of state's population, industry and agriculture.	Climate is an important determinant of population distribution; however, natural resources must be managed to support those populations.
Environment and Society • Human modification to physical environment • How physical systems affect human systems • Distribution and use of resources	Populations can be supported, despite limited precipitation, by moving and storing water.	Movement of water has lead to agricultural and industrial activities which change the physical environment.
The Uses of Geography • Understanding the past • Changing spatial organization over time	Perceptions contribute to population distribution.	More people live in drier Southern California than wetter Northern California, even though water availability is not as great.

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

P.O. Box 54153
Los Angeles, CA 90054-0153
(213) 217-6000
http://www.mwd.dst.ca.us

Education Programs Email
rdonnelly@mwd.dst.ca.us

Mission Statement
The mission of The Metropolitan Water District of Southern California is to provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way.

Elevations & Directions

OREGON

Crescent City

2

3

3

2

3

Eureka

3

3

3

Redding

2

3

1

3

3

Lake Tahoe

Sacramento

3

NEVADA

2

San Francisco

2

PACIFIC OCEAN

1

2

Fresno

3

3

1

N

W — E

S

2

3

Santa Barbara

San Bernardino

3

1

Needles

ARIZONA

2

Los Angeles

Riverside

3

2

1

2

San Diego

1

MEXICO

Elevations

3		5,000 feet and over
2		500 to 5,000 feet
1		Under 500 feet

map

1
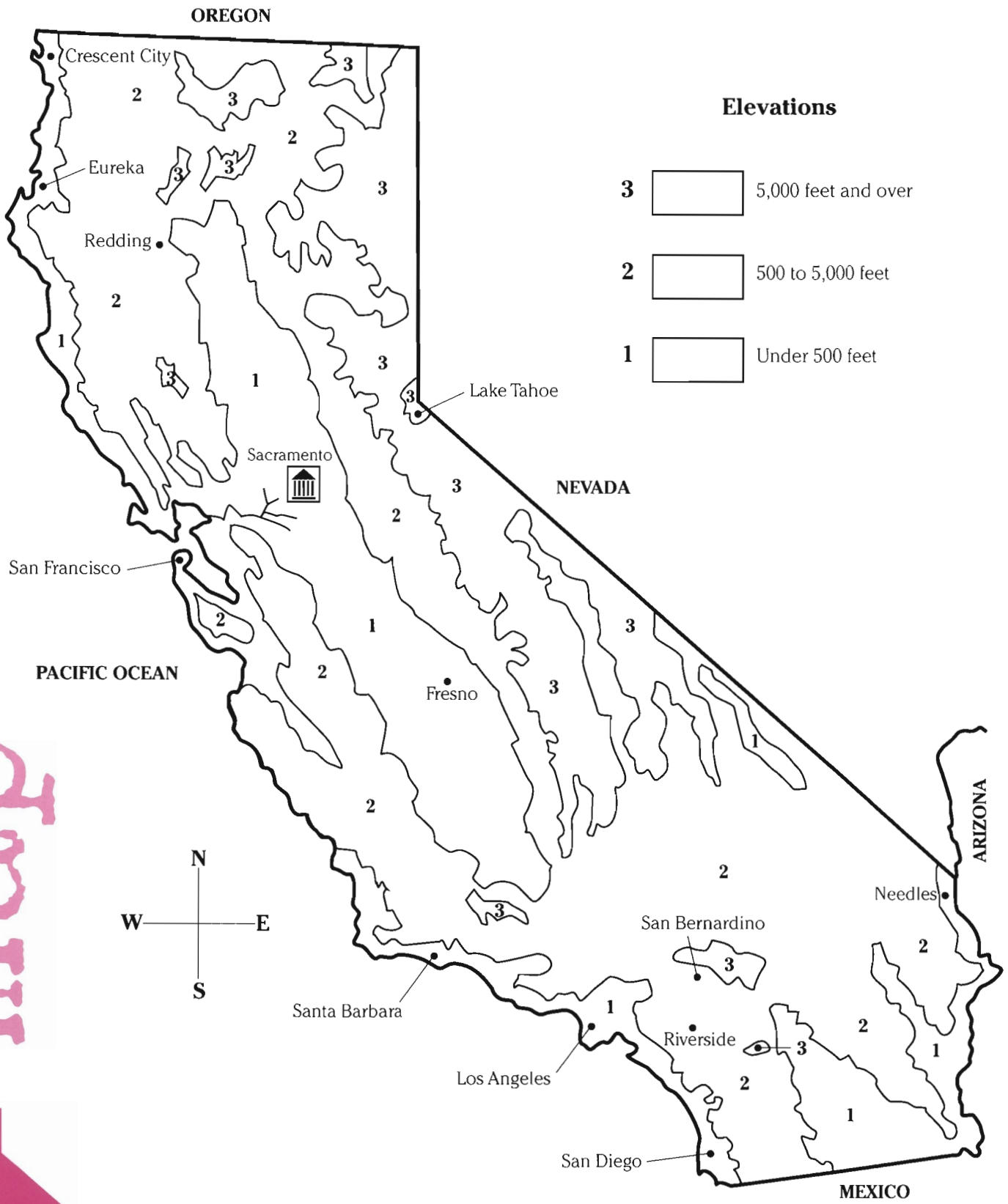
questions

?

Map #1 will help you learn many things about your state. Look carefully at the map and you will see some cities in California. You will also see the directions: north, south, east and west, the numbers 1, 2, 3 scattered all over the state, and a legend (or key) with boxes numbered 1 through 3 with elevations (where the mountains and valleys are located).

I. Using crayons, colored pencils or markers, color in the areas of the map as follows:

    1. all areas labeled "1" and box #1 (under 500 feet) color white or leave blank

    2. all areas labeled "2" and box #2 (500 to 5,000 feet) color light pink

    3. all areas labeled "3" and box #3 (5,000 feet and over) color dark pink

When you are finished, use the map to do the activities and answer the questions below.

II. Look carefully at the arrows on your map which show the cardinal directions: north, south, east and west. Answer the following questions. (Circle the number of the answer you choose).

    A. I live in:

        1. The northern part of California

        2. The central part of California

        3. The southern part of California

    B. To the west of California is:

        1. Nevada

        2. Arizona

        3. the Pacific Ocean

        4. Oregon

    C. Lake Tahoe is mostly:

        1. north of Los Angeles

        2. south of Los Angeles

        3. east of Los Angeles

    D. Fill in the blanks with "north," "south," "east" or "west":

        1. If I want to go the mountains, I have to go _____.

        2. If I want to go the beach, I have to go _____ or _____.

        3. If I want to go to Mexico, I have to go _____.

        4. If I want to go to Arizona, I have to go _____.

questions

?

E. If I took a bus from Los Angeles to Riverside, I would be going mostly:
   1. from east to west
   2. from north to south
   3. from west to east
   4. from south to north

F. If I got in a boat and sailed north along the California coast, I could get to:
   1. Mexico
   2. Nevada
   3. Arizona
   4. Oregon

III. With your teacher's help, use a more detailed map of California or an atlas to locate the city where you live.

A. On your own copy of the map of California, draw a star (*) in the exact location of your city and write the name of your city next to the star.

B. Find the latitude and longitude of your city (to the nearest degree) and write the answer below:

_____° latitude   _____° longitude

IV. Look carefully again at the arrows which show the cardinal directions: north, south, east and west. These arrows also help you find "secondary" directions. For example:

The direction between the N and the E is **northeast**.
The direction between the S and the E is **southeast**.
The direction between the S and the W is **southwest**.
The direction between the N and the W is **northwest**.

Use this information to answer the following questions.
(Circle the number of the answer you choose.)

