

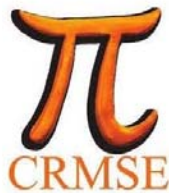
# Plant Adaptations and Local Weather: Lessons in Schoolyards and on Field Trips

Lessons aligned with Next Generation Science Standards

Written for Grade 3 Teachers and Students

in the San Diego Region

February 17, 2017



SAN DIEGO  
COASTKEEPER



UNITED FOR A MORE HUMANE SAN DIEGO



San Diego Children and Nature coordinated the development of these lessons. The organizations (represented by the logos) support the alignment of nature-based learning to NGSS, encourage teachers to prepare students for field trips with school-based activities, and to extend field trips to the nature in student's everyday lives. School field trips offered by these and other nature education organizations are posted at [http://sdchildrenandnature.org/wp/wp-content/uploads/2015/12/SDCaN\\_FieldTrips.pdf](http://sdchildrenandnature.org/wp/wp-content/uploads/2015/12/SDCaN_FieldTrips.pdf).

# Plant Adaptations and Local Weather: Lessons in Schoolyards and on Field Trips

Students start in their schoolyard and classroom (Part 1) by learning about the Mediterranean climate of San Diego, and exploring the adaptations that enable plants to live for six months without little or no rain. Students observe the characteristics of leaves, identify ways that leaves conserve water, and discuss how this makes plants adapted to dry climates. Students learn about the ten most common local plants in the coastal sage scrub ecosystem, and how they are adapted to the Mediterranean climate. Students take a field trip or visit local natural area (Part 2) to observe local plants and habitats and learn from trained naturalists. After the field visit (Part 3), students make field guides for common native plants and communicate about how they are adapted to the local climate.

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Draft prepared by Plant Adaptations work group: Amanda Gossard, Cabrillo National Monument; Crystal Howe, San Diego Unified School District and California Regional Environmental Education Community (CREEC); attendees at NGSS workshop on March 13, 2015; and Leta Bender, Judie Lincer, Anne Fege and Su Scott, San Diego Children and Nature.

Send suggestions on content, teaching approach, and format to [afege@sdchildrenandnature.org](mailto:afege@sdchildrenandnature.org).

## Learning Outcomes

**By the end of this unit, students will be able to answer these questions:**

1. What is San Diego's climate?
2. How are native plants adapted to dry climates?
3. What plants grow in San Diego and why?

## Next Generation Science Standards (NGSS)

### Earth Systems—Weather and Climate

**ESS2.D: Weather and Climate.** [Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.](#) (3-ESS2-2)

<b>Performance expectation: 3-ESS2-2</b> Obtain and combine information to describe climates in different regions of the world. <a href="http://ngss.nsta.org/DisplayStandard.aspx?view=pe&amp;id=73">http://ngss.nsta.org/DisplayStandard.aspx?view=pe&amp;id=73</a>		
<b>Science &amp; Engineering Practices:</b>	<b>Disciplinary Core Ideas:</b>	<b>Crosscutting Concepts:</b>
Analyzing and Interpreting Data Engaging in Argument from Evidence	ESS2.D: Weather and Climate	Cause and Effect Patterns
<b>Interdisciplinary Common Core Connections:</b> ELA Literacy: W3.1 W3.2 W.3.3 W3.7 SL3.1		

### Life Sciences—Adaptation

#### LS4.C: Adaptation

- [For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.](#) (3-LS4-3)

<b>Performance expectation: 3-LS4-3</b> Construct an argument with evidence that in a particular habitat, some organisms can survive well, some survive less well, and some cannot survive at all. <a href="http://ngss.nsta.org/DisplayStandard.aspx?view=pe&amp;id=65">http://ngss.nsta.org/DisplayStandard.aspx?view=pe&amp;id=65</a>
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<b>Science &amp; Engineering Practices:</b>	<b>Disciplinary Core Ideas:</b>	<b>Crosscutting Concepts:</b>
Analyzing and Interpreting Data Engaging in Argument from Evidence	<b>ES4.C:</b> Adaptation	Cause and Effect Structure and Function
<b>Interdisciplinary Common Core Connections:</b>		
ELA Literacy: W3.1 W3.2 W.3.3 W3.7 SL3.1		

### Common Core State Standards for Literacy

[CCSS.ELA-LITERACY.W.3.2](#)

Write informative/explanatory texts to examine a topic and convey ideas and information clearly

[CCSS.ELA-LITERACY.W.3.3](#)

Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

[CCSS.ELA-LITERACY.W.3.1](#)

Write opinion pieces on topics or texts, supporting a point of view with reasons.

[CCSS.ELA-LITERACY.W.3.7](#)

Conduct short research projects that build knowledge about a topic.

