FLORIDA Wildflower FOUNDATION

Unit 5

Wildflower Adaptations

Overview

Now that students understand flower parts and life cycles, they're ready to explore how wildflowers have evolved special features to thrive in challenging environments. This unit builds on previous knowledge by showing how flower structures and life cycle stages are shaped by environmental pressures.

In this unit, students explore how wildflowers survive and thrive through physical adaptations. Unlike animals, plants cannot move, so their adaptations are structural rather than behavioral and develop over generations. Students will examine functional, defensive, and reproductive adaptations, as well as how wildflowers are specially adapted to Florida's ecosystems, such as aquatic, fire-dependent and coastal habitats. Through observation and discussion, students will discover how these adaptations help plants survive and reproduce in their unique environments.

Activities

1. Wildflower Adaptations
2. Wildflower Adaptation Game
3. Adaptation Scavenger Hunt
4. Plant Warriors
5. Ecosystem Adaptations
6. Wildflower Adaptations Web Quest
7. Adaptations Writing Extension

Vocabulary

adaptation
alkaloid
aquatic
cross-pollination
defensive adaptation
drought
ecosystem
epiphyte
evaporation
fire-dependent
functional adaptation
habitat
mimicry
physical adaptation
photosynthesis
pollen
pollinator
predator
reproductive adaptation
succulent
transpiration
waxy

Vocabulary words are italicized within the introduction text and activities.

Standards

Grade 3: ELA.3.C.2.1, ELA.3.C.3.1, ELA.3.C.4.1, ELA.3.C.5.2, SC.3.L.14.2, SC.3.N.1.1, SC.3.N.1.2, SC.3.N.1.3, SC.3.N.1.5, SC.3.N.1.6, SC.3.N.1.7, SC.3.N.3.2

Grade 4: ELA.4.C.2.1, ELA.4.C.3.1, ELA.4.C.4.1, ELA.4.C.5.2, SC.4.E.6.5, SC.4.L.16.2, SC.4.L.17.4, SC 4.N.1.1, SC.4.N.1.2, SC.4.N.1.4, SC.4.N.1.5, SC.4.N.1.6, SC.4.N.1.7, SC.4.N.1.8, SC.4.N.3.1

FLORIDA Wildflower FOUNDATION

Unit 5

Wildflower Adaptations

Introduction

Imagine living in the Florida heat without air conditioning, or surviving on a beach where salty wind blows constantly. Wildflowers face these challenges every day! Since they can't move to find shade or water, wildflowers have developed amazing adaptations — special features that help them survive in tough conditions.

An ***adaptation*** is any trait that helps a living thing survive and successfully reproduce in its environment. Wildflowers only have ***physical adaptations*** (changes to their body structures) because they cannot move on their own or change their behavior like animals can. These adaptations develop over many, many generations: if a trait helps a plant survive and make seeds, it gets passed on to the baby plants; if it doesn't help, the plant doesn't survive, and the trait disappears.

Adaptations can be divided into three types:

- ***Functional***: help the plant survive, like the deep roots of Tickseed that reach water during dry spells
- ***Defensive***: help protect the plant from predators, like the spiny leaves of Pricklypear cactus
- ***Reproductive***: help the plant produce seeds successfully, like the bright flowers of Butterfly milkweed that attract pollinators

In this unit, you'll become an adaptation detective, discovering how wildflowers protect themselves, attract pollinators and thrive in Florida's unique habitats.

Wildflower Adaptations — Reproductive

It is important for wildflowers to reproduce. Flowering plants have co-evolved with their pollinating partners over millions of years, producing a fascinating and interesting diversity of ***reproductive adaptations***. The variety in color, form and scent we see in flowers is a direct result of the need for flowers to be pollinated.

Wildflowers that depend on ***pollinators*** with high-energy diets, such as hummingbirds, produce huge amounts of nectar that have a much higher concentration of sugar and other nutrients as compared with flowers pollinated by other insects. Examples include Trumpet creeper (*Campsis radicans*) and Coral honeysuckle (*Lonicera sempervirens*).

Some plants use a form of ***mimicry*** to help with pollination. For example, Cardinalflower (*Lobelia cardinalis*) (pictured) attracts hummingbirds with its bright red, tubular flowers; however, the flowers have no nectar.

Bats and moths that are active at night are attracted to flowers that are white or very pale. These night-blooming flowers have a strong fragrance and a lot of nectar to attract pollinators that are active at night.

Beetle-pollinated flowers tend to be larger and more open to provide an easy landing pad since beetles cannot get around as easily as other flying insects. Landing pads provide a place where beetles can rest or feed while making contact with the flower's pollen.

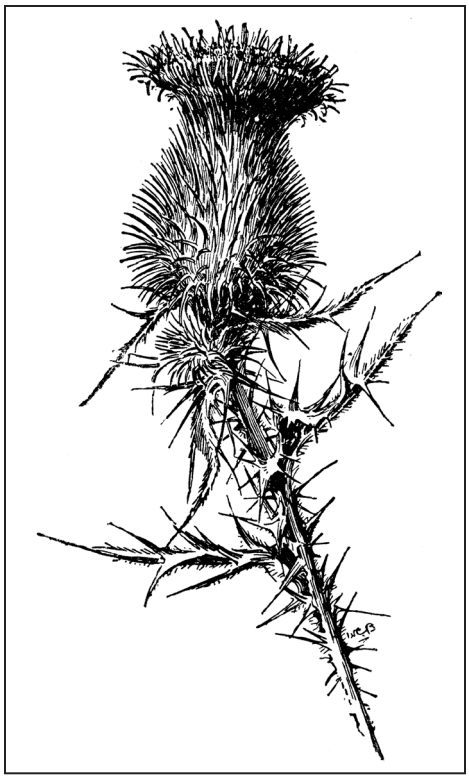
Pollen is high in protein, and many bees and beetles eat it. Flowers that depend on insects that eat pollen produce large amounts of pollen to ensure successful pollination.