A. San Francisco is:
   1. northwest of Eureka
   2. northeast of Eureka
   3. southwest of Eureka
   4. southeast of Eureka

   B. Lake Tahoe is:
- **1.** northwest of Fresno
- **2.** northeast of Fresno
- **3.** southwest of Fresno
- **4.** southeast of Fresno

   C. San Diego is:
- **1.** northeast of Los Angeles
- **2.** west of Los Angeles
- **3.** northwest of Los Angeles
- **4.** southeast of Los Angeles

V. Look carefully at the map legend for elevations which show where mountains and valleys are located. Answer the following questions. (Circle the number of the answer you choose.)

   A. Most of the tallest mountains in California are located in:
- **1.** the southwest
- **2.** the southeast
- **3.** the northeast
- **4.** the northwest

   B. In California, snow falls mostly in the mountains at high elevations. In winter, there is probably more snow in:
- **1.** Northern California
- **2.** Southern California

   C. When the snow melts, there is probably more water in:
- **1.** Northern California
- **2.** Southern California

   D. Since most of our surface water comes from rain and snow which runs off of mountains, the driest part of California is probably:
- **1.** the northeastern part
- **2.** the northwestern part
- **3.** the southeastern part
- **4.** the southwestern part

questions

E. Complete the table below by grouping the cities on the map by their elevations.

Under 500 feet	500 to 5,000 feet	5,000 feet and over
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

VI. Study Map #1 to complete the following exercises.

A. Take a trip! Plan a trip from your city to Lake Tahoe. You have to walk, so draw little blue dots on your map to show your footsteps as you travel. Remember, it's hard and tiring to walk over mountains, so go around them whenever you can...or at least go over the lowest parts.

B. Take a trip to Needles following the same instructions as above (use red dots for this trip).

C. Take a trip to Oregon following the same instructions as above (use green dots for this trip).

D. Choose the trip you enjoyed the most (from question A, B or C) and write a paragraph describing the other cities you passed, elevations, and the direction you traveled (use a separate piece of paper for your answer.)

?

1

Elevations & Directions

puzzlers

A. Unscramble the names of these California cities:

1. CROTASNEMA _____
2. TASNA RABRABA _____
3. NAS GIDEO _____
4. SNA NICACOFRS _____
5. SOL SEEGNAL _____
6. KAEERU _____

B. Now, arrange the unscrambled cities in order from North to South.

1. _____ NORTH
2. _____
3. _____
4. _____
5. _____
6. _____ SOUTH

C. Unscramble the names of these places which are located to the North, South, East and West of California:

1. NOZIARA _____
2. NOGORE _____
3. DENAVA _____
4. COXEMI _____
5. FAPCICI NEOCA _____

D. Now arrange the unscrambled places according to whether they are North, South, East or West of California:

1. EAST _____ and _____
2. SOUTH _____
3. NORTH _____
4. WEST _____

OREGON

Crescent City

14

3

Eureka

Redding

4

19

15

22

San Francisco

San Francisco Bay

PACIFIC OCEAN

Sacramento

1

NEVADA

24

5

18

6

16

Fresno

13

20

21

7

25

Needles

N
W   E
S

8

9

10

San Bernardino

Santa Barbara

11

Riverside

12

Los Angeles

23

17

San Diego

ARIZONA

MEXICO
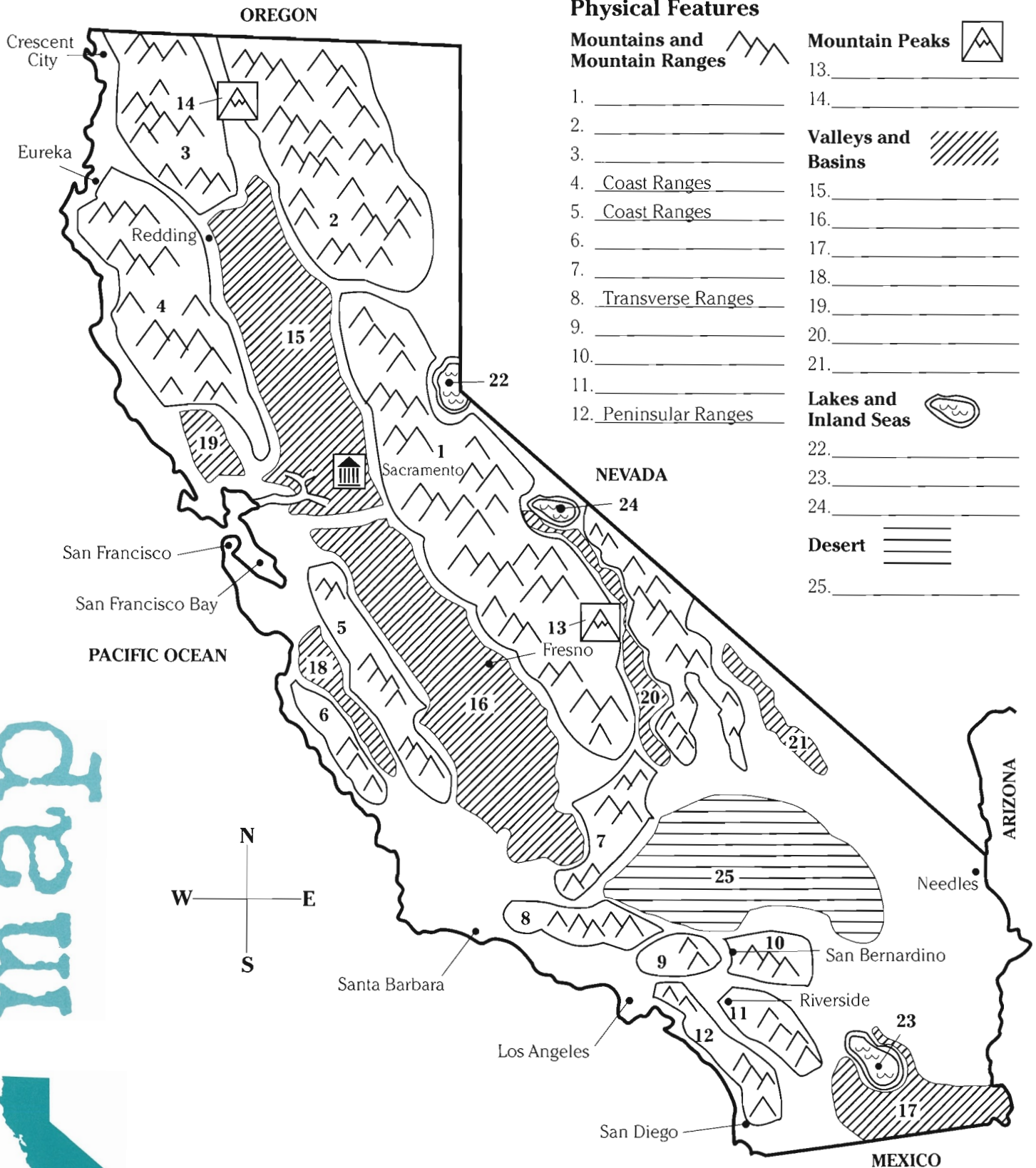
Physical Features

Mountains and Mountain Ranges

1. _____
2. _____
3. _____
4. Coast Ranges
5. Coast Ranges
6. _____
7. _____
8. Transverse Ranges
9. _____
10. _____
11. _____
12. Peninsular Ranges

Mountain Peaks

13. _____
14. _____

Valleys and Basins

15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____

Lakes and Inland Seas

22. _____
23. _____
24. _____

Desert

25. _____

map
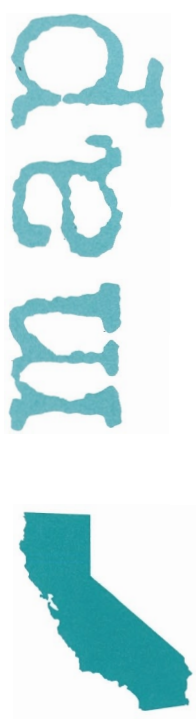
Physical Features

With Map #1, you learned where California is in relation to Oregon, Nevada, Arizona, Mexico and the Pacific Ocean. You also learned where some of California's cities are in relation to one another. And, you learned where California's major mountains and valleys are located (elevations). Now, you are ready to learn the names of some of California's important physical features.