[CCSS.ELA-LITERACY.SL.3.1](#)

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly

# Part 1. Local climate and native plants

## Learning objectives

At the conclusion of these lessons, students will be able to:

1. Analyze data to describe the Mediterranean climate of San Diego
2. Describe the characteristics of leaves, and how they help plants reduce water loss
3. Identify how common local plants are adapted to the dry climate

## Lesson 1: What is San Diego's Climate?

Students will analyze local climate data to describe the Mediterranean climate of San Diego, and explore the adaptations that enable plants to live for six months without little or no rain.

Time: 30 to 45 minutes

## Materials

- Student Reading, with climate data table
- Science journals, for graphing climate data
- Leaves from plants that require a lot of water, such as basil, lettuce, parsley, sycamore, maple
- Leaves from some native, drought-tolerant plants, such as toyon, buckwheat, lemonade berry, scrub oak, black and white sage.

## Engage: Weather and Climate in Everyday Life

Engage students in a conversation about weather and climate by wearing winter clothes for the introduction of this lesson. You could also show a series of photos of people wearing different clothing and ask the same questions.

*What areas of the world would you wear these types of clothing items? Why?*

*Would we wear them here in San Diego? Why or why not?*

*What is the typical type of weather here in San Diego? →sunny, cloudy, foggy, partly cloudy, doesn't rain very much*

*What do you wear when it's hot? When it's cold?*

Ask students what kind of environment their school is in. Does it get a lot of rain? Wind? Sun? Is there a big change in temperature from day to night?

## Explore: Analyzing and Interpreting Data

Take time for the Student Reading, with the monthly climate data. Students graph the data in their science journals.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average high in °F:	65	65	66	67	69	71	75	76	76	73	69	65
Average low in °F:	49	51	53	56	59	62	65	67	65	61	54	48
Average precipitation in inches:	2.0	2.3	1.8	0.8	0.1	0.1	0.0	0.0	0.2	0.6	1.0	1.5
Days with precipitation:	7	7	7	5	2	1	0	0	1	3	4	6

Source: Climate data for San Diego <http://www.usclimatedata.com/climate/san-diego/california/united-states/usca0982> (also available in °C)

What does the data show?

Look at the graph and table for average highs. What are the warmest months? What is the maximum difference between the warmest and coldest months?

Look at the graph and table for average lows. What are the coldest months? What is the maximum difference between the warmest and coldest months?

Look at the precipitation (rainfall). What are the wettest months? Driest months?

## Explain: Climate Zones

Using the data in Figures 1 and 2, what is the climate zone in San Diego? Polar, temperate, or tropic?

Introduce climate zones with a world map. Our planet consists of three distinct climactic zones (temperate, tropical and polar). What do the colors on the map mean? Where are the zones located, relative to the equator?

Variation in climate zones is further influenced by their location to the coast and elevation. Where is the school, relative to the coast? What is the elevation of the school, relative to the feet (or meters) above sea level?

From the San Diego that was graphed, are there four seasons?

Seasons are defined by the hours of day and night. Summer has the most hours of daylight, and winter has the fewest hours. This difference in sunlight makes the weather

warmer in the summer and colder in the winter. These are the climate seasons that happen everywhere on earth.

Does San Diego really experience four seasons? Or does the idea of two seasons fit better? Wet and dry? Which months are the wettest? The driest?

Describe the climate in the dry months. In the wet months.

Introduce Mediterranean climate. Use Figure 2.

The coastal region of southern California has a very special kind of temperate climate. It is called "Mediterranean" because it is like the climate around the Mediterranean Sea, between Europe and Africa. Mediterranean climates have wet winters and dry summers. Most of the yearly rain falls in the winter, and the rest of the year is very dry. (from Student Reading)

There are only five areas in the world with a Mediterranean climate, California being one of them. These regions are all located on the **west coast** of a continent, near a large body of water, and between 31 and 40 degrees latitude north and south of the equator.

You may want to take this opportunity to review basic geography vocabulary (cardinal directions, equator, poles, longitude and latitude). If you have laminated world maps, you could have students use white board markers to locate the various regions with Mediterranean climates.

What is the difference between climate and weather?

Look online at today's weather. How are the temperatures and rainfall different today, from the monthly average in the climate data?

*So what's the difference between weather and climate?* → weather varies day to day; climate is a pattern of weather taken over time; what we decide to wear each day depends on the weather, but what we decide to keep in our closet is based on the climate.

*Would people who live in Alaska have the same clothes in their closet as we do in San Diego?* → we may share some of the same clothing items, but in San Diego we wear flip flops and shorts more often than Alaskans would wear them. We have only a few jackets, and Alaskans have many heavy coats, etc.



