

What Do Plants Need to Grow?

Exploring Water's Role in Plant Adaptations
Grades 2-3

Vetted by Riverside County Office of Education-STEM

UCCE Master Gardener Program of Riverside County

Master Gardeners

The University of California Cooperative Extension (UCCE) Master Gardener Program (MGP) is an educational program designed to teach and effectively extend information to address home gardening and non-commercial horticulture needs in California.

UCCE is the outreach arm of UC's division of Agriculture and Natural Resources (ANR). Master Gardener volunteers (MG volunteers) promote the application of basic environmentally appropriate horticultural practices through UCCE-organized educational programs that transfer research-based knowledge and information.



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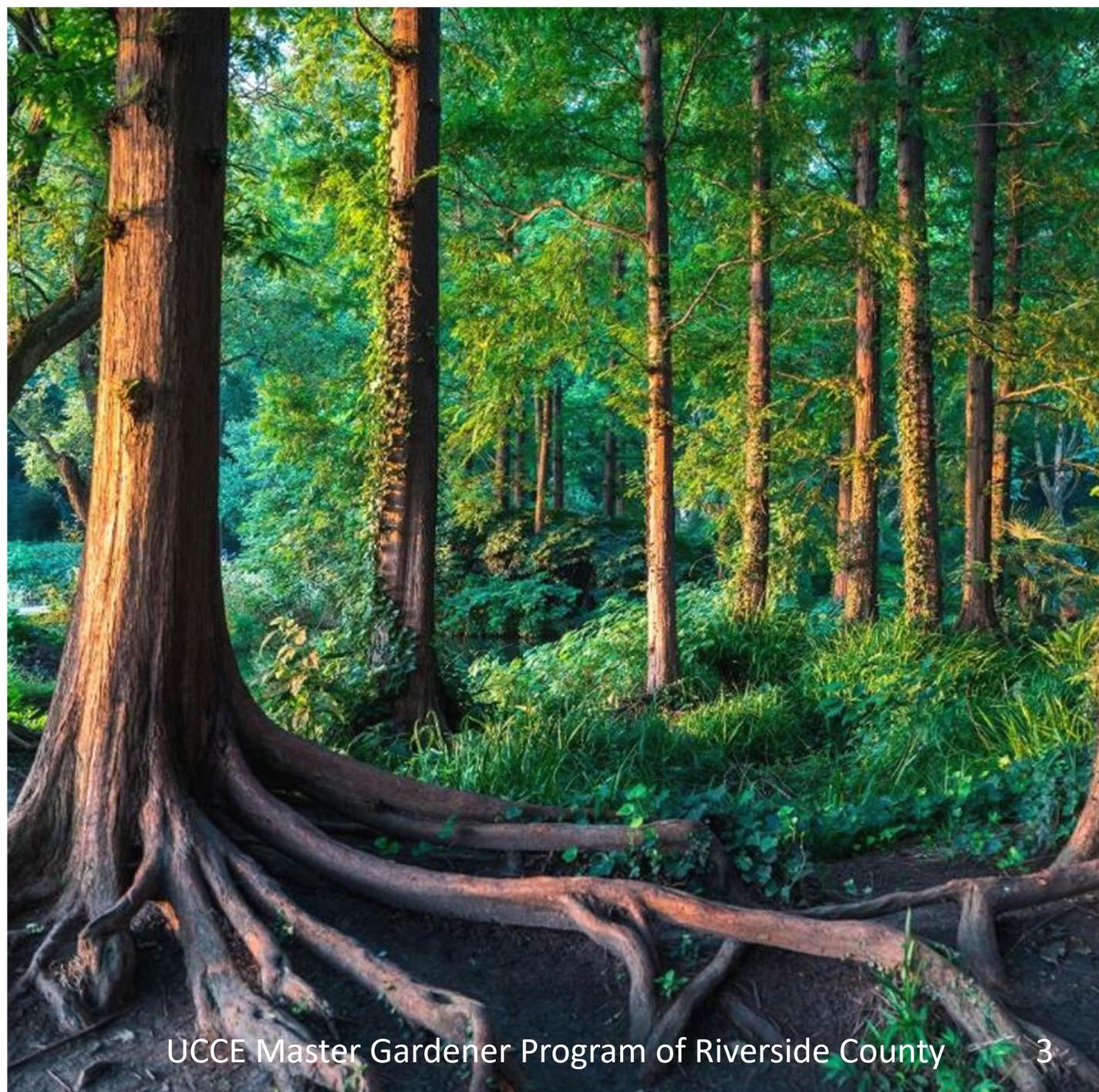
Agriculture and Natural Resources