I. On Map #2, you will find the numbers 1 through 25 scattered all over the state. You will also see five different symbols:

    means these features are mountain ranges

    refers to mountain peaks

    shows valleys and basins

    refers to lakes & inland seas

    shows deserts

Using crayons, colored pencils or markers, color in the areas of the map as follows:

1. all areas labeled " " (mountains & mountain ranges) color light orange

2. all areas labeled " " (valleys & basins) color light green

3. all areas labeled " " (lakes & inland seas) color light blue

4. all areas labeled " " (deserts) color light gray

When you are finished coloring, look at the following list of physical features (this list is not in order, but it will help you identify the items in an atlas and on your map).

Salton Sea	San Bernardino Mountains
Peninsular Ranges	Owens Valley
Transverse Ranges	Cascade Range
Sacramento Valley	Coast Ranges (1)
Mono Lake (Mōno)	Coast Ranges (2)
Mount Whitney	Santa Lucia Mountains
Death Valley	Salinas Valley
Sierra Nevada Mountains	Mount Shasta
San Joaquin Valley	Mojave Desert
Lake Tahoe	Klamath Mountains

Physical Features

Imperial Valley   Tehachapi Mountains
Napa Valley   San Gabriel Mountains
San Jacinto Mountains

Using an atlas, identify the numbered features on Map #2 and fill in the blanks with the correct names of the physical features. To help you get started, the names of four mountain ranges have already been filled in. When you have finished filling in the blanks, you will be able to answer the questions in Parts II through V.

II. Use your completed map to answer the following questions.
(Circle the number of the answer you choose.)

    A. California's major desert area is located:
        1. in Northern California
        2. in Central California
        3. in Southern California
        4. on the coast

    B. Mono Lake is located at the northern end of _____ Valley.

    C. There are two large valleys in Central California. One is northeast of San Francisco; it is called the _____ Valley. The other is southeast of San Francisco; it is called the _____ Valley.

    D. The Salton Sea is located in:
        1. Imperial Valley
        2. Owens Valley
        3. San Joaquin Valley
        4. Sacramento Valley

III. Look carefully at the mountains and valleys on your completed map and answer the following questions.

    A. List the mountain ranges surrounding the San Joaquin Valley.

    _____   _____   _____

    B. Which mountain peak is at the northern end of the Sacramento Valley?

    _____

    C. The Owens Valley is on the southeastern side of the:
        1. Sierra Nevada Mountains
        2. San Jacinto Mountains
        3. San Gabriel Mountains
        4. Peninsular Ranges

D. With the help of your classroom atlas, find the highest and lowest physical features in California. Write the name and elevation in the spaces below:

Highest Physical Feature _____ Elevation _____

Lowest Physical Feature _____ Elevation _____

E. Complete the table below using your classroom atlas. Find the latitude and longitude of the following features (to the nearest degree):

	Latitude	**Longitude**
San Gabriel Mountains		
Mount Shasta		
Mono Lake		

IV. Compare Map #2 with Map #1 and answer the following questions. (Circle the number of the answer you choose.)

A. Sacramento Valley, San Joaquin Valley and Imperial Valley are all located at elevations of:
  1. 5,000 feet and over
  2. 500 to 5,000 feet
  3. under 500 feet

B. The Sierra Nevada Mountains reach elevations of more than 5,000 feet.
  1. True
  2. False

C. The Coast Ranges generally reach elevations of:
  1. Under 500 feet
  2. 500 to 5,000 feet
  3. 5,000 feet and over

D. Salinas Valley and Napa Valley are both:
  1. over 500 feet in elevation
  2. under 500 feet in elevation
  3. 500 to 5,000 feet in elevation
  4. over 5,000 feet in elevation

E. Since water runs downhill (from higher elevations to lower elevations), the "runoff" of rain and melted snow from the southeastern side of the Sierra Nevada Mountains probably flows into:

1. Sacramento Valley
2. Owens Valley
3. Napa Valley
4. Salinas Valley

F. Much of California's water supply comes from melting snow which runs off of the highest mountains and down into the lowest valleys. Which of the cities below do you think receives the most water from surface runoff from nearby mountains?

1. San Diego
2. San Francisco
3. Sacramento
4. Los Angeles

V. Look carefully at your completed Maps #1 and #2 and answer the following questions.

A. Use the list below to complete the table. Group these physical features according to their location in either Northern California, Central California or Southern California.

Cascade Range, San Bernardino Mountains, Lake Tahoe, Salton Sea, Napa Valley, San Joaquin Valley, Tehachapi Mountains, Mojave Desert

Northern California	Central California	Southern California

5

Physical Features

B. Using the answers in A - E below, fill in the blanks in the sentences by writing the correct letter in each space.

1. Sacramento, the state capital of California, is located _____.

2. Lake Tahoe is located _____.

3. San Francisco is located _____.

4. Santa Barbara is located _____.

5. The Salton Sea is located _____.

6. San Diego is located _____.

7. Mount Shasta is located _____.

8. Fresno is located _____.

A. in a valley in Central California
B. in a valley in Southern California
C. near the coast of Southern California
D. near the coast of Northern California
E. in the mountains in Northern California

Physical Features

KEY: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

A. Use the key above to break the code and complete the following sentences.

1. In Southern California there is a large dry area called the:

___ ___ ___ ___ ___ ___   ___ ___ ___ ___ ___ ___
13 15 10 1   22 5   4   5   19 5   18 20

2. The highest temperature ever recorded in the United States, 134 degrees Fahrenheit, was registered in:

___ ___ ___ ___ ___   ___ ___ ___ ___ ___ ___
4   5   1   20 8   22 1   12 12 5   25

3. California's tallest mountain is 14,495 feet high and is known as:

___ ___ ___ ___ ___   ___ ___ ___ ___ ___ ___ ___
13 15 21 14 20   23 8   9   20 14 5   25

4. The largest "saline" lake (a lake with salty water) in California is the:

___ ___ ___ ___ ___ ___   ___ ___ ___
19 1   12 20 15 14   19 5   1

B. Use the key to write your own map-related decoder message.

C. Use the legend from Map #2 to find the names of the seven valleys and basins in this word search. The names might be found across, backwards, up and down, or diagonal.

```
S  S  D  G  K  H  T  A  E  D
T  A  J  D  O  U  B  C  L  E
H  N  C  S  T  W  Z  A  I  S
F  J  G  R  L  G  I  F  M  A
A  O  I  T  A  R  N  Q  E  N
R  A  B  Y  E  M  Z  K  U  I
I  Q  S  P  H  B  E  C  G  L
E  U  M  U  A  P  A  N  O  A
W  I  X  I  J  C  D  P  T  S
A  N  Z  O  V  S  N  E  W  O
```

map

OREGON

Crescent City

Eureka

Redding

5
5
5
3
2
1
2
3
1
2
1
1
1
3
4
3
2
4
3

San Francisco

Lake Tahoe

Sacramento

NEVADA

1
2
4
3
2

PACIFIC OCEAN

Fresno

3
2
1
3
4
2
2

N
W   E
S

Santa Barbara

Los Angeles

San Bernardino

Riverside

San Diego

Needles

ARIZONA

MEXICO

Average Annual Precipitation
(Rain & Snow)

5		90" to 120"
4		30" to 90"
3		20" to 30"
2		10" to 20"
1		0" to 10"