Plants may use a combination of other strategies, such as visual cues (for example, bright colors or patterns, showy petals or sepals), scent, food or mimicry to lure a pollinator. Some orchid flowers, for example, look very similar to the insects that pollinate them in order to attract them. Many bee-pollinated flowers reflect a low ultraviolet pattern near the center of each petal. The ultraviolet patterns are invisible to humans, as our vision does not see ultraviolet light; however, bees do.

Wildflowers have evolved to bloom at differing times throughout the seasons, from the first hints of warmth in late winter through spring and summer, until last call in autumn. This decreases competition and provides pollinators with a constant supply of food.

Wildflowers that use wind for ***cross-pollination*** generally have flowers that appear early in the spring, before or as the plant's leaves are emerging. This prevents the leaves from interfering with the dispersal of pollen from the anthers and allows the stigmas to receive pollen. Pollen from wind-pollinated wildflowers is lightweight, smooth and small. Wildflowers that are wind-pollinated, such as most grasses, generally occur as large populations so female flowers have a better chance of receiving pollen.

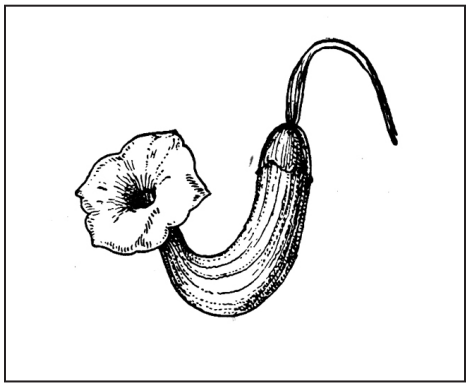
Wildflower Adaptations — Defensive



Defensive adaptations (defenses) are adaptations that help the plant defend or protect itself. The Sensitive brier (*Mimosa quadrivalvis*) reacts to being touched by folding up its leaves. Some plants, such as Coralbean (*Erythrina herbacea*) and some Thistles (*Cirsium* spp.) (pictured, top) are armored with thorns, spines or sharp hairs.

Chemical defenses, such as the "milk" in Milkweed (*Asclepias* spp.) help plants deter predation. The "milk" is actually an ***alkaloid*** that contains a toxic, latex-like chemical. (The Monarch butterfly, however, is adapted to tolerate the "milk." The butterflies eat the milkweed and store the alkaloids in their bodies, which make them taste bad to birds and other ***predators***.) Other plants produce a bitter taste, discouraging animals that might want to eat them.

Some plants have highly aromatic foliage that discourages insects, as well as herbivores such as deer, from eating them. The leaves of plants such as Richweed (*Collinsonia canadensis*), St. John's mint (*Clinopodium brownei*) and others in the mint family produce a strong mint-like scent when crushed. Any sort of strong smell, even if it is a nice smell, is likely a chemical defense.



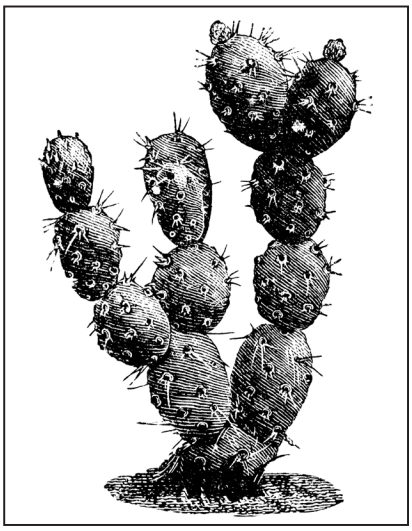
Some plants use scent to attract "defenders." Research has shown that certain plant species, when being eaten by insects, will emit a scent that attracts the predators of those insects (usually another species of insect). These predators eat the insects that are eating the plant, and thus, the plant is "saved."

Plants can also use ***mimicry*** as a defense. For example, Passionflower vines (*Passiflora* spp.) produce small, yellowish bumps at the base of their leaves. These bumps are the same size, shape and color as butterfly eggs. They fool butterflies into thinking another butterfly has already laid eggs on the plant. The butterfly will then look for another vine on which to deposit its eggs. Virginia snakeroot (*Aristolochia serpentaria*) (pictured, bottom) produces dark red flowers that smell like rotting meat. This attracts flies that are hoping to lay their eggs on the meat. In the process of moving around the flower in search of the meat, the flies pollinate the flowers.

Wildflower Adaptations — Functional

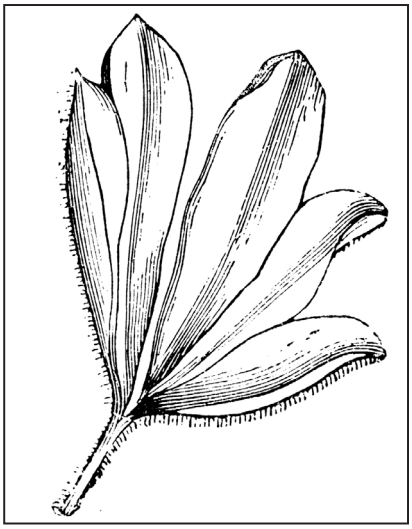
Functional adaptations help plants carry out major life functions such as ***photosynthesis***, growth, and water and nutrient storage and transport. Wildflowers living in extreme weather conditions have to develop appropriate adaptations in order to survive. The Florida environment can be extreme with hot temperatures and light freezes, ***drought*** and excessive rain, salty and poor soils, and even more. One of the many benefits of native plants is that they have had millions of years to become adapted to the extremes of the regions in which they live.

Wildflowers living in a water-limited environment — such as on Florida's sand dunes and in sandhills or scrub ***habitats*** — must develop ways to capture and store water. Plants in these areas typically have thick or ***succulent*** leaves where water can be stored. Many of these leaves have a thick, ***waxy*** covering on their surface that keeps the wildflowers cooler and reduces water loss due to evaporation. Examples are Seapurslane (*Sesuvium portulacastrum*) and Railroad vine (*Ipomoea pes-caprae*).