Figure 1: Global climate zones

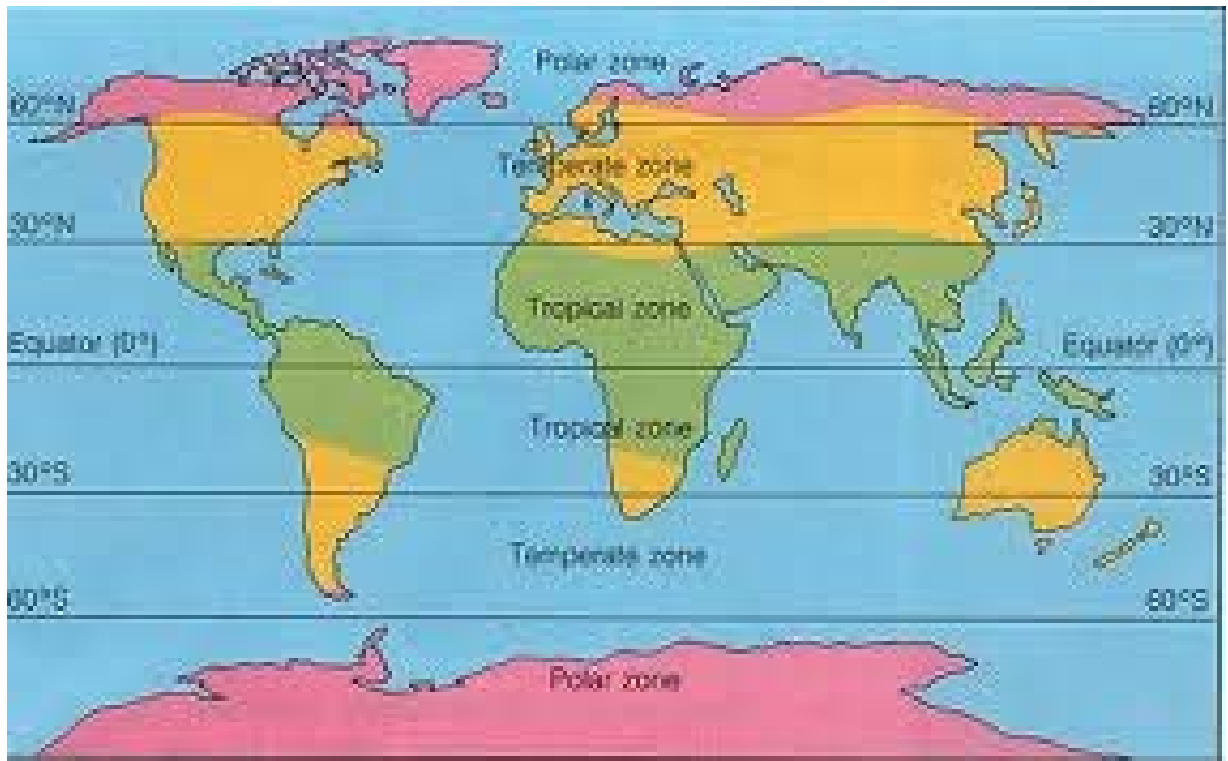
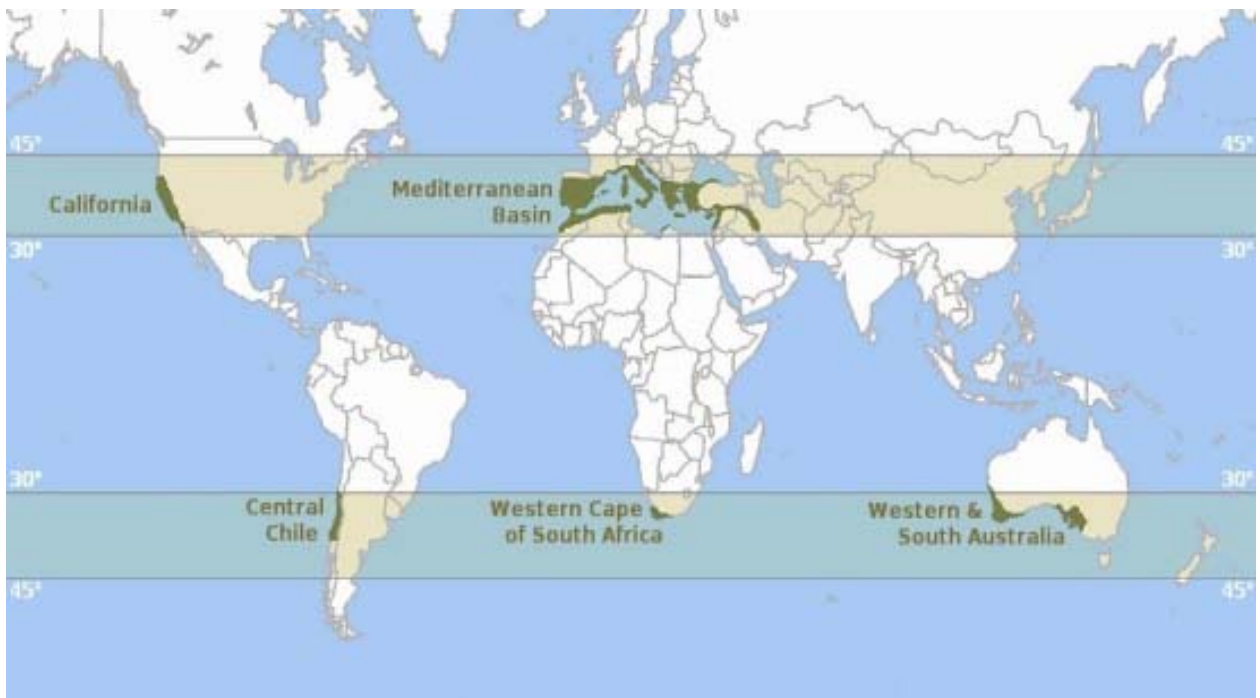