Metropolitan Water District of Southern California
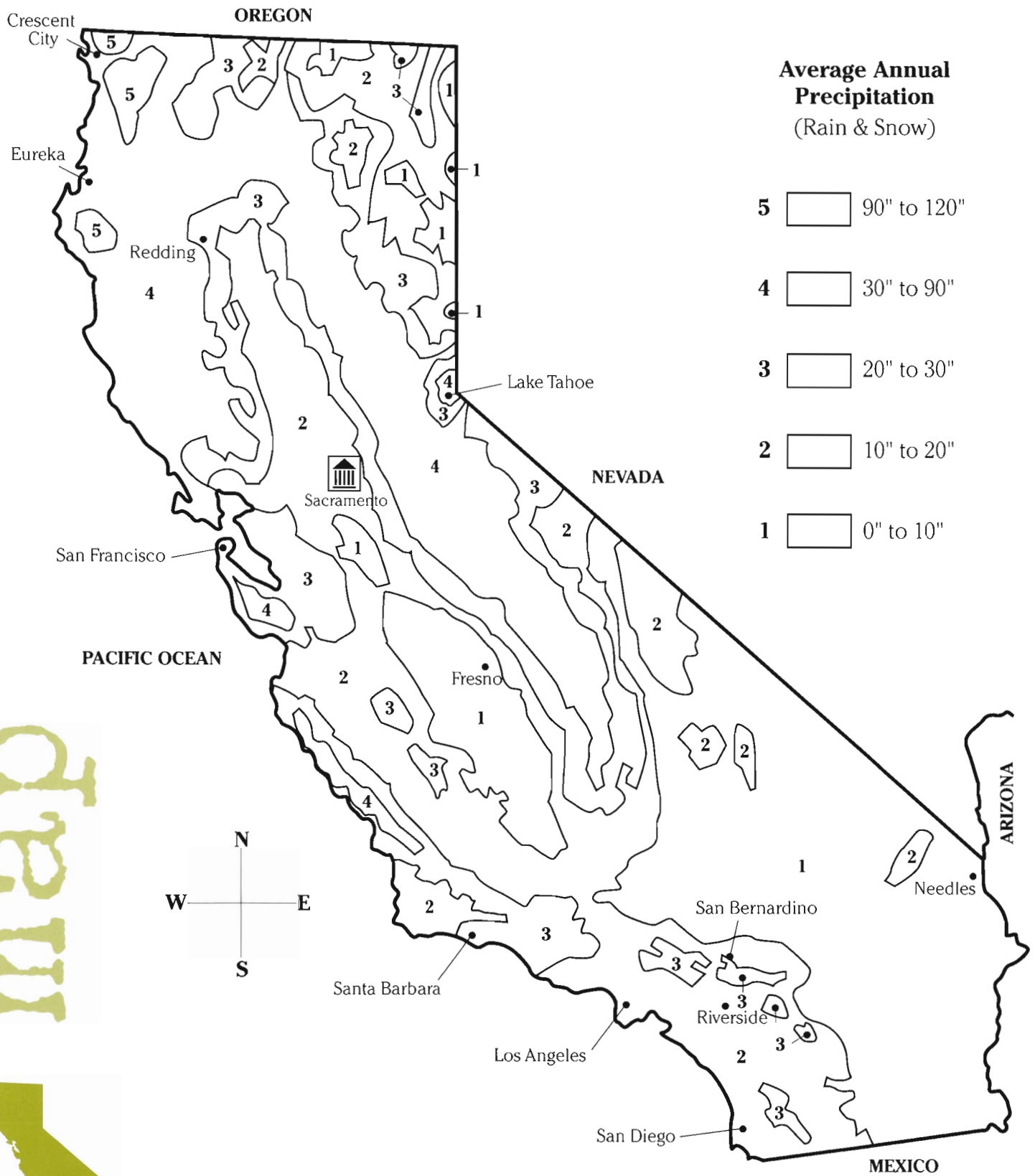
Precipitation

Now that you have learned some things about California's location and physical features from Maps #1 and #2, you are ready to learn about precipitation in our state. "Precipitation" (PREE-SIP-UH-TAY-SHUN), refers to moisture which falls to the earth. It can be rain, snow, sleet, hail or even mist. Different amounts of precipitation fall on different parts of our state.

I.   On Map #3, you will find the numbers 1 through 5 scattered all over the state. You will also find a legend (or "key") with boxes numbered 1 through 5 and amounts of precipitation (in inches). Using crayons, colored pencils or markers color in the areas of the map as follows:

   1.   all areas labeled "1" and box #1 (0" to 10") color white or leave blank
   2.   all areas labeled "2" and box #2 (10" to 20") color light green
   3.   all areas labeled "3" and box #3 (20" to 30") color dark green
   4.   all areas labeled "4" and box #4 (30" to 90") color light blue
   5.   all areas labeled "5" and box #5 (90" to 120") color dark blue

When you have completely colored the map, you will have a clear idea of where different amounts of precipitation fall in our state over the period of one year.

II.   Use your finished map to answer the following questions.
(Circle the number of the answer you choose.)

   A.   Most of California's rain and snow falls in the:
      1.   southeast
      2.   northwest
      3.   southwest

   B.   California's largest "dry" area is in the:
      1.   northeast
      2.   southwest
      3.   southeast

   C.   How much precipitation does the region from San Francisco to the Oregon border receive per year?
      1.   0" to 10"
      2.   10" to 20"
      3.   20" to 30"
      4.   30" to 90"

2   Metropolitan Water District of Southern California

questions

D. Precipitation amounts in the region between Los Angeles and the Mexican border are about:
  1. 10" to 20" per year
  2. 20" to 30" per year
  3. 30" to 90" per year
  4. 90" to 120" per year

E. Complete the table below by filling in the amount of average annual precipitation received by each city.

City	Average Annual Precipitation (")
Eureka	
Crescent City	
Redding	
Lake Tahoe	
Sacramento	
San Francisco	
Fresno	
Santa Barbara	
Los Angeles	
San Bernardino	
Riverside	
San Diego	
Needles	

F. Now make a new list. This time list the cities in order of the amounts of precipitation received yearly. List the cities with the highest amounts of precipitation first then down to the lowest amounts. (Some cities will have the same amount of precipitation; in this case, list those cities in alphabetical order.)

III. Compare Maps #1, #2 and #3 in order to answer the following questions. (Circle the number of the answer you choose.)

    A. Most of the rain and snow in California falls:
        1. in the valleys
        2. on the mountains
        3. in the desert
        4. on the southern coast

    B. Of the mountain ranges listed below, the one which receives the most precipitation is the:
        1. Tehachapi Mountains
        2. San Bernardino Mountains
        3. Sierra Nevada Mountains
        4. Peninsular Ranges

    C. Which of the valleys listed below receives the least amount of precipitation per year?
        1. Napa Valley
        2. Sacramento Valley
        3. San Joaquin Valley
        4. Salinas Valley

IV. Continue to use Maps #1, #2 and #3 to answer the following questions. (Circle the number of the answer you choose.)

    A. The "wettest" city shown on Map #3 is:
        1. Sacramento
        2. Los Angeles
        3. San Diego
        4. San Francisco

    B. In order to send water in an aqueduct from the wettest part of the state to the driest part of the state, you would send it:
        1. from east to west
        2. from north to south
        3. from west to east
        4. from south to north

questions

?

C. Since water runs downhill and finally out to the ocean, most of the runoff from the northeastern part of California flows down into the Sacramento Valley and runs out to sea near:
1. San Diego
2. Los Angeles
3. San Francisco
4. Riverside

D. If you lived in San Francisco and needed a lot of water, the nearest place to find it would be:
1. the Sierra Nevada Mountains
2. the San Joaquin Valley
3. the Sacramento Valley
4. Death Valley

E. If you were a farmer, the place where precipitation (instead of irrigation) would be most likely to water your crops would be:
1. Imperial Valley
2. San Joaquin Valley
3. Sacramento Valley
4. Death Valley

V. Compare Maps #2 and #3. Complete the chart by coloring the columns (bars) according to amount of rainfall by location. (Color the columns the same as the legend on your map; for example 0" to 10" would be colored white or left blank).