Small, needle-like leaves, such as those of Florida rosemary (*Ceratiola ericoides*) (pictured, top), have less surface area, which means less area that is exposed to the air and sunlight that causes ***evaporation*** and ***transpiration***. Similarly, Hairy dawnflower (*Stylisma villosa*) holds its leaves upright at 90° angles to reduce the amount of surface area exposed.

Some wildflowers can store water in their stems, trunks, or in underground structures like the Pricklypear cactus (*Opuntia* spp.) (pictured, middle) or Triangle cactus (*Acanthocereus tetragonus*). Cacti have round stems that store a lot of water. Their spines are actually leaves that help reduce the amount of water lost through transpiration.



Small hairs are also found on some wildflowers' leaves, such as Skyblue lupine (*Lupinus diffusus*) (pictured, bottom) and Softhair coneflower (*Rudbeckia mollis*). These small hairs can absorb water from the atmosphere, reflect sunlight and lower the leaves' temperature.

Bromeliads can survive both extremely wet and dry conditions. Some live on the bark of other trees and do not have access to wet soils, so they need ways to capture and store water when it rains. Their long, curved leaves overlap at the base, forming a little bowl. The rain runs down the leaves and is stored in the bowl. An example is the Strap airplant (*Catopsis* spp.).

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Unit 5 Activity 1

Wildflower Adaptations

Objective

Students will be able to identify and understand how plants are adapted for survival.

Materials

- "Wildflower Adaptations" worksheet (one per student)

Standards

Grade 3: SC.3.N.1.1, SC.3.N.3.2

Grade 4: SC.4.L.16.2, SC.4.L.17.4, SC.4.N.1.1, SC.4.N.1.4, SC.4.N.1.8, SC.4.N.3.1

Directions

This is a two-part activity. Students can work individually, in pairs or in groups.

1. As a class, brainstorm a list of types of adaptations that could be used by Florida wildflowers.
2. Provide each student with a "Wildflower Adaptations" worksheet.
3. Assign each student/pair/group a wildflower to research using the Internet or other reference and resource materials. Have them fill in Part One of the worksheet as it relates to their assigned wildflower.
4. For Part Two, have students/pairs/groups design and draw an imaginary wildflower that would have at least three adaptations. Encourage students to use adaptations from the class list, but to also be creative and think of their own adaptations that may not be on the list.
5. The wildflower drawing should include a sketch showing the adaptations, labels with reasons for each adaptation, and appropriate grammar, conventions, and neatness.

A scoring rubric is provided to help assess student work.

Alternative

Provide students with craft materials and allow them to design a 3-dimensional model of an imaginary wildflower with at least three adaptations. Have them list and define the adaptations that are included in the model.

Wildflower Adaptations

Part one

Wildflower name: _____

Adaptations	How does this adaptation help your wildflower survive? Why did it develop the adaptation?
1.	
2.	
3.	

Part two

Sketch of plant and adaptations

Wildflower Adaptation Scoring Rubric (for teachers)

4	3	2	1
The sketch or model relates to topic, is large enough to see, and has labels.	The sketch or model relates to the topic but is small or unclear; most labels are present.	The sketch or model is somewhat neat; not all labels are included and/ or the sketch isn't large enough.	The sketch or model is neither clear nor neatly displayed; the visual isn't large enough, or is lacking labels.
Each adaptation is identified with fully developed reasons given for the adaptation.	Each adaptation is identified with reasons given for the adaptation, but the reasons are only briefly stated.	One adaptation is missing, poorly done, or does not relate to the topic; reasons for the adaptations are not well-described or not complete.	One or more adaptations are missing, poorly done, or does not relate to the topic; reasons for the adaptations are missing or not appropriate.
Project is well-written: • Focused and on-topic; • Good grammar, spelling and punctuation; • Neatly done.	Project is adequately written: • Focused and on-topic; • Good grammar, spelling and punctuation; • Could be more visually appealing.	Parts of project are difficult to understand: • Writing is not completely focused on topic; • Some adaptations or reasoning are confusing; • Somewhat messy appearance.	Project is poorly written and difficult to understand: • Writing is unfocused, off topic, and confusing to the reader; • Contains many punctuation, grammar and spelling errors; • Messy appearance.

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Unit 5 Activity 2

Wildflower Adaptation Game

Objective

Students will discuss challenges to plant survival in Florida's environments, and be able to identify ways wildflowers and other plants have adapted to these challenges.

Materials

- "Wildflower Adaptations Clue Cards" (one set)
- "Wildflower Adaptations Plant Cards" (two sets)

Standards

Grade 3: SC.3.N.1.1

Grade 4: SC.4.L.16.2, SC.4.N.1.1

Tip

Prior to starting this activity, print and laminate one set of "Wildflower Adaptations Clue Cards" and two sets of "Wildflower Adaptations Plant Cards." Use different colored paper to easily differentiate Clue Cards from Plant Name Cards.

Directions

1. Have students list what plants and wildflowers need to survive. Be sure that they include water, soil, and sunlight.
2. Discuss characteristics of Florida that make it difficult for wildflowers to grow. For example, it is hot with periods of heavy rainfall and drought; soils are well drained; fungi and algae attack some wildflowers; and animals and insects eat some wildflowers.
3. Discuss with students some of the specific adaptations that are found in the plants featured in the game.
4. Take the students outside and divide them into two groups or teams. Designate a starting line for them to form two lines behind.
5. Place "Wildflower Adaptations — Plant Name Cards" together in two sets about 50 feet away.
6. Give students the following instructions:
    - The teacher will read a clue from the "Wildflower Adaptations — Clue Cards." Listen carefully to the clues being read.
    - As a team, discuss the clue and determine which plant it refers to or which wildflower is being described.
    - When time is called (about 15 seconds) and a signal given, one person from each team will run to their team's wildflower cards and select the name of the wildflower that matched the clue given, then run back to the team.
    - The first student back scores a point for their team if the correct card was picked.
    - If the correct card was not picked, the other team gets a point if their runner picked up the correct card. There may be more than one right answer to some clues.
    - The team with the highest score wins after all clue cards have been given.