Figure 2: Mediterranean climate zones







## **Evaluate: What are the climate conditions for plants in San Diego?**

What are the temperatures in San Diego's climate? Are they extreme, with big differences in the seasons?

Plants need water to survive and grow.

What do you notice about rainfall in the different months? What do you think happens to plants, when they don't get water for half the year?

What are the wet and dry seasons? What season do we have now?

Introduce concept of drought.

Drought is a long period of dry weather (little rainfall). That could be for six months each year, as we commonly have in San Diego in the "dry months."

When there is far less precipitation than expected, for months or even years, that is called an extended drought.

In order to survive a drought, plants have to be prepared for the long months without rainfall.

## **Explore: What happens to leaves when they don't get water?**

Students will observe the water loss in leaves, from a plant that requires a lot of water, and a native, drought-tolerant plant.

Each team or pair will be given leaves from two different plants, that have high- and low-water needs.

Each student writes observations and sketches the leaves in their science journal.

Label the leaves and set them on a shelf for 2-3 days or a weekend.

Then again write observations and sketch the leaves.

## **Evaluate: Which plants are best for San Diego?**

Teams answer these questions about the differences in the leaves, making a claim based on evidence.

What differences did you observe, between the plant that needs a lot of water to grow, and the native plant that doesn't need much water?

Which plant would grow best in the low-water summer months in San Diego?

What evidence do you have for this claim?

Show video again, about coastal sage scrub plants, <https://www.youtube.com/watch?v=Buxtictj7k>. Likely that students will see and learn different concepts than when they first viewed the video.

## **Lesson 2: How are plants adapted to dry climates?**

Students will observe the characteristics of leaves, identify ways that leaves conserve water, and discuss how this makes plants adapted to dry climates.

Time: 30 to 45 minutes

### **Materials**

- Leaves from native plants and local gardens, could also be potted plants
- Magnifying lenses
- Stereoscope (dissecting scope, with light)
- Index cards
- Large sheets of paper, for leaf sorting

### **Engage: Observing leaf characteristics**

With permission from the groundskeepers, class walks around the schoolyard and clips leaves from plants. If this is not possible or if there are limited plants in the schoolyard, additional leaves need to be gathered from gardens and brought to the classroom.

Give four leaves to each group of four students. Write the following questions on the board. In their groups, the students compare their leaves and answer the questions. Pass out the magnifying lenses to allow them to look at the details in the leaves. Make stereoscope (dissecting scope) available to see leaf surfaces. Allow students to dissect some leaves to see the leaf structure, specialized leaves, water storage.

- What are some differences between the leaves?
- What do the leaves have in common?
- Do any of the leaves have teeth?
- Do any have hairs? Where?
- What do the leaves feel like?
- Who has the biggest leaf? The narrowest leaf? The smallest leaf?
- Have any leaves been eaten by insects? Fungus? How can they tell?

Include in this class discussion: How do scientists make observations? Use cues such as pointing to eyes (seeing/observing) ears (hearing), hands (touching) gesturing to a book for reading/research. Help the students get at the idea that scientists use clear descriptions only based on their senses.

### **Explore: Identifying leaves**

Each group of four students selects four leaves to compare. one index card for each leaf, and create one leaf clue for each of the 4 leaves. Each student in the group will be responsible for

writing the clue for one leaf, and their student name on the back of the index card. Each of the 4 leaves should have a clue to identify it. Clues should lead someone to choose that leaf after reading it.

Write the following examples of clues, on the board.

Some clues could be: "I have hairs underneath." "I feel very smooth." "I have 5 pointed tips."

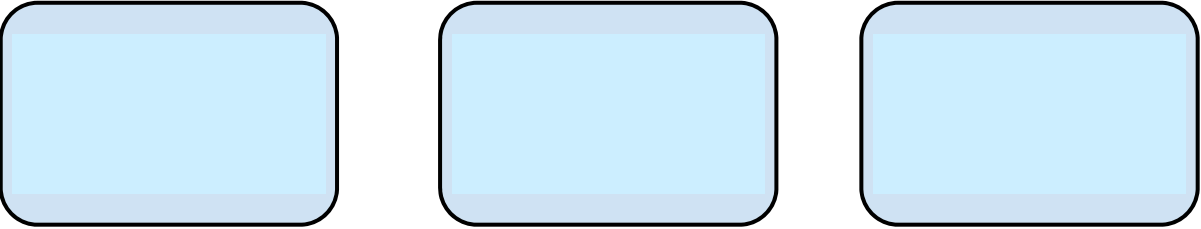
Walk around and make sure the index cards have the clue on the front and their name on the back. With a pen or sharpie label the back of each clue with a number that matches the leaf if necessary. If possible try to refrain from doing this, unless the students are unable to distinguish which leaf they wrote the clue for.