UCCE Master Gardener Program

Teachers: Why Is This Important?

Most plants are composed of about 90% water.

Water is necessary for photosynthesis, plant cell integrity, and transporting nutrients to the plant.



Learning Goal

Students will learn:

- All plants need water, so plants must adapt to the drier or wetter growing conditions of a habitat in order to survive.



Anchor Phenomena: Amazing Plants



Amazing Plants | Tigtag Junior



Develop a Model To Describe the Phenomena

Draw a diagram showing how plants grow in drier habitats and in wetter habitats. Include both observable and unobservable details.

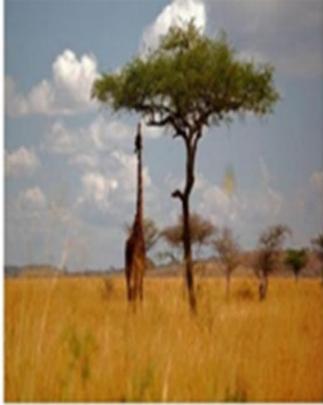
- Label all important parts of the diagrams.
- Use arrows to show how all parts interact.
- Write an explanation describing the relationship between plants and water in the habitat.



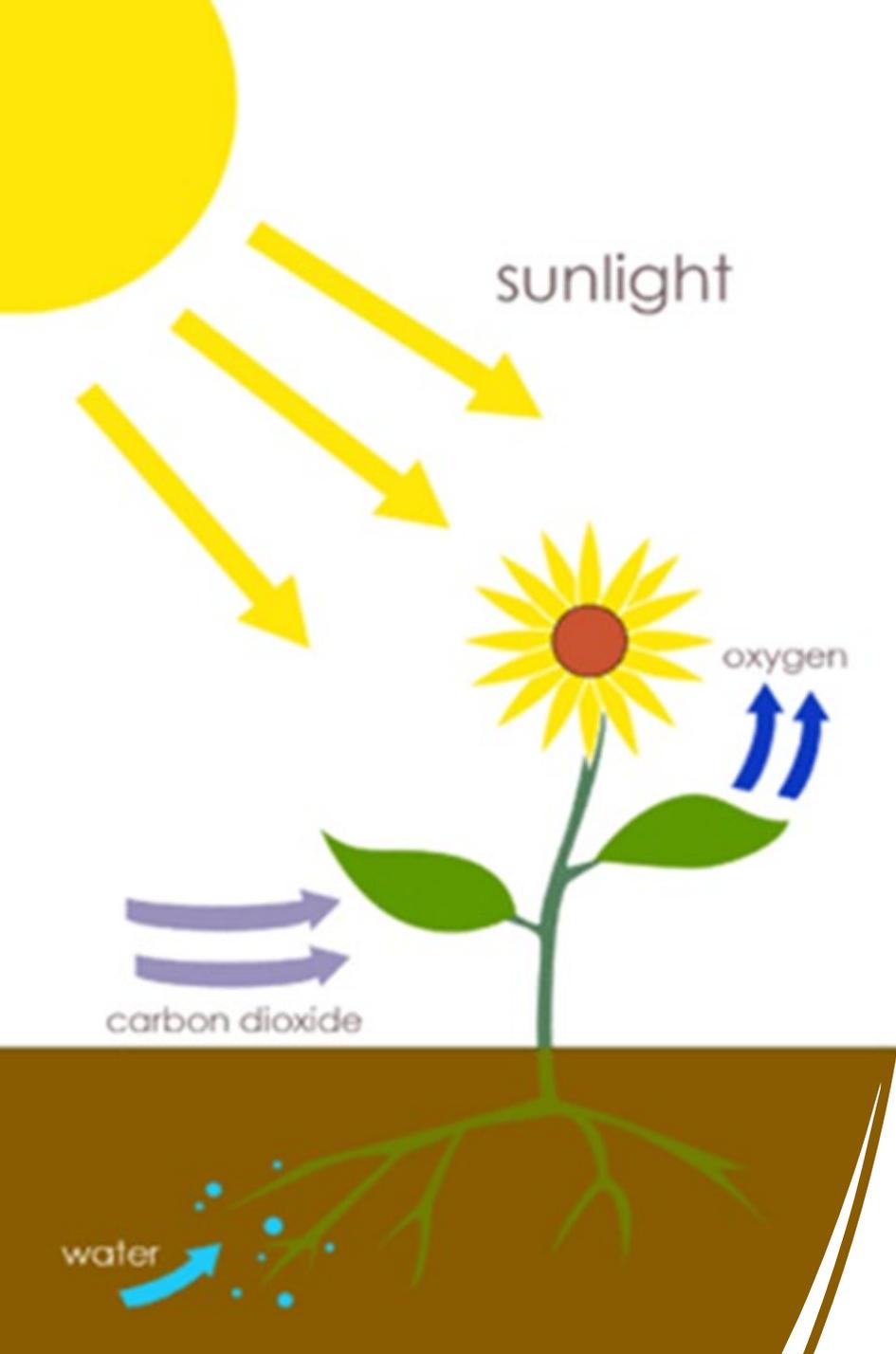
Examine These Plants Carefully

- How are these plants alike?
- How are these plants different?
- Pick one of these plants and describe *where* you think it might be found growing.

Where Do Plants Live?



- Plants can be found in the different habitats around the world.
- A **habitat** is a place where living things make their home.
- Some of these habitats have very little water, some have frozen water, some have heavy rainfall, and some are covered with water.



In Every Habitat Plants Need Water To Survive

All parts of the plant need water.

- The **roots** of a plant absorb water.
- The **stem** moves water through the plant.
- **The leaves** capture energy from sunlight and carbon dioxide from the air. As water evaporates through the leaves, oxygen is released, and more water is pulled up through the roots of the plant.