Extension

Have students use the Internet or other reference and resource materials to research wildflowers found in Florida and develop adaptation clue cards of their own to use with this game.

Wildflower Adaptation Clue Cards

American white waterlily

This floating aquatic plant has pale white and pink flowers and broad, circular and spongy leaves that are rooted below the water's surface. A massive floating canopy of leaves is produced over weak stems that easily break and allow the plant to spread. The upper leaf surface, where most photosynthesis occurs, is covered with thick wax that repels water.

Ghost orchid

This epiphyte consists of large masses of photosynthetic roots with one to 10 fragrant flowers that open one at a time. The flowers emit a fruity fragrance during early morning that attracts the Giant sphinx moth, an insect with a very long proboscis. The lower petals produce two long lobes that resemble the back legs of a jumping frog. It is found in moist, swampy forests in southwestern Florida.

Coral honeysuckle

This woody vine has bright, reddish-orange, tubular flowers. It attracts butterflies and hummingbirds and blooms in the spring and summer.

Daisy fleabane

Primarily small bees and flies visit the flowers for nectar or pollen. The flowers have a mild fragrance. It can set fertile seed without cross-pollination. The seeds have small bristles or white hairs that promote distribution of the seeds by wind. The root system consists of a taproot. This plant spreads by re-seeding itself.

Yellow-eyed grass

This very tall native wildflower is common in flatwoods, savannas, bogs and lake margins nearly throughout Florida. It grows in full sun in wet sites where soil remains moist year-round. Its small yellow flowers open one at a time in a densely crowned cone-like head that resembles a tiny pine cone. This flower survives best in habitat that requires frequent fire to eliminate competition.

Gulf Coast lupine

This small, endangered wildflower is endemic to the Panhandle region of Florida. It is adapted to tolerate extreme conditions found on coastal dunes. Leaves are pubescent or covered with fine hairs. Flowers are purplish-blue, with a deep purple central spot.

Pitcherplant

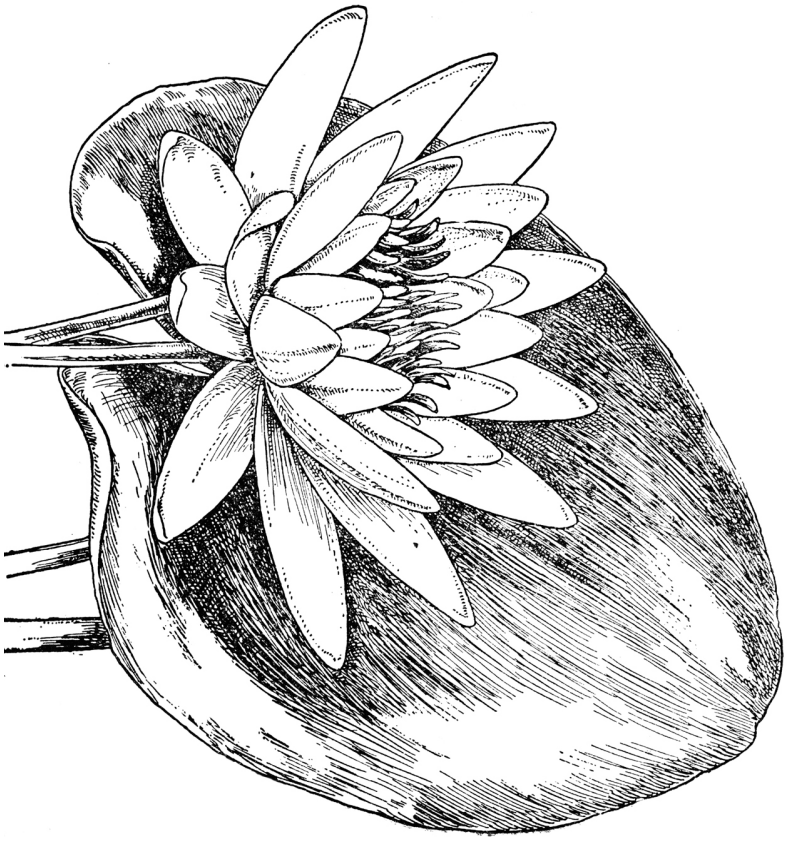
Leaves of this carnivorous plant have a deep fluid-filled cavity into which insects fall, drown, and are digested. The nutrients are absorbed by the plant.

Pricklypear cactus

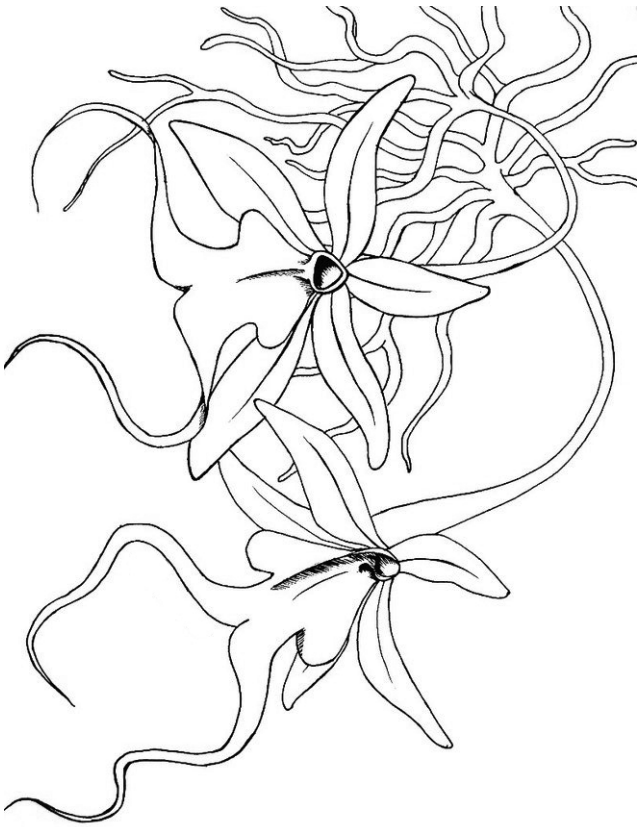
This prickly plant has yellow flowers that invite bees to enter. The spines found on its thick pads act like sponges to absorb and hold water.