Bar chart — Inches of Precipitation (y-axis 0 to 120):
- Sierra Nevada Mountains: 90
- Mojave Desert: ~9
- Sacramento Valley: 20
- Klamath Mountains: 120
- San Gabriel Mountains: 30
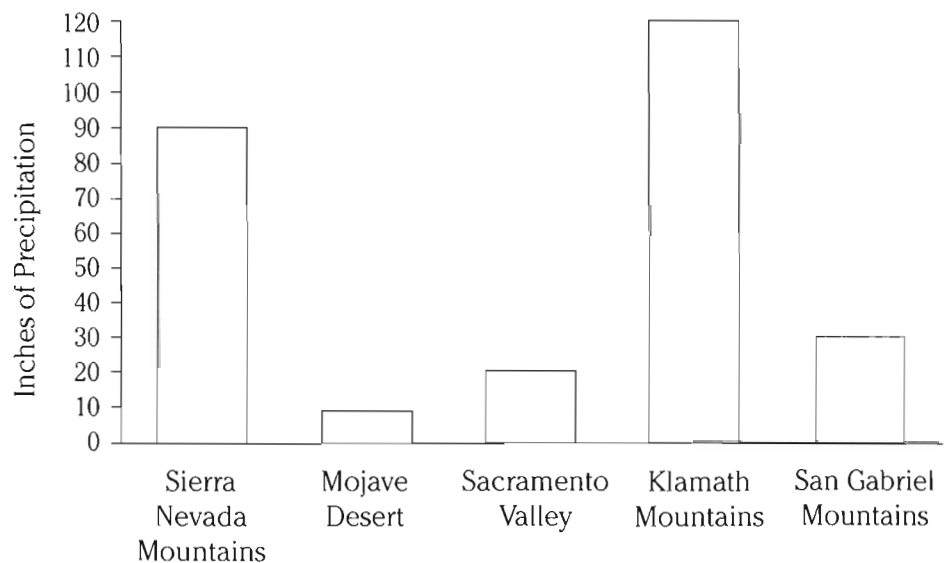
Precipitation

Use Maps #1, #2 and #3 and A through E below to complete the paragraphs. Be sure to use information from all of the maps (including elevation, location, precipitation).

1. The San Joaquin Valley is located between the_____ to the east and the Coast Ranges to the _____. The elevation of the _____ is _____. This location receives between _____ of precipitation each year.

2. _____ is a coastal city just _____ of the Mexican border. This city receives an average of _____ of precipitation each year.

3. Sacramento is located _____ of San Francisco. The elevation of this city is _____, and the average annual precipitation is _____.

4. The elevation of the _____ is 500 to 5,000 feet. Parts of this mountain range receive between _____ of annual precipitation. The Oregon border is _____ of these mountains and the Cascade Ranges are located to the _____.

5. Lying near the California/Nevada border is _____. Just _____ of the Owens Valley, this lake lies at an elevation of _____.

    Use A through E to fill in the blanks above.
    A. Mono Lake
    B. Sacramento
    C. San Diego
    D. San Joaquin Valley
    E. Klamath Mountains

OREGON

Modoc

Trinity

Sierra

Colusa

Sacramento

Alpine

NEVADA

Mono

Mariposa

Alameda

Santa Clara

PACIFIC OCEAN

Inyo

ARIZONA

San Bernardino

N

W — E

S

Los Angeles

Riverside

Orange

San Diego

MEXICO

California's Eight Most Populated Counties

Over 1 million	
Los Angeles	9,500,000
San Diego	2,700,000
Orange	2,600,000
Santa Clara	1,600,000
San Bernardino	1,500,000
Riverside	1,300,000
Alameda	1,300,000
Sacramento	1,100,000

California's Eight Least Populated Counties

Under 20,000	
Alpine	1,180
Sierra	3,360
Modoc	10,150
Mono	10,400
Trinity	13,400
Mariposa	16,000
Colusa	18,300
Inyo	18,350

* Source: California Department of Finance, Demographic Research Unit, 1997

map

Metropolitan Water District of Southern California

Population

In Maps #1, #2 and #3, you learned many important things about California's "physical geography." A state's climate and physical features influence where people choose to live within the state and the kinds of jobs and businesses which are found in various areas. Now you are ready to study California's "human geography" – that is, where the more than 32,000,000 people in our state choose to live.

I. The areas outlined and labeled on Map #4 show 16 of California's 58 counties. The map legend shows the state's eight **most** populated and eight **least** populated counties. Using crayons, colored pencils or markers, color the counties with populations over 1 million dark blue and the counties with populations under 20,000 light blue.

II. Use your finished map to answer the questions below:

A. How many of the **most** populated counties are in Southern California?

_____

B. How many of the least populated counties are in Northern and Central California?

_____

C. If you lived in the county on the map with the smallest population, you would live in _____ county.

D. If you lived in the county on the map with the largest population, you would live in _____ county.

E. Of the three Southern California counties listed below, which has the least population? (Circle the number of the answer you choose.)

1. San Diego County
2. Riverside County
3. Los Angeles County

F. About how many people live in the county where our state capital is located?

_____

Population

questions

III. Use the population information on Map #4 to come up with the correct figures to write in the spaces for the questions below.

A. About how many people live in these five Northern California counties combined? (Write the correct figures for each county in the spaces below and add them up.)

Sacramento County   _____

Alameda County   + _____

Santa Clara County   + _____

Modoc County   + _____

Trinity County   + _____

     = _____

B. About how many people live in these five Southern California counties combined? (Write the correct figures for each county in the spaces below and add them up.)

Los Angeles County   _____

San Bernardino County   + _____

Orange County   + _____

Riverside County   + _____

San Diego County   + _____

     = _____

C. Using your answers from question A (Northern California) and question B (Southern California), which statement is true?
     1. More people live in Northern California.
     2. More people live in Southern California.

D. If the total population of California is approximately 32,000,000 people and about 9,500,000 live in Los Angeles County, what percent of the total population of California live in Los Angeles County? (Complete the formula and fill in the blank.)

$$\frac{9,500,000}{32,000,000} = \underline{\qquad} \% \qquad \frac{9,500,000}{32,000,000} = 32 \overline{)9.50}$$

IV. Compare Map #4 with Maps #1, #2 and #3 to answer the following questions.

A. What is the elevation of the most populated Northern California county?

_____

Population

questions

B. Look at your answers to questions IIIA and IIIB. Find the Tehachapi Mountains on Map #2 and complete the following sentence: More than 1/2 of California's total population of about 32,000,000 people live:

1. north of the Tehachapi Mountains
2. south of the Tehachapi Mountains
3. east of the Tehachapi Mountains
4. on top of the Tehachapi Mountains

C. Together, Alameda County and Santa Clara County have a total population of about 2,900,000. These counties are in an area which usually receives about how much average annual precipitation?

1. 0" to 10"
2. 30" to 90"
3. 10" to 20"
4. 20" to 30"

D. Together, Los Angeles County, Orange County and San Diego County have a total population of about 14,800,000. These counties are all in a region which receives about how much average annual precipitation?

1. 10" to 20"
2. 0" to 10"
3. 20" to 30"
4. 90" to 120"

E. From the answers to questions "C" and "D" above, we can say that, in California, more people live:

1. where it is wet and rainy.
2. in the high mountains.
3. near the state capital.
4. in regions with less precipitation.

V. Use an atlas to answer the following question:

A. Located in Mono County lies a lake with the same name. Use your atlas to find the latitude and longitude of Mono Lake (to the nearest degree).

_____ ° latitude   _____ ° longitude

Population

"Where in California are you?"