How Do Plants Survive In Different Habitats?

To survive plants must *adapt* to the wetter or drier growing conditions of the habitat.

- ***Adapt*** means to make changes in order to survive. This is a process that takes place over many generations –a very long period of time.
- Adaptations to wetter or drier water habitats can be observed in **one or more parts of a plant**-the roots, stem, leaves and even the flowers.

*Compare the stems and leaves of these trees.
How has each tree adapted to its habitat?*



Adaption Example: Sunflower

The sunflower's stem length, leaf, flower size, and roots have all *adapted over time* to grow in dry desert and wetland habitats.





Let's Explore Some Habitats!

How have plants adapted their roots, stems and leaves to the wetter or drier conditions of these habitats?

- Desert
- Grasslands
- Wetlands
- Temperate Rainforest
- Tropical Rainforest

Desert



Plants have developed adaptations to living without water for long periods of time.

- Cacti have **thick stems that can store water.**
- **Shallow roots spread out further** to quickly capture rainfall **or very deep tap roots** that reach water far underground.
- **Small leaves are thick and waxy** to reduce water loss.
- **Spines provide shade and also protection** from animals seeking water from the plants' stem and leaves.

Grasslands



Grasslands have medium to low rainfall, and very windy conditions. Over time, grasses adapted to become the dominant plant because:

- **Grass stems bend without breaking and go dormant** (stop growing) during drought.
- **Roots grow deep into the soil** to find and absorb water.
- **Leaves are thin, shiny or have tiny hairs** to reduce water loss.