Wildflower Adaptation Plant Cards

American white waterlily



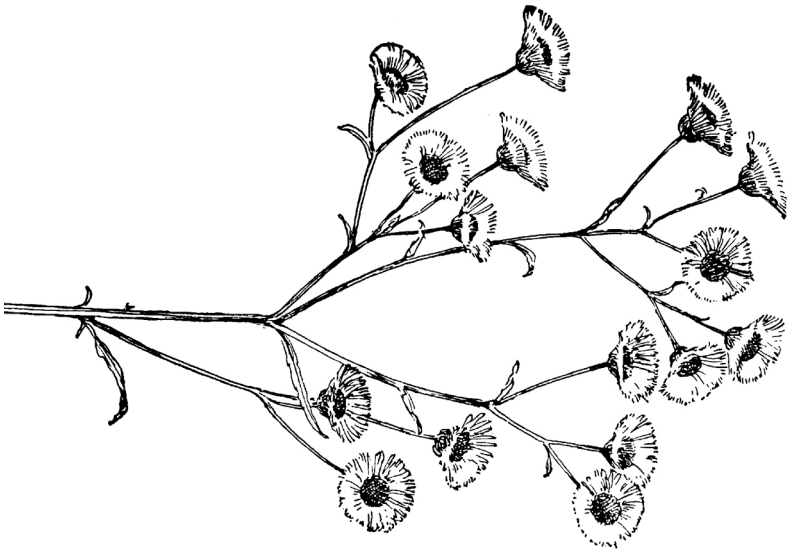
Ghost orchid



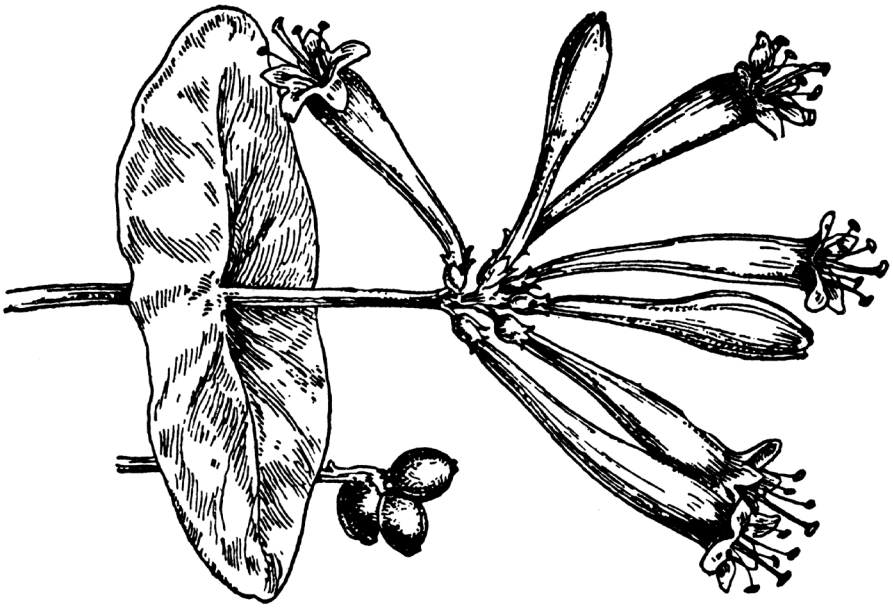
American white waterlily courtesy FCIT (etc.usf.edu/clipart)
Ghost orchid courtesy of Christina Lakish (christinacoleart.tumblr.com)