### **Explore: Identifying leaves (alternate activity)**

Assign students into groups no larger than 4 students and give 6 to 10 leaves to each group. Students observe characteristics of each leaf, such as shape, size, color, texture, patterns.

Prepare chart papers for each group ahead of time with the following headings. Ask students to group the leaves on chart paper.

Leaf Groups (place your leaves here in groups):



What characteristic did you use to make your groups (size/color/texture/etc)?

What do you think the leaves use this characteristic for?

Rotate the students so that they can see at least two other groups' leaf sets. When the students are at the new set of leaves, encourage groups to see if they might be able to re-group the leaves using a different characteristic than the previous group (and chart their thinking next to the previous groups' thinking).

After the rotations, have a class share discussion regarding ALL of the characteristics that the students noticed and what the students think about how the different characteristics might be used for by plants. How do these adaptations help the plants survive? This is an elicitation discussion and all of the student's thinking is valuable to the share regardless of how correct they might be at this point.

## Explain: Leaf characteristics in dry climates

Water is always flowing through plants. Ask students to trace water from the roots.

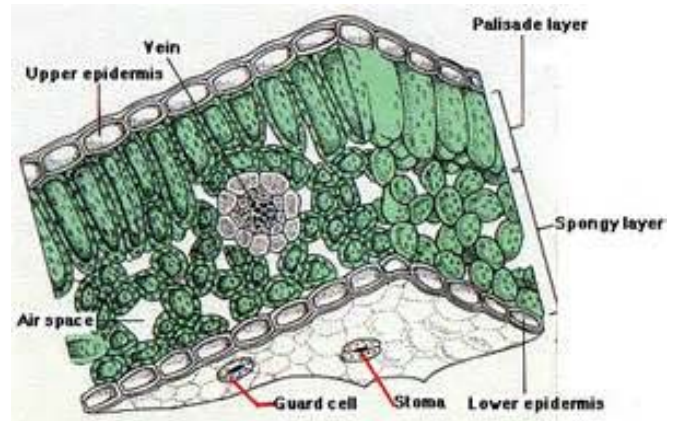
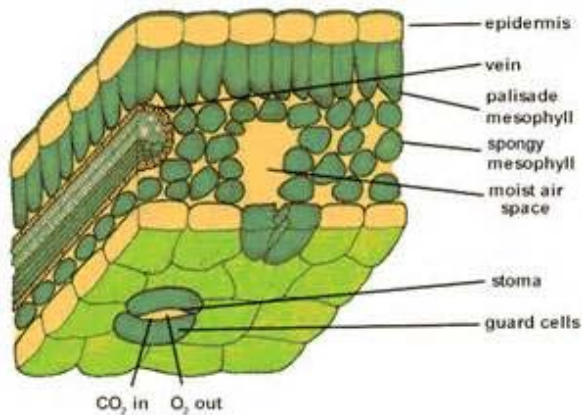
Roots take up the water from the soil, water moves up through the stem, and into the leaves.

Show sketch of plant water movement.

Water exits the leaves through the surface and through the small pores called stomata.

What happens when too much water evaporates from the leaves?

Show sketch of leaf anatomy



Leaves of plants growing in dry climates have ways to reduce their water loss through the leaves. This is called adaptation, which means to adjust or modify to different conditions or environments.

## Elaborate: Leaf adaptations to dry climates

Plants have adapted to dry climates by reducing water loss through their leaves. Each group will learn more about one of the adaptations of leaves.

Recall the leaf characteristics that we used to identify leaves, which of these do you think are ways that plants have adapted to dry climates?

Each group will be assigned a different leaf characteristic, which could be addressed in at least two different traits (small or large, dark or light). Ask them to take 15 minutes to gather evidence by observation or experimentation.

Assign the following to different groups. Which of the leaf traits (within each pair) make plants best adapted to dry climates?

Small or large leaves?

Waxy surface (like crayon wax) or absorbent surface (like a paper towel)?

Dark or light color?

Smooth (like cotton shirt) or hairy (like a fleece)?

Thin leaves or thick leaves (like a cactus)?

Leaves that stay on the plant or leaves that fall off in the dry season?

### **Evaluate: Best leaf adaptations for dry climates**

Each group will present their claim, evidence, and argument to the class. Generally, the evidence would be about leaf structure, and the reasoning about the function of reducing water loss.