The following paragraphs describe some of the counties shown on Map #4. Read each description carefully and use the information from Maps #1, #2, #3 and #4 to fill in the blanks.

1. Situated between the Sierra Nevada Mountains to the east and the San Francisco Bay area to the southwest, this county offers a pleasant climate with only 10" to 20" of precipitation each year. With a population of about 1,100,000 people, this is an exciting county to live in because the state capital is located here.

   I'm in _____ **County.**

2. Located on the Southern California coast, this county ranges in elevation from under 500 feet to about 5,000 feet. The landscape includes beautiful beaches to the southwest and the San Gabriel Mountains to the northeast. Precipitation in this county averages only 10" to 20" per year. With a population of about 9,500,000 people, this county offers a wide range of employment, entertainment and cultural opportunities.

   I'm in _____ **County.**

3. Located in the north corner of California, this county shares a border with Oregon and Nevada. Elevation in this county ranges from 500 feet to over 5,000 feet. Precipitation also varies greatly with areas receiving from 0" to 30" per year. The population of this county is only about 10,150 people.

   I'm in _____ **County.**

4. The eastern half of this Southern California county receives 0 to 10 inches of annual precipitation, and the western half receives 10" to 20". This county reaches all the way from the San Jacinto mountains in the west to the Arizona border in the east, and the northern tip of the Salton Sea is located here. This is a fast-growing county with a population of about 1,300,000 people.

   I'm in _____ **County.**

4 **puzzlers** **!**

5. Sharing a border with Mexico, this county's landscape includes many beautiful beaches. About 2,700,000 people make their home in this county. The elevation is below 500 feet and annual precipitation is between 10" to 20".

    I'm in _____ County.

6. This county touches the southern tip of the San Francisco Bay, and is north of the Salinas Valley and west of the San Joaquin Valley. Elevations range from under 500 feet to 5,000 feet. Annual precipitation is between 20" to 30". About 1,600,000 Californian's live in this county.

    I'm in _____ County.

Industry & Agriculture

OREGON

Industrial Expansion*

The counties listed below have the fastest growing industries:

1. Los Angeles (fastest growing)
2. Orange
3. Santa Clara
4. San Diego
5. San Bernardino
6. Riverside
7. Kern
8. Alameda
9. Sacramento
10. Contra Costa

* These counties are listed in order

Source: California Department of Commerce, 1997

Agriculture**

The counties listed below have the biggest agricultural production:

Stanislaus
Imperial
Tulare
Riverside
Monterey
Kern
San Joaquin
San Diego
Merced
Fresno

** These counties are **not** listed in order

Source: California Department of Food and Agriculture, 1996

NEVADA

Sacramento

Contra Costa

San Joaquin

Stanislaus

Alameda

Santa Clara

Merced

PACIFIC OCEAN

Fresno

Monterey

Tulare

ARIZONA

N
W — E
S

Kern

San Bernardino

Los Angeles

Riverside

Orange

San Diego

Imperial

MEXICO

map

Metropolitan Water District of Southern California

questions

Map #5 will inform you about California's economy, especially about industry and agriculture, which are two very important parts of the economy of our state. There are 58 counties in California and each one is important. However, the map only shows 17 of the state's counties. These are the counties which contribute most to California's economy through agriculture and industry. Agriculture is the growing of food and other natural products for animals and people. Industry is the making of things which people use.

If you look carefully at the map, you will see that there are ten counties listed under "Industrial Expansion." These are the top ten counties in the state which have the fastest-growing industries. You will also find ten counties listed under "Agriculture." These are the top ten counties in California for agricultural production. Some counties are in the top ten in both industry and agriculture.

As you can see, California has a lot of industry and agriculture. In fact, of all the 50 states of the United States, California is number one in both industry and agriculture. And, if California were a country, it would be *number seven out of all the countries in the world* in terms of the value of its industries and agriculture.

I. To make your map even easier to understand, put a star (*) next to the counties which have **both** agriculture **and** industry. Next, color all of the top agricultural counties light orange, and color all the top industrial counties dark orange. For those counties which are in the top ten in both agriculture and industry, color half of the county light orange and half dark orange.

II. Study your completed Map #5 carefully in order to answer the questions below.

A. How many of the counties on the map are in the top ten in **both** agriculture **and** industry? _____

B. List the counties on the map that are in the top ten in **both** agriculture **and** industry.

_____ _____ _____

C. Most of the big agricultural and industrial counties in California are:

1. south of Sacramento
2. north of Sacramento

questions

?

III. Listed below are the top ten "Agricultural" counties along with the dollar amounts of annual production. Put the correct rank on the blank space provided next to the county. For example, the county with the highest production should be numbered "1", and the county with the lowest should be numbered "10".

_____	Imperial County	$ 956,521,000
_____	Stanislaus County	$ 1,233,196,000
_____	Kern County	$ 2,067,028,000
_____	Riverside County	$ 1,141,820,000
_____	San Diego County	$ 1,114,104,000
_____	Merced County	$ 1,429,918,000
_____	Fresno County	$ 3,313,426,000
_____	Monterey County	$ 1,934,907,000
_____	Tulare County	$ 2,801,921,000
_____	San Joaquin County	$ 1,351,530,000

Extra Credit (Add the total production of the top ten agricultural counties.) $ _____

IV. Compare Map #5 with Maps #1, #2, #3 and #4 and answer the questions below. (Circle the number of the answer you choose.)

A. All of the counties which are in the top ten in both "Agriculture" and "Industrial Expansion" are located mostly at:
  1. lower elevations (under 5,000 feet)
  2. higher elevations (5,000 and over)

B. California's top three agricultural counties all include parts of:
  1. Owens Valley
  2. Sacramento Valley
  3. Death Valley
  4. San Joaquin Valley

C. California's top three fastest-growing industrial counties are located: (Refer to your map legend to help answer this question.)
  1. on the western side of the state
  2. on the eastern side of the state
  3. in the Sacramento Valley
  4. in Napa Valley

questions

?

D. Match these three important agriculture-producing counties with the physical features below. (Write the correct letters in the spaces.)

1. Kern County _____   a. Pacific Ocean coastline

2. Monterey County _____   b. San Jacinto Mountains

3. Riverside County _____   c. Tehachapi Mountains

E. How many of California's counties with the fastest-growing industries are located south of the Tehachapi Mountains? _____

F. The majority of the ten counties with the biggest agricultural production are located in areas which mostly receive:

1. 0" to 20" of precipitation each year

2. 20" to 30" of precipitation each year

3. 30" to 90" of precipitation each year

4. 90" to 120" of precipitation each year

G. The Southern California county which has the largest population and the fastest-growing industries is :

1. Modoc County

2. Orange County

3. Santa Clara County

4. Los Angeles County

Industry & Agriculture

ACROSS:

3. The making of things which people use

5. #1 in agricultural production

8. The act of growing larger

10. The Tehachapi Mountains are located in this county.

11. This county is #6 in agriculture.

DOWN:

1. The #1 county in industry

2. The growing of food and other natural products

4. The #2 county in agriculture

6. A "dry" county which is #8 in agriculture.

7. County where our state capitol is located.

9. This agricultural county is on the border with Mexico.

Managing California's Water

OREGON

• Crescent City

• Eureka

Redding •

1

2

3

4

5 — Lake Tahoe

6

11 🏛 Sacramento

12

13

NEVADA

San Francisco •

7

PACIFIC OCEAN

• Fresno

9

14

8

15

10 **ARIZONA**

N

W — E

S

17

Needles •

20

San Bernardino •

18

Riverside

19

16

23

21

Santa Barbara

Los Angeles

San Diego •

22

MEXICO

1. Lake Shasta
2. Sacramento River
3. Lake Oroville
4. Feather River
5. Folsom River
6. American River
7. San Joaquin River
8. Owens River
9. Kern River
10. Colorado River
11. The Delta
12. Mokelumne Aqueduct
13. Hetch Hetchy Aqueduct
14. California Aqueduct (State Water Project)
15. Los Angeles Aqueduct
16. Colorado River Aqueduct
17. Castaic Lake
18. Lake Perris
19. Lake Mathews
20. Lake Havasu
21. Coachella Canal
22. All American Canal
23. Eastside Reservoir

map

Metropolitan Water District of Southern California

Managing California's Water

You have learned a lot of facts about California's physical and human geography by studying Maps #1 through #5. However, those facts should also make you ask a lot of questions.