Wildflower Adaptation Plant Cards

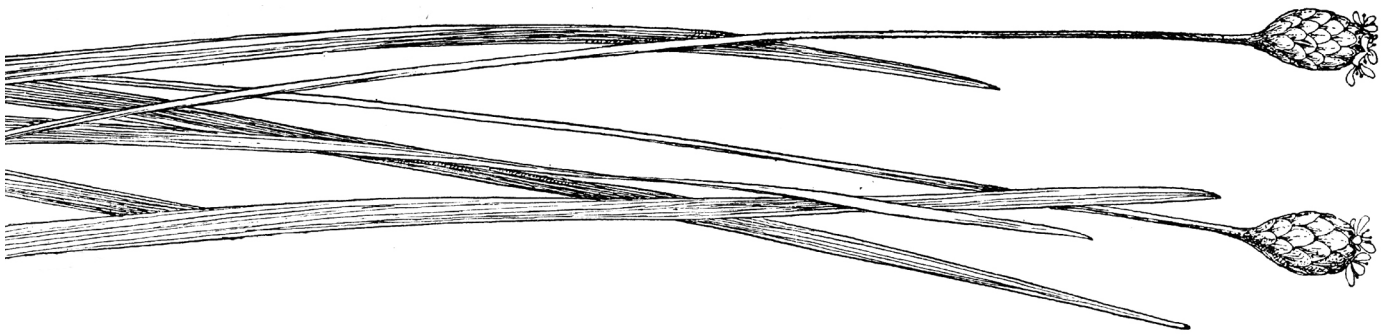
Daisy fleabane



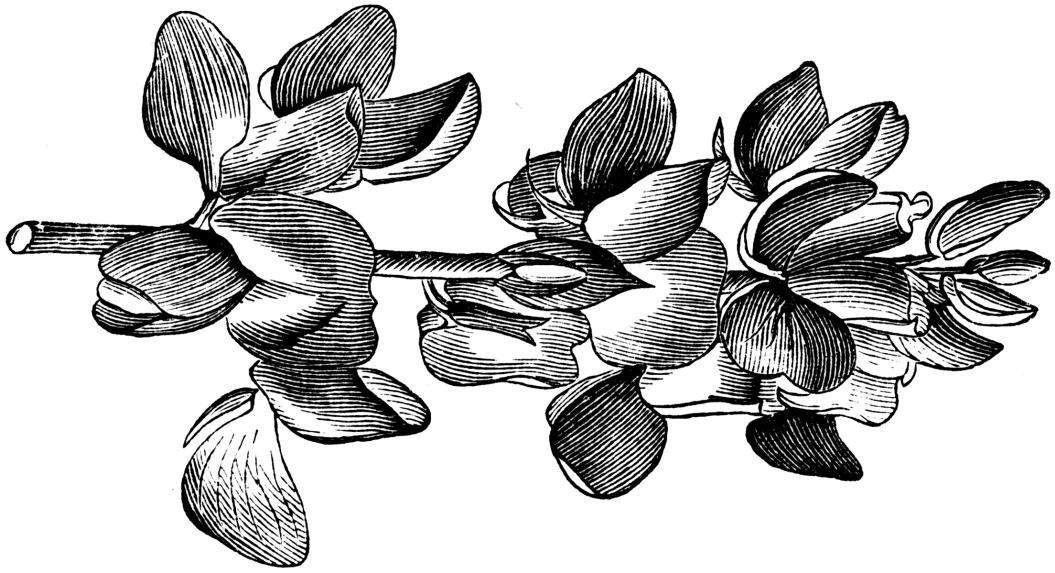
Coral honeysuckle



Wildflower Adaptation Plant Cards



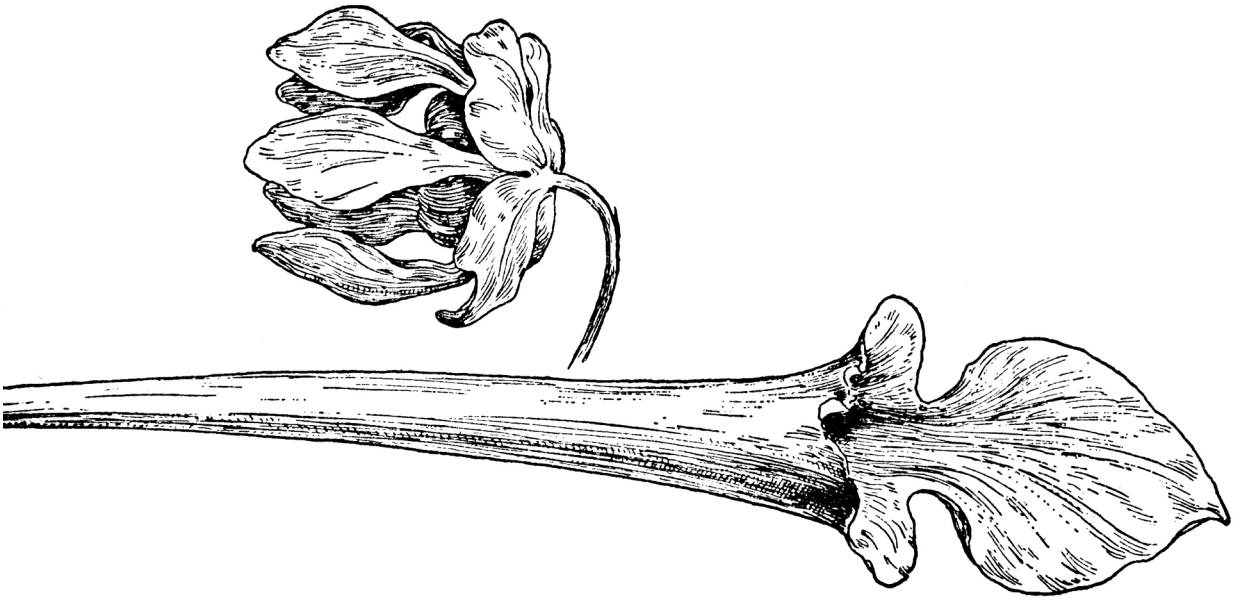
Yellow-eyed grass



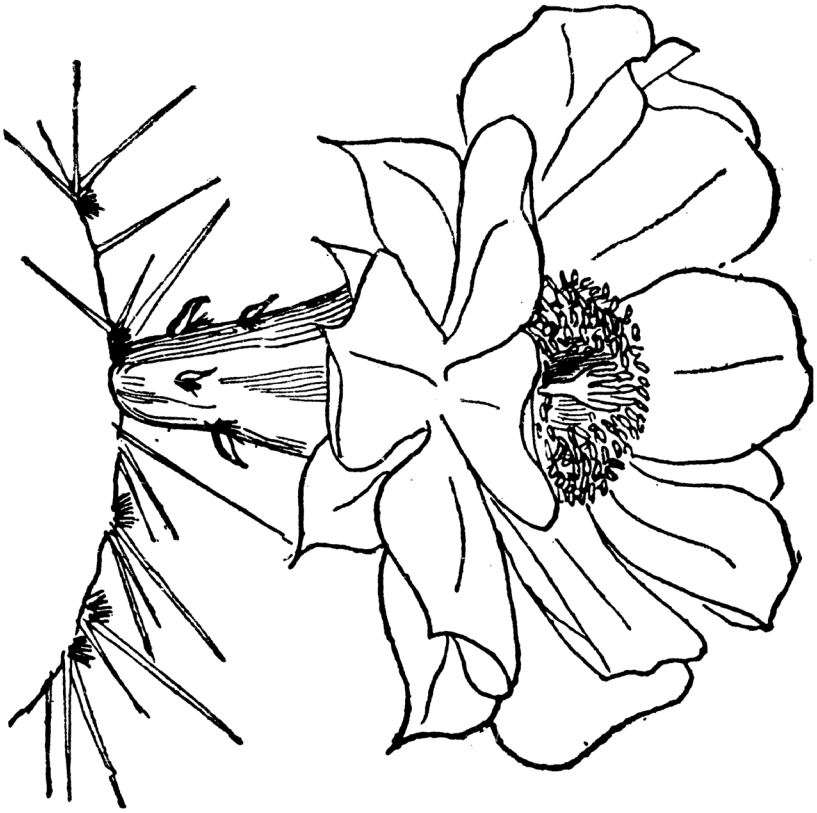
Gulf Coast lupine

Wildflower Adaptation Plant Cards

Pitcherplant



Prickly pear cactus



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Unit 5 Activity 3

Adaptation Scavenger Hunt

Objective

Students will be able to identify and categorize adaptations found in wildflowers.