**The question is:** Which of the leaf traits (within each pair) make plants best adapted to dry climates?

**Evidence:**

**Reasoning:**

**Claim:**

Each group presents their claim, evidence, and argument to the class, of which traits make plants best adapted to dry climates.

### **Extension: Leaves in the schoolyard**

Students walk around schoolyard to observe leaves and their characteristics.

## ***Lesson 3: What plants grow in San Diego?***

Students will learn about the ten most common local plants in the coastal sage scrub ecosystem, and how they are adapted to San Diego's dry summer climate.

Time: 30 to 45 minutes

### **Materials**

- Leaves from native plants (not poison oak)
- Two sets of photos of ten most common plants, each with name written on the back (images provided online, to get photo prints made in 4x6 size)
- Science journals, for students to make observations about each plant
- Plant press, white card stock for mounting plants (for Extension, make a native plant collection)

### **Engage: Coastal Sage Scrub introduction**

Explain that in San Diego we have six different types of plant communities that can survive in a Mediterranean climate. The plants located in these plant communities are rare and very special because they don't grow in many other places in the world.

Show this video of coastal sage scrub, <https://www.youtube.com/watch?v=Buxtictj7k>, for a second time. Plant images begin at 2:20, and threats to the coastal sage begin at 3:55. Good overview, even if students absorb only some of the concepts and images.

Discuss where there is local coastal sage scrub. Have they seen the plants?

Have the students walked in the nearby canyons?

Have they ever visited a Federal, state, county, or city park like Cabrillo National Monument (Federal) or Mission Trails Regional Park (City)?

## Explore: Ten common plants in Coastal Sage Scrub

This lesson will focus on the ten most common plants in coastal sage scrub and chaparral. See student handout for photos and names.

1. Black sage
2. White sage
3. Broom baccharis
4. California buckwheat
5. California sagebrush
6. California sunflower
7. Laurel sumac
8. Lemonade berry
9. Scrub oak
10. Toyon

Student groups will examine the leaves and/or photos of each of the ten plants. Assign two to each group, making sure that all ten plants are represented. Each student sketches and writes in their science journals, then shares their work with the group.

Name of plant

Leaf sketch

Two characteristics that show how these leaves are adapted to dry climates

Groups each share their observations about one plant, going around the room until all ten plants are described.

Suggested plant adaptations:

Native plant name	Adaptation for dry climates
California buckwheat	Small, thin leaves
California sagebrush	Small leaves, drought deciduous
California sunflower	Drought deciduous
Coyote bush	Small leaves
Coast live oak	Small, waxy leaves



Laurel sumac	Waxy leaves, curled leaves
Lemonade berry	Waxy leaves, curled leaves
Scrub oak	Small, waxy leaves
White sage	Light color, drought deciduous

Local resources for common native plants:

[https://www.nps.gov/cabr/learn/nature/upload/CABRI\\_Plant-Guide\\_reduced.pdf](https://www.nps.gov/cabr/learn/nature/upload/CABRI_Plant-Guide_reduced.pdf)

### **Extension: Native plant memory game**

Project images of the ten native plants, and ask students to call out their names. Continue with this until you think they have a good grasp of the names of the native plants.

Pass out the ten native plant photos to partners or table groups. Students play memory game several times, to become familiar with the plants and their names. They can use their student handout as an answer key.

Variation to the Memory Game: students can play “Go Fish” matching the name to the picture.

### **Extension: Schoolyard walk**

Take a walk around the schoolyard with the students. What plants are native? What plants remind you of native plants?

Ask the groundskeeper or the principal to take the walk with you. Look at the irrigation systems, and notice which plants and trees have extra water. Ask how often the water is turned on, and what automated system is used.

### **Extension: Make a native plant collection**

Students collect plants during the field trip, in their schoolyard, and/or in the neighborhood.

Press, mount, and label mount the plants

Follow steps outlined on webpages about plant collection,

<http://www.amnh.org/explore/curriculum-collections/biodiversity-counts/plant-identification> (see sub-pages about pressing and mounting plants).

More information about plants native to San Diego

San Diego Chapter of the California Native Plant Society,

<http://www.cnpssd.org/plantlistlinked.html>

San Diego Natural History Society, <http://www.sdplantatlas.org/>.

## Part 2. Go on a field trip!

Field visits to local natural areas and nature centers gives students the opportunity to see local plants and habitats and learn from trained naturalists. Local school field trips and programs are listed in this table, [http://sdchildrenandnature.org/wp/wp-content/uploads/2015/12/SDCaN\\_FieldTrips.pdf](http://sdchildrenandnature.org/wp/wp-content/uploads/2015/12/SDCaN_FieldTrips.pdf)

Classes can also visit nearby canyons and natural areas. Teachers can lead their own field trips, or invite a trained naturalist or park ranger to lead a walk. Look for the ten common native plants. Students can record plants along a segment of the trail (in their science notebooks), which is a very simple vegetation monitoring method.