FACT: Most of California's precipitation takes place at higher elevations.
QUESTION: How is it possible for most of California's population, agriculture and industry to be located at the lower elevations?

FACT: Most of the precipitation in California falls in the northern areas.
QUESTION: Since people need adequate supplies of water every day, how can the majority of the people live in the southern part of the state where there is very little precipitation?

FACT: The driest areas and lowest elevations in California are located in the central and southern parts of the state.
QUESTION: Since industry and agriculture require large amounts of water, how can so much agriculture and industrial expansion take place in the drier parts of the state?

Map #6 will help you answer these questions by illustrating and explaining how California's water is managed.

I. Look carefully at Map #6. Match the numbers on the map to the features listed on the map legend. Notice that some of the features are lakes, some are rivers, and some are water delivery systems (aqueducts and canals). Using crayons, colored pencils or markers, color the features on the map as follows:

Lakes and Reservoirs – color light blue

(The Eastside Reservoir Project [#23], scheduled for completion in 1999, is the newest part of Southern California's extensive water management system. When completed, this reservoir will be filled with water from the Colorado River Aqueduct and the California Aqueduct.)

Rivers – color dark blue

(Draw blue lines right over the black lines on the map which represent rivers.)

Mokelumne (MOE-KELL-UM-NEE) **Aqueduct** – color light orange

Hetch Hetchy Aqueduct – color dark orange

California Aqueduct – color light purple

(Don't miss the two branches of this aqueduct in Southern California.)

Los Angeles Aqueduct – color dark purple

Colorado River Aqueduct – color light pink

Managing California's Water

All-American Canal – color dark pink

Coachella Canal – color black

The Delta – color grey

(The Delta [#11] is a special place in California. It is where the Sacramento and the San Joaquin rivers come together and form many channels and waterways before they flow out into San Francisco Bay and the Pacific Ocean.

II. Compare Map #6 with Map #1 and answer the following questions. (Circle the number of the answer you choose.)

    A. Most of the large rivers within California begin:

        1. in the desert at low elevations.
        2. on the coastline at low elevations.
        3. in the mountains at high elevations.
        4. in the valleys.

    B. Looking at these maps, I can say that rivers in California tend to run towards:

        1. Nevada
        2. the Pacific Ocean
        3. Oregon
        4. the Sierra Nevada Mountains

    C. Looking at Maps #1 and #6 and using what I learned from the last two questions, I can say that the major natural force involved in where water flows is:

        1. wind
        2. gravity
        3. pumps
        4. erosion

III. Compare Map #6 with Map #2 and answer the following questions. (Circle the number of the answer you choose.)

    A. Lake Shasta (#1) is located near:

        1. Death Valley
        2. the San Bernardino Mountains
        3. the Salton Sea
        4. the Cascade Range

questions

B. Lake Oroville (#3) and Folsom Lake (#5) are located near the:
   1. Salinas Valley
   2. Owens Valley
   3. Sierra Nevada Mountains
   4. San Jacinto Mountains

C. The Sacramento River (#2), the Feather River (#4), the American River (#6) and the San Joaquin River (#7) all flow towards:
   1. Mono Lake
   2. the Peninsular Ranges
   3. the Delta
   4. Lake Tahoe

D. The Hetch Hetchy Aqueduct (#13) carries water to the city of:
   1. Eureka
   2. Fresno
   3. San Francisco
   4. San Diego

E. The California Aqueduct (#14), which is part of the State Water Project, carries water south to the San Joaquin Valley and Southern California. To reach Southern California, the water must be pumped over the:
   1. Klamath Mountains
   2. Cascade Range
   3. Santa Lucia Mountains
   4. Tehachapi Mountains

F. The Los Angeles Aqueduct (#15) carries water south through the:
   1. Napa Valley
   2. Owens Valley
   3. Sacramento Valley
   4. Salinas Valley

G. The Colorado River Aqueduct (#16) carries water from the Colorado River across the:
   1. Sacramento Valley
   2. San Joaquin Valley
   3. Sierra Nevada Mountains
   4. Mojave Desert

H. The California Aqueduct (#14) splits into two branches in Southern California. The direction it travels to reach Lake Perris (#18) is

_____ and to reach Castaic Lake (#17) it goes _____.

IV. Compare Map #6 with Map #3 and answer the following questions. (Circle the number of the answer you choose.)

    A. The aqueduct which carries precipitation collected from the west side of the Sierra Nevada Mountains is the:
        1. Colorado River Aqueduct
        2. Mokelumne Aqueduct
        3. California Aqueduct
        4. Los Angeles Aqueduct

    B. Much of the precipitation in Northern California is collected in:
        1. Lake Perris
        2. the Salton Sea
        3. Lake Shasta
        4. Lake Havasu

    C. A lot of the precipitation which is collected in California is carried by aqueducts in which two general directions?

    _____   _____

V. Compare Map #6 with Map #4 and answer the following questions.

    A. List the aqueducts which carry water to help support the large population of Southern California.

    _____

    _____

    _____

    B. Of the least populated counties on the map none require aqueducts to import water. (Circle True or False.)

        1. True
        2. False

    C. The Mokelumne Aqueduct carries a portion of its water to which of California's most populated counties?

    _____

questions

D. California's population increased significantly in the last 100 years and is expected to continue increasing. This makes managing California's water supply even more important and more challenging.

  1. Color the columns (bars) below to show how the population of our state has increased.

Millions

| | 1900 | 1930 | 1960 | 1990 | 1997 | 2020 projected |
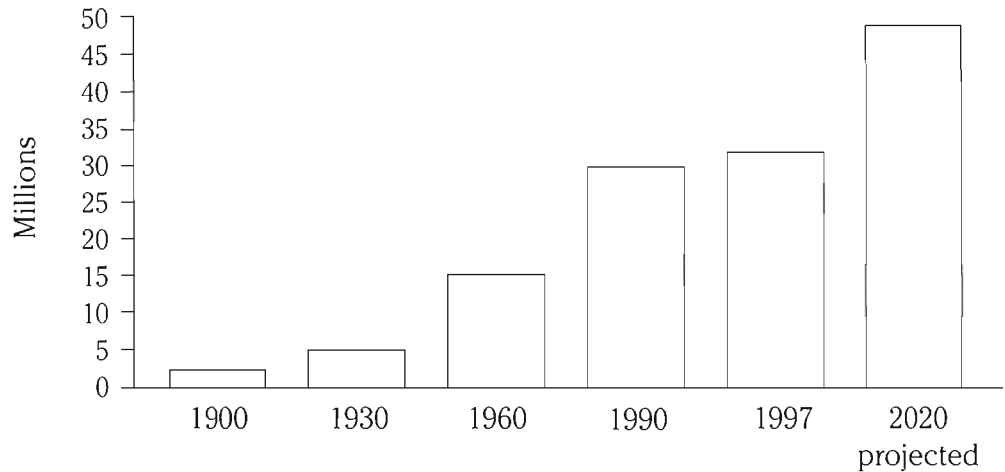
  2. Use a ruler to find the exact population for each year and write the figure below the column.

  3. How old will you be in the year 2020?

  _____

VI. Compare Map #6 to Map #5 and answer the following questions.

  A. Match the counties on the left with the water delivery systems on the right: (Write the correct letters in the spaces provided.)