Directions

1. Provide each student with a set of the "Adaptation Scavenger Hunt" worksheets to complete as a homework or class assignment.
2. Students are to look for something in the leaves, stems, flowers, fruits, or other plant parts that appear to be an adaptation to the plant's environment.
3. Students must determine which category the adaptation belongs in — functional, defensive or reproductive — and offer an explanation for their reasoning.
4. Students will write a short description of the plant, its flower, and its adaptation; they will also sketch the wildflower and label its adaptation.
5. Students should try to find one example of each type of adaptation.
6. Have students share and compare their findings.

Variation

Have students use the Internet or other reference and resource materials to research Florida native wildflower adaptations and select three examples with which to complete the "Adaptation Scavenger Hunt" worksheet.

Materials

- "Adaptation Scavenger Hunt" worksheets (one set per student)
- hand lens (one per student)

Standards

Grade 3: SC.3.N.1.1, SC.3.N.1.2, SC.3.N.1.3, SC.3.N.1.6, SC.3.N.1.7

Grade 4: SC.4.E.6.5, SC.4.N.1.1, SC.4.N.1.2, SC.4.N.1.4, SC.4.N.1.5, SC.4.N.1.6, SC.4.N.1.7

Tip

This scavenger hunt requires access to wildflowers in bloom. Check to see if your campus has a wildflower garden or growing boxes, or look in an unmowed area, near a fence line, or in a drainage ditch.

Some of the wildflowers found on school grounds are very small, so students will have to look closely.

Note: If completing as a homework assignment, you may choose to suggest adaptations that do not require a hand lens.

Adaptation Scavenger Hunt

Adaptation descriptions

Functional: Helps the plant carry out major life functions such as photosynthesis, water and nutrient storage and transport, and growth. It could include anything that seems to help the plant stay upright, climb, transport nutrients, capture water, store water, drain water from its leaves, or anchor itself.

Reproductive: Increases plant pollination or seed production. Look at the flowers and see how pollinators are attracted to the plant. Look at the seed-containing fruits and think about how they are dispersed and what kind of animal may help spread the seeds.

Defensive: Helps a plant defend itself from being eaten. Defensive adaptations can be physical (for example, leaves or stems with thorns, spines or sharp hairs), chemical (such as a toxic "milk" within the stems or leaves, or a strong odor), or mechanical (leaves that fold up when you touch them, for example).

Directions

1. Find three examples of flowering plants at home, in your neighborhood, or at school. Look at each plant and find an adaptation in its leaves, roots, stems, flowers or fruits that appears to be an adaptation to its environment.
2. Determine which category the adaptation you identified belongs in — functional, defensive or reproductive. Circle the adaptation type that applies on the worksheet.
3. Write a short description of the plant and describe its adaptations.
4. Sketch a picture of the plant that shows its adaptations.
5. Try to find one example of each type of adaptation.

Plant name: _____ **Plant adaptation description:** **Functional Reproductive Defensive**	**Sketch of plant and adaptation**

Adaptation Scavenger Hunt

Plant name: _____ **Plant adaptation description:** **Functional Reproductive Defensive**	**Sketch of plant and adaptation**

Plant name: _____ **Plant adaptation description:** **Functional Reproductive Defensive**	**Sketch of plant and adaptation**

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Unit 5 Activity 4

Plant Warriors

Objective

Students will be able to design and demonstrate an understanding of plant defense mechanisms through creative modeling.

Directions

1. Invite students to create a plant that uses at least one of the defense methods they have learned about. Remind them that a successful plant design increases the plant's chances of producing good seeds. Their designs should focus on protecting the plant itself or on protecting the plant's seeds.
2. Students may use the Internet or other reference and resource materials to help identify additional plant defense mechanisms.
3. Have students present their creations to the class and demonstrate the plant's defense mechanisms.
4. Set up a "Hall of Warriors" for students to display their inventions. Each plant should have a card that identifies its name, location and potential enemies, as well as the defense that helps protect the plant.

Materials

- miscellaneous craft supplies including construction paper, glue, yarn, paints, crayons, scissors, etc.

Standards

Grade 3: SC.3.L.14.2, SC.3.N.1.1, SC.3.N.1.2, SC.3.N.1.5, SC.3.N.3.2

Grade 4: SC.4.L.16.2, SC.4.L.17.4, SC.4.N.1.1, SC.4.N.1.4, SC.4.N.3.1

Note: Remind students that plants do not have the freedom to move, so no karate-chopping vines!

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Unit 5 Activity 5

Ecosystem Adaptations

Objective

Students will be able to understand the characteristics of Florida's four major ecosystems and identify the ways in which plants must adapt to survive in each ecosystem.

Directions

Students can do the research and presentation part of this activity individually, in pairs or in groups

1. Give each student, pair or group a copy of one of the four "Ecosystem Adaptations" handouts.
2. Direct students to read the information they've been presented and then, using the Internet or other reference and resource materials, research additional information such as Florida wildflowers endemic to the ecosystem or animal-plant interactions in the ecosystem. Have them keep track of the sources they use.
3. Have each student write about their ecosystem and the wildflowers found within it. Instruct them to describe the adaptations of each wildflower and how they help or allow the wildflowers to survive within that ecosystem.
4. Have each group design a presentation of their ecosystem information to share with the whole class. Presentations can be done on the computer or as poster sessions.