Wetlands



A wetland is an area of land that is flooded or soaked by water. The water can be salty, fresh, or somewhere in between. Wetland plants have adapted by developing:

- **Long stems** that grow above the water level.
- **Roots that grow out of the swampy soil** and supply air to the underwater roots.
- **Waterlilies have stems that are buried under the mud and rocks.** These stems connect to stalks, which support the floating flowers and leaves.
- **Waterlily leaves have adapted their shape** to float easily on top of water.

Temperate Deciduous Forest



This habitat has four seasons with temperatures that fall below freezing in the winter. It rains from 30 to 50 inches per year. Adaptations include:

- As weather cools, the leaves cause too much water loss and can be weighed down by too much snow, so **the tree drops its leaves.**
- Tree **stems have thick bark** to protect against cold winters.
- Tree **roots can grow outward as far a 90 feet** and as deep as four feet.

Tropical Rainforest



This habitat is very warm and wet with 80 to 150+ inches of rain each year. With so much rainwater plant adaptations include:

- **Smooth stem bark** that water quickly slides off.
- **Leaves with *drip tips* and waxy surfaces** that allow water to run off easily.
- **Long stilt roots to help hold up plants** in the wet soil.

Video: Plant Adaptations



plant adaptations

Teachers: The first section of this video through 1:50 focuses on plant adaptations in response to wetter or drier conditions.

Check For Understanding

- What is a habitat ?
- Pick one plant part: root, stem or leaves. Describe how that part uses water to help a plant survive.
- What does adapt mean?
- What parts of a plant adapt to drier or wetter habitat conditions?
- Select a habitat and give an example of how a plant has adapted to its wetter or drier conditions.



Phenomena in the Garden:

Explore Plant Adaptations to Water in Your Community

Supplies:

- Collection of leaves from school and from home.
- 1 recording sheet per student (Slide 21)
- 1 set of Drier-Wetter Habitat slides (22-23) to post
- Scissors, pencils, crayons

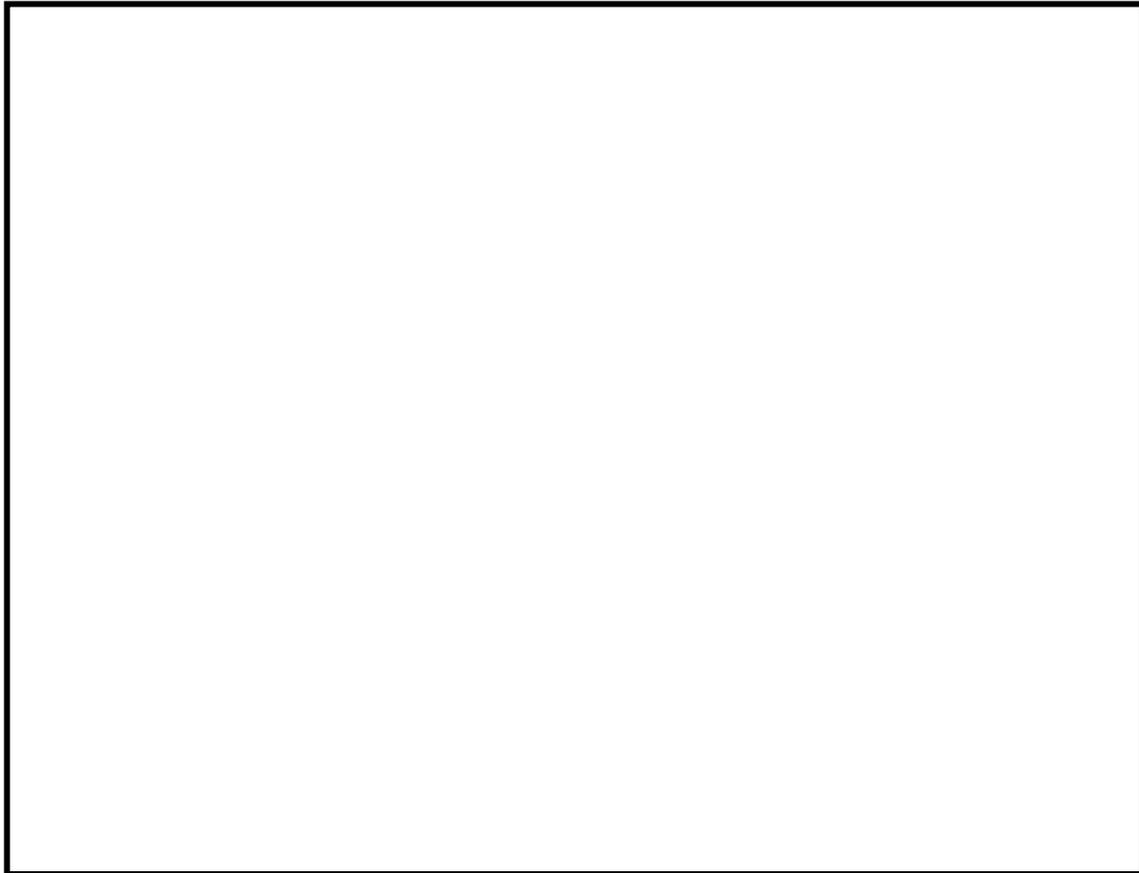
Steps:

- **Challenge** students to collect a variety of leaves.
- **Provide** each student with a leaf and an observation sheet to record information.
- **Post** the Drier-Wetter Habitat slides. Have students post their finished observation sheet under one of the two categories.
- **Evaluate:** Do most of the leaves come from plants that would be found in a wetter or drier habitat?



Leaf Observation

Draw a picture of your leaf.



Record your observations of the leaf's characteristics.

Size: _____

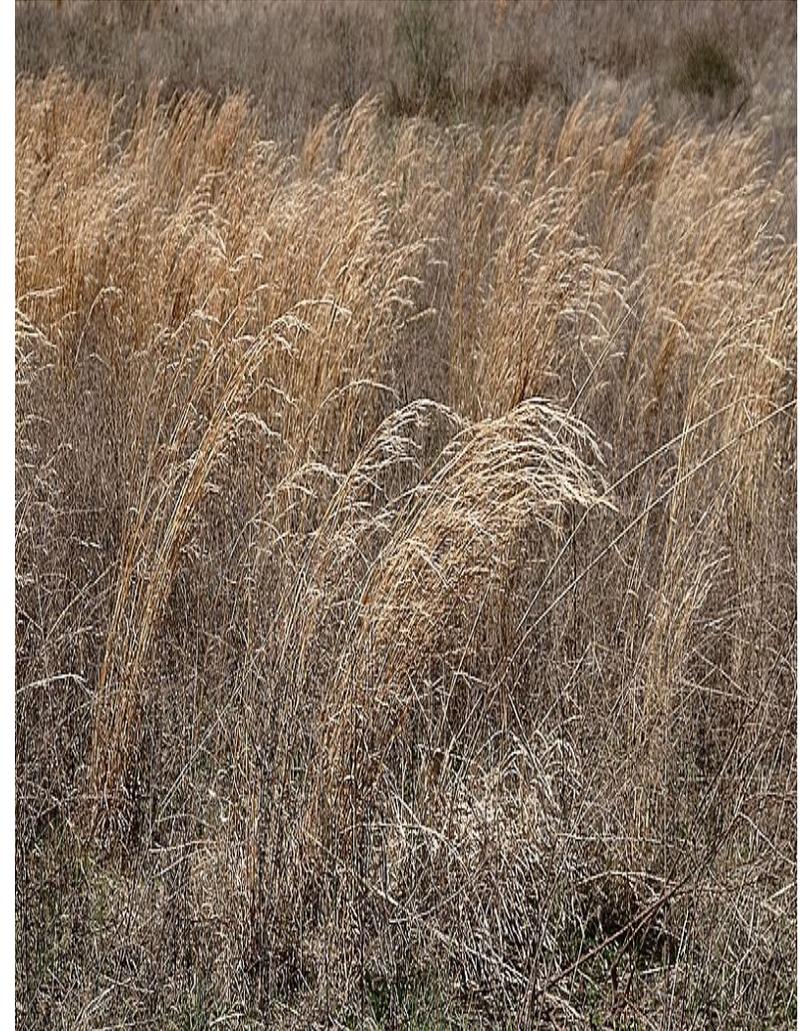
Texture: _____

Thickness: _____

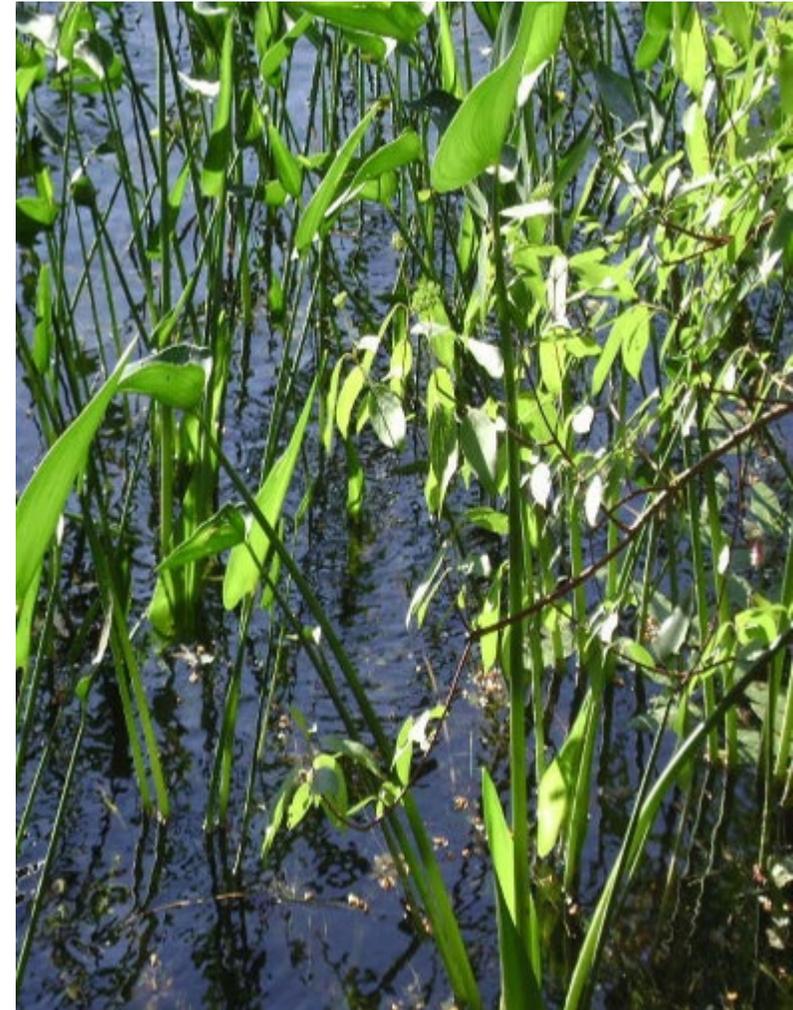
Color: _____

Other important details:

Drier Habitats



Wetter Habitats





Develop a Model To Describe the Phenomena

Revise or draw a new diagram showing how plants grow in drier habitats and in wetter habitats. Include both observable and unobservable details.

Label all important parts of the diagrams.