  __ **1.** water for industry in Alameda County   a. Mokelumne Aqueduct

  __ **2.** water for agriculture in Riverside County   b. California Aqueduct

  __ **3.** water for agriculture in Kern County   c. All American Canal

  __ **4.** water for agriculture in Imperial County   d. Coachella Canal

  B. The Colorado River Aqueduct helps provide water for homes, industry and agriculture in Southern California. The aqueduct begins at Lake

  _____ and ends at the Eastside Reservoir Project and

  Lake _____.

questions

C. If water delivery systems (aqueducts and canals) did not carry water to various regions of California, and water was not properly managed, what would happen to California's economy? (Circle True or False.)

    1. The economy would still be strong.   True   False

    2. There would be less agricultural production.   True   False

    3. There would be less industrial expansion.   True   False

    4. The population could continue to grow.   True   False

D. No matter where I live in California, the most important thing I can do to contribute to the efficient management of water resources is

_____   _____   _____.

Major Water Delivery Systems

County

Population

Economy

Annual Average Precipitation

Elevations

Physical Features
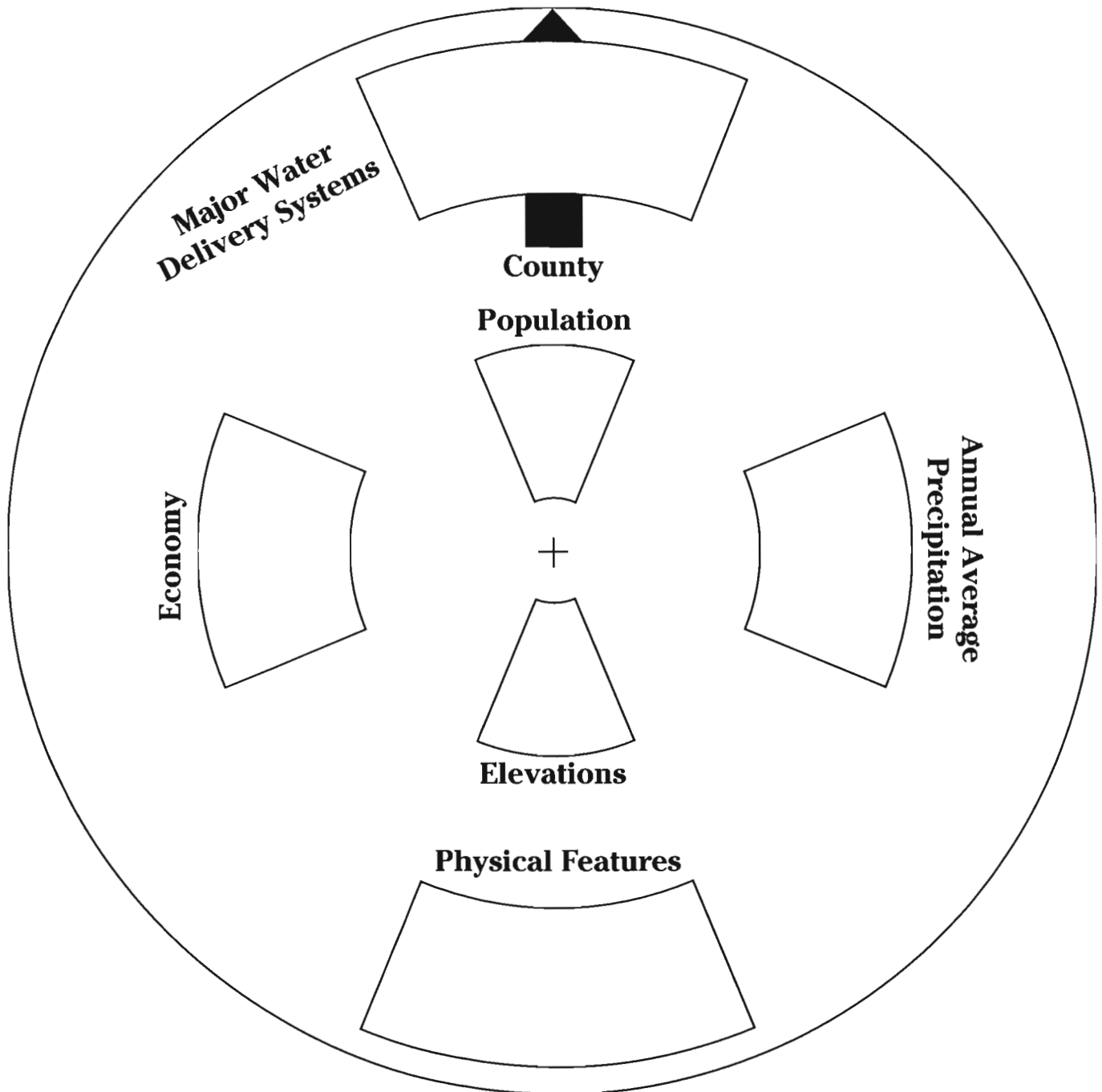
The California Water Wheel
Cut out the large circle on this page. Then, cut out the boxes inside the circle.
Place this circle over the larger circle on page 9 and push a brass brad through
the center of both circles. Turn the wheel to review information about four
California counties.

Riverside

Fresno

Santa Clara

Los Angeles

The

Wheel

Water

California

Colorado River Aqueduct
California Aqueduct

Delta/Mendota Canal *
*Delta/Mendota Canal is not illustrated on the map. Built by federal government, part of the Central Valley Project.

#3 in industrial expansion

Mostly 10-20 inches

State Water Project **
** State Water Project includes the California Aqueduct. It also includes the South Bay Aqueduct, not illustrated on map.

Los Angeles Aqueduct
Colorado Aqueduct
California Aqueduct

#1 in agricultural production

Over one million

Over 700,000

Mostly 0-10 inches

Over 9.5 million

Over 1.5 million

From under 500 feet to about 5000 feet

500-5000 feet

From 0-10 inches in the valley, to about 30-90 inches on the mountain tops

San Gabriel Mountains
Pacific Ocean Coastline

#6 in agricultural production
#8 in industrial expansion

From over 5000 to under 500 feet

Mostly 500-5000 feet

San Francisco Bay

#1 in industrial expansion

20-30 inches

Sierra Nevada Mountains
San Joaquin Valley

San Jacinto Mountains
Colorado River

The California Water Wheel
Place the cut-out circle from page 8 over this circle and push a brass brad through the center of both circles. Turn the wheel and review information about four California counties.

Metropolitan Water District of Southern California

Riverside

Fresno

Los Angeles

Santa Clara

Wheel

The

Water

California

Colorado River Aqueduct
California Aqueduct

Delta/Mendota Canal *
*Delta/Mendota Canal is not illustrated on the map. Built by federal government, part of the Central Valley Project.

State Water Project **
**State Water Project includes the California Aqueduct, It also includes the South Bay Aqueduct, not illustrated on map.

#3 in industrial expansion

Mostly 10-20 inches

Los Angeles Aqueduct
Colorado Aqueduct
California Aqueduct

Mostly 0-10 inches

#1 in agricultural production

Over one million

Over 700,000

Over 9.5 million

Over 1.5 million

From 0-10 inches in the valley, to 30-90 inches on the mountain tops

From under 500 feet to about 5000 feet

500 - 5000 feet

#8 in agricultural production #9 in industrial expansion

From over 5000 to under 500 feet

Mostly 500 - 5000 feet

San Gabriel Mountains
Pacific Ocean Coastline

San Francisco Bay

#1 in industrial expansion

20 - 30 inches

Sierra Nevada Mountains
San Joaquin Valley

San Jacinto Mountains
Colorado River

The California Water Wheel
Place the cut-out circle from page 8 over this circle and push a brass brad through the center of both circles. Turn the wheel and review information about four California counties.