Great 28-page resource on Taking Students Outdoors, from FOSS (Full Option Science System), <http://www.fossweb.com/delegate/ssi-wdf-ucm-webContent?dDocName=D567152>

Educator's guide to Nearby Nature School Field Trips, [http://www.sdchildrenandnature.org/attachments/SDCaN\\_NearbyNatureFieldTripGuide\\_18p\\_final\\_2011.pdf](http://www.sdchildrenandnature.org/attachments/SDCaN_NearbyNatureFieldTripGuide_18p_final_2011.pdf)

### Example activities from field trip providers

Cabrillo National Monument (National Park). Upon arriving at the Park, classes move down to Ballast Point Overlook for introductions. They begin with a review of the vocabulary cards, then discuss the properties of the Plant Adaptation Curriculum Guide, <https://static1.squarespace.com/static/557f1354e4b03cb1c9282428/t/57ab703c893fc0d6eb46321f/1470853198710/Plant+Adaptations.pdf>. What are the adaptations represented and how can plants use them to help within their habitats?

Move into an interpretive walk discussing the plant communities. Students make observations about the plants; leaf size and color, leaf texture, plant height, plant spacing and location of plant communities (North vs. South). Students take notes on their observations, draw, and/or fill in data sheets.

Art extension: Students will make plant rubbings from a few specimens from the park: Toyon, Lemonade Berry, and Laurel Sumac

What does it all mean? Discuss adaptations plants have made to help them survive in the Mediterranean Climate. What are some similarities found across these plant communities? What are some differences? How is this park different from their local natural areas?

### Preparation for the field trip

Students gather additional information about the field site.

What is the local climate?

What are the common plants in that natural area. What are the common animals?

## Part 3. Learn more about native plants!

After the field trip or visit to nearby park, students make a field guide for common native plants and communicate about how they are adapted to the local climate. As these plants commonly grow in nearby canyons and local natural areas, students will continue to see and learn about them. They will be featured in Grade 5 lessons in “Matter and Energy in Ecosystems” 5-LS2-1, <http://ngss.nsta.org/DisplayStandard.aspx?view=topic&id=20>.

### ***Lesson 4: Choose native plants for schoolyard***

Time: Two 45-minute class periods

#### **Engage: Designing native habitat**

In small groups, students will design a native habitat area in the schoolyard:

The design process will include the following steps:

Students will choose an area in the schoolyard, that can best meet these requirements. Size should be about 3 meters square (about 10 ft x 10 ft).

Students will select common coastal sage plants, give reasons for their selection, and draw the design of the natural habitat area.

For teacher reference: There are detailed steps for planning, designing, installing, and using native schoolyard habitats, in Schoolyard Habitat Guide, <https://www.fws.gov/cno/pdf/HabitatGuideColor.pdf> . This activity, for third graders, focuses only on choosing plants for a small area of the schoolyard.

#### **Evaluate: Expository writing and presentations**

Students present their designs to the class. Provide evidence for why their design is effective in meeting the three requirements for the habitat area.

Teachers may use these evaluation rubrics: Research report, <https://www.scribd.com/document/216931926/Research-Report-Rubric> and [http://rubistar.4teachers.org/index.php?screen=ShowRubric&rubric\\_id=1034111&](http://rubistar.4teachers.org/index.php?screen=ShowRubric&rubric_id=1034111&),

Oral presentation, <https://www.scribd.com/document/133959584/Oral-Presentation-Rubric> and [http://rubistar.4teachers.org/index.php?screen=ShowRubric&rubric\\_id=1037128&](http://rubistar.4teachers.org/index.php?screen=ShowRubric&rubric_id=1037128&)

#### **Extension: Make native plant collection**

See activities at the end of Lesson Three.

## Student Reading for Plant Adaptations

### *What is San Diego's climate?*

Southern California has a very special climate. It is called “Mediterranean” because it is like the climate around the Mediterranean Sea, between Europe and Africa. Mediterranean climates have wet winters and dry summers. Most of the yearly rain falls in the winter, and the rest of the year is very dry.

Table 1: Monthly average climate data for San Diego, California

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average high in °F:	65	65	66	67	69	71	75	76	76	73	69	65
Average low in °F:	49	51	53	56	59	62	65	67	65	61	54	48
Average precipitation in inches:	2.0	2.3	1.8	0.8	0.1	0.1	0.0	0.0	0.2	0.6	1.0	1.5
Days with precipitation:	7	7	7	5	2	1	0	0	1	3	4	6