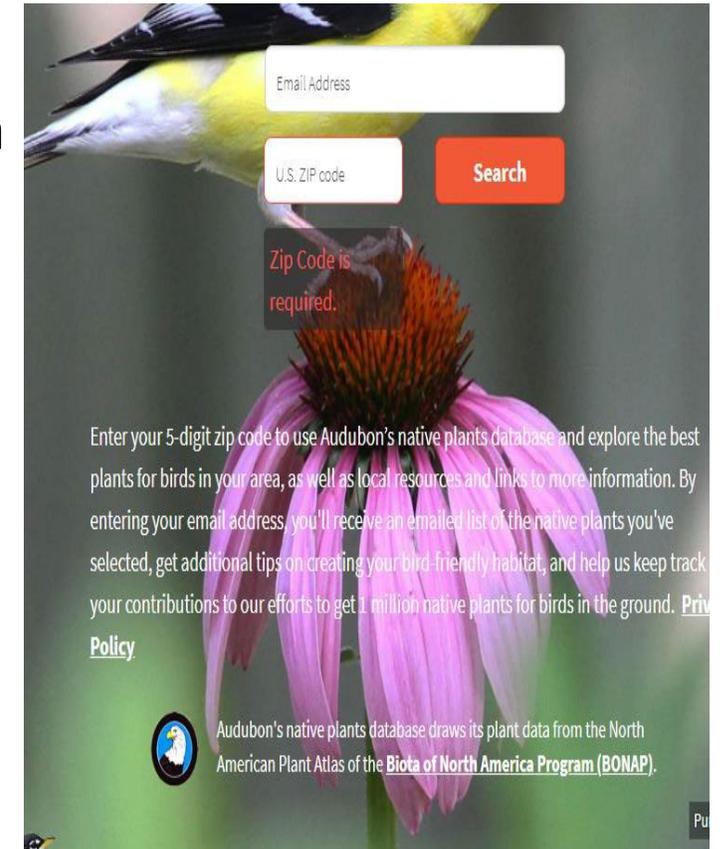
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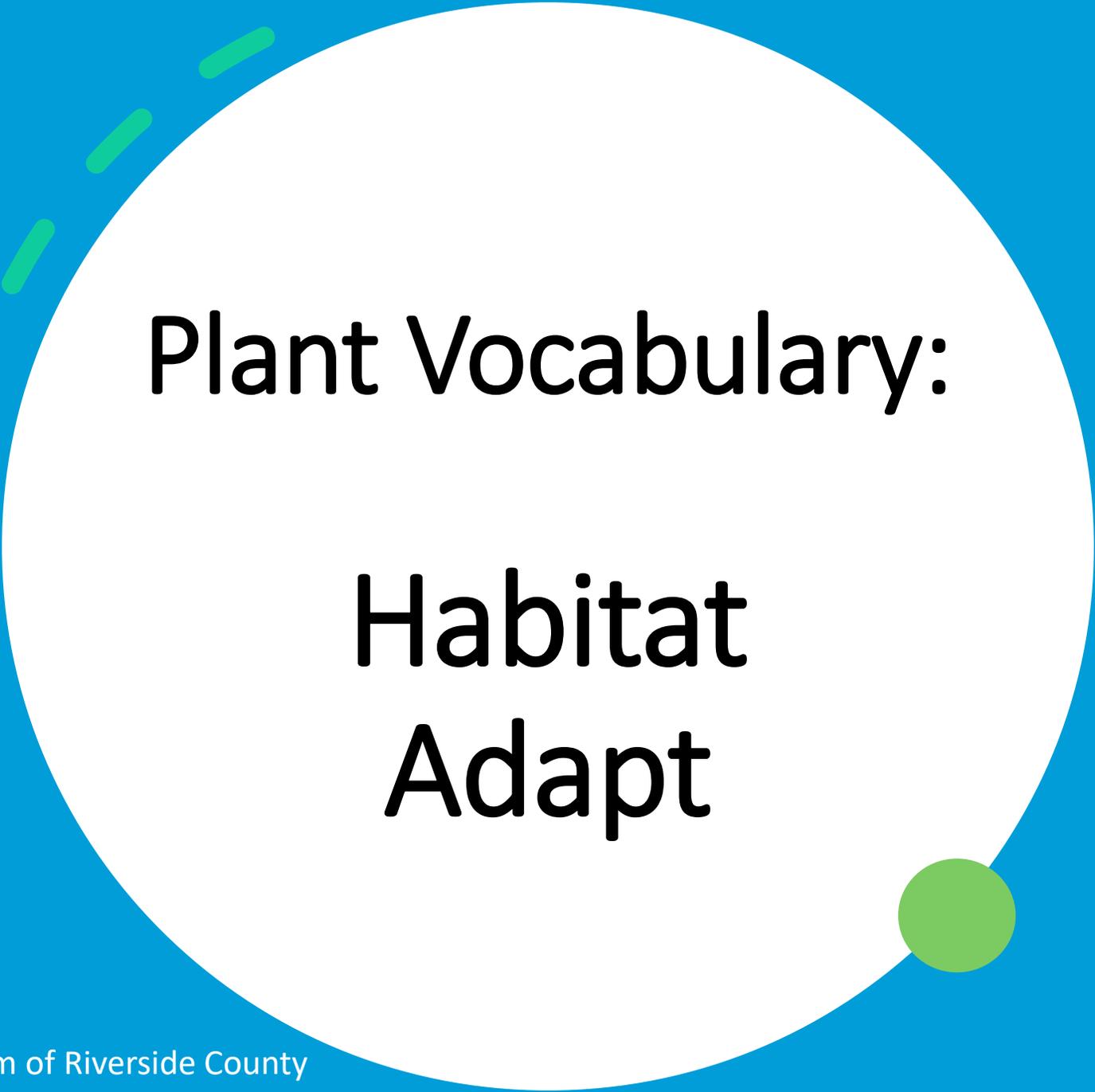
Extend Your Thinking: *Native Plants*

Do you know what plants were originally growing where you live and go to school?

Most plants we are familiar with in our home and school gardens were purchased at nurseries and are originally from different habitats! Native plants adapted over time to the wetter or drier conditions of the habitat in which you live and go to school.

- **Research plants that** are native to the area where your school is located. The [Audubon Society](#) will use your school's zip code to identify native plants that will also attract birds and pollinating insects to your garden.
- **Create a class list** of native plants you would like to plant in a garden area of your school.

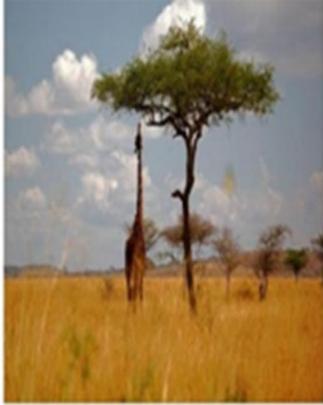




Plant Vocabulary:

**Habitat
Adapt**

Habitat



A habitat is a place where living things make their home.

Adapt

Adapt means to make changes in order to survive.



Next Generation Science Standards

- **2-LS2.A: Interdependent Relationships in Ecosystems**▪ Plants depend on water and light to grow.
- **2-LS4.D: Biodiversity and Humans**▪ There are many different kinds of living things in any area, and they exist in different places on land and in water.
- **3-LS2.C: Ecosystem Dynamics, Functioning, and Resilience:** When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die
- **3-LS3.B: Variation of Traits:** The environment also affects the traits that an organism develops.
- **3-LS4.C: Adaptation:** For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Next Generation Science Standards

Science and Engineering Practices

- Modeling: Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)
- Constructing Explanations and Designing Solutions: Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)

Crosscutting Concepts

- Structure and Function: The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)
- Cause and Effect: Cause and effect relationships are routinely identified and used to explain change.(3-LS4-2),(3-LS4-3)

Resources

- California Master Gardener Handbook, Second Edition 2015
- [Adaptations Background Information PDF](#): Garfield Park Conservatory Alliance
- [Biomes of the World](#): Missouri Botanical Garden
- [Habitats](#): National Geographic
- [Living Learning-Primary School](#): Centennial Parklands
- [Native Plant Database](#): Audubon Society
- [Nearly 40% of Plants Species are Very Rare](#) :National Science Foundation
- [Plant Adaptations: PDF](#): Thinktrees.Org.
- [Survival Through Adaptation-Water is Life](#) and [Explore Plant Adaptations in Your Community](#): The Huntington
- **Images**: Creative Commons, Stock Images; Kiddle; UCANR; Wikipedia
- **Videos**: Tigtag Junior; Michelle Vascik

Gardening Questions?

Email the UCCE Master Gardeners of Riverside County

- Email Helpline: anrmgriverside@ucanr.edu
- School Gardens: mgschoolgardens@gmail.com

Website Resources

- [Riverside Master Gardeners Website](#)



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