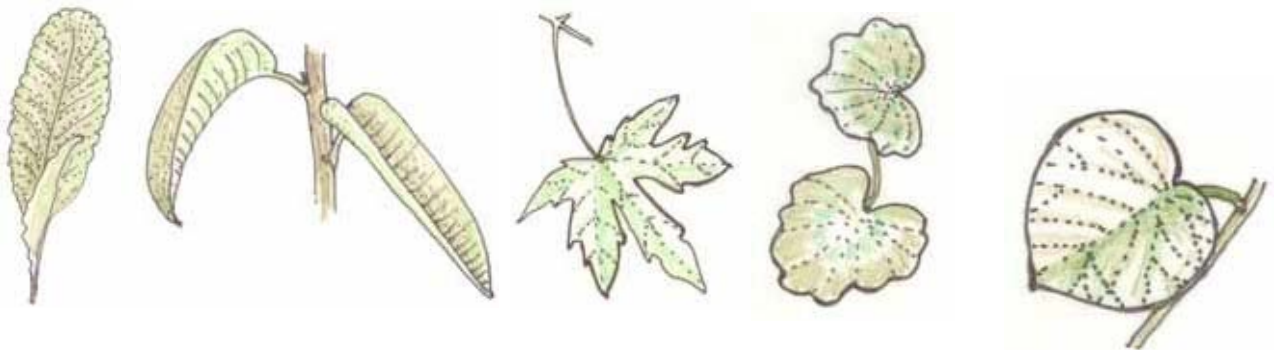
Plants living in local habitats have adapted to live in hot, dry conditions. Plants grow in the winter when the rain falls. They have adapted to need little water in the summer and to survive hot Santa Ana winds in the fall. Most local plants are even adapted to survive when wildfires sweep through the region.

Plants that live in dry climates have adapted to get water efficiently. Deep roots help plants gather as much water as possible from the soil. Some plants have roots that are three or four times as large as the plant above the ground.

## ***How can leaves help identify plants?***

The shape, texture, and margins of leaves can be used to identify plants.

The overall shape of a leaf gives clues to the tree's identity. For example, California buckwheat has long, slender leaves, and Coast Live Oaks have flat oval-shaped leaves. The shape of the leaves differ in many ways. For example, the tips of the leaves may be notched, pointed, rounded or tapered. And the bases of the leaves may be squared, rounded or heart-shaped.



The edges or margins of leaves can also provide clues to the tree's identity. For example, some leaves have teeth (serrated) along their margins and some leaf margins are smooth. Some leaves are lobed, with several points.

Some leaves are completely hairy, others have hair on only one side, and others are completely smooth. Leaves may also be thick or thin, rough or waxy. Leaves are many colors of green, some are very dark green and some are almost grey.

## ***How are plants adapted to dry climates?***

The leaves of plants have adapted to the climates they grow in. Native plants in dry climates have adapted ways to prevent the plant from losing water through their leaves.

Hot weather and wind can pull water from plants' tender leaves. Some plants have waxy or leathery coating on their leaves and stems that keep water in. Scrub oaks and lemonade berry have shiny, smooth leaves. Other plants, such as California buckwheat, have tiny, hard, thin leaves that prevent water loss.

Most shrubland plants are green all year round. But some native plants, such as black sage, lose half their leaves when rainfall is especially low. This adaptation helps them prevent water loss through leaves. Black sage also has smaller leaves during droughts, or times of little rainfall. When rains increase, the leaves grow larger.

Some plants' leaves are turned away from the sun to prevent water loss. Toyon's leaves point straight up. Laurel sumac's leaves are folded like tacos. Only the leaf edges get direct sunlight.

A plant's color can help it stay cool too. Dark colors absorb sunlight. Light colors reflect it. Plants such as white sage and California sagebrush are light grey. This adaptation helps them reflect sunlight and stay cool in the heat.



**Ten common plants  
in Coastal Sage  
Scrub**

Learn the ten most common plants in the canyons and natural areas of San Diego.



Broom baccharis



California buckwheat



California sagebrush



California sunflower



Laurel sumac



Lemonade berry



Scrub oak



Toyon



Black sage



White Sage



## Vocabulary

**Adaptation:** adjustment of natural or human systems to a new or changing environment

**Annual plant:** a plant that begins from a seed, and then grows, flowers, produces seed, and dies in less than a year

**Biodiversity:** variety of different types of life found on earth

**Climate:** the average weather of a given region taken over a significant period of time

**Coastal sage scrub:** a plant community that can withstand heat and seasonal lack of water, usually found in Mediterranean climates

**Deciduous:** shedding, or dropping, leaves

**Dormant:** not growing but resting or waiting for more suitable growing conditions

**Drought:** less rainfall than is expected over several months or years

**Drought tolerant:** being able to withstand an extreme lack of water

**Evergreen:** plants that keep their leaves all year round

**Habitat:** the place where a plant or animal lives

**Invasive plant:** a plant invading into a space for which it does not belong

**Mediterranean Climate:** is characterized by a long, dry season (spring, summer, and fall) followed by a short, wet season (winter)

**Native plant:** a plant that originated from a particular place

**Perennial plant:** a plant that lives for many years

**Plant communities:** a collection of plants with similar characteristics

**Weather:** the state of the atmosphere that changes constantly, including temperature, humidity, wind, and clouds