Materials

- "Ecosystem Adaptations" handouts (one sheet per group)

Standards

Grade 3: ELA.3.C.2.1, ELA.3.C.5.2, SC.3.N.1.1, SC.3.N.1.7

Grade 4: ELA.4.C.2.1, ELA.4.C.3.1, ELA.4.C.4.1, ELA.4.C.5.2, SC.4.N.1.1, SC.4.N.1.4, SC.4.N.1.7

Ecosystem Adaptations — Coastal Dunes and Scrub

Although it rains quite a bit in Florida, our coastal dunes and scrub regions are very dry and hot, closely resembling a desert. One reason is that their soil is composed of deep, dry sands that allow water to quickly drain through it. Another reason is that there is a lot of sunlight shining directly on the plants and reflecting off the light-colored soils.

In coastal areas, winds are often strong, salty and blow constantly, drying plants out. In the scrub, plants receive little water, constant sun, and may be subject to high-intensity fires.

Florida plants are exposed to extreme temperatures and drought conditions. To survive, plants must avoid losing too much water and at the same time, stay cool. Plant adaptations to cope with these conditions include:

- Thick ***succulent*** leaves and/or stems where water can be stored.
- Few or no leaves, which helps reduce water loss during ***photosynthesis***. Leafless plants conduct photosynthesis in their green stems.
- Long root systems that spread out wide or go deep into the ground to absorb water.
- Leaves with hair or spines that help shade the plant, reducing water loss. These hairs and spines can also provide protection from animals that would consume the plant.
- Leaves that turn throughout the day to reduce the amount of leaf surface that is exposed to the sun and heat. This reduces water loss and helps keep the plant cooler.
- ***Waxy*** coating on stems and leaves to help reduce water loss.
- Slower growth rates, which requires less energy. The plants don't have to make as much food and therefore do not lose as much water.

Ecosystem Adaptations — Aquatic and Wet Areas

Florida has a wide variety of ***aquatic habitats***, including rivers, streams, springs, wetlands and marshes. Wetland areas are often a mixture of forests and understory plants. Special ***adaptations*** to help plants thrive in a watery habitat include:

- Underwater leaves and stems are flexible to move with water currents.
- Some plants have air pockets in their stems, hollow stems or air-filled bladders to help them stand up or float in the water.
- Submerged plants lack strong water transport systems in their stems. Instead, water, nutrients and dissolved gases are absorbed directly from the water.
- Roots and root hairs are reduced or absent because the roots are only needed for anchorage, not for absorption of nutrients and water.
- Leaves that float on top of the water to expose themselves to sunlight.
- Seeds that can float.
- Drip tips and ***waxy*** surfaces that allow water to run off, discouraging the growth of bacteria and fungi.
- Buttresses and prop and stilt roots that help hold up plants in the shallow soil.

Ecosystem Adaptations — Flatwoods and Dry Prairies

Florida's flatwoods and dry prairies feature hot summers, cold winters and frequent fires. Flatwoods are dominated by an open canopy of pine species, and an understory of Saw palmetto (*Serenoa repens*), Gallberry (*Ilex glabra*) and other flammable evergreen shrubs, while dry prairies have little to no canopy. Both ecosystems typically contain many grasses and wildflowers. ***Adaptations*** developed for this type of area include:

- Deep root systems help the plants survive when fires consume their above-ground portions. The deep roots quickly sprout new growth. They also help some grasses obtain water from sandy soils. Many species in these ecosystems are ***fire-dependent***, meaning they require fire in order to germinate, reproduce or thrive.
- Narrow leaves will lose less water than broad leaves.
- New growth emerges from near the base, not the tip of the plant, so they are not permanently damaged from grazing animals or fire.
- Wind pollination takes advantage of exposed, windy conditions.
- Soft stems bend in the wind.

Ecosystem Adaptations — Forests

Florida has both wetland and dry forested areas. During years of normal rainfall, they may receive up to 50 inches of rain. This abundance of water can cause problems such as promoting the growth of bacteria and fungi that could be harmful to plants.

Heavy rainfall also increases the risk of flooding, soil erosion and rapid leaching of nutrients from the soil. (Leaching occurs when the minerals and organic nutrients of the soil are "washed" out of the soil by rainfall as the water soaks into the ground.) Plants grow rapidly and quickly use up any organic material left from decomposing plants and animals. This results in soil that is poor and provides few nutrients for plants.

Plants that live in forests have many ***adaptations***:

- Leaves with drip tips and *waxy* surfaces allow water to run off, discouraging the growth of bacteria and fungi.
- Buttresses and prop and stilt roots help hold up plants in shallow soil.
- Some plants climb or grow on other plants so they can reach sunlight.
- Flowers on the forest floor are designed to attract animal ***pollinators*** since there is relatively no wind on the forest floor to aid in pollination.
- Smooth bark and smooth or waxy flowers speed the run-off of water.
- Shallow roots help capture nutrients from the top level of soil.
- Many bromeliads collect rainwater in a "bowl" formed at their base by overlapping leaves. The water is absorbed through hairs on their leaves instead of through roots. Some bromeliads are ***epiphytes*** (plants that live on other plants).
- Epiphytes have aerial roots that cling to the host plant, absorb minerals and absorb water from the atmosphere.
- Wildflowers and other plants or trees in dry upland forests often have small leaves to prevent drying out between rainfalls.

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Unit 5 Activity 6 Web Quest

Wildflower Adaptations

Objective

Students will investigate and be able to demonstrate an understanding of wildflower adaptations through short answers and expounded writing.

Directions

Students may perform the research part of this activity individually or in pairs/groups, but should complete the short answers and single page response individually.

1. Give each student a copy of the "Wildflower Adaptations" worksheet.
2. Direct students to search the Internet to find answers to the questions on the worksheet.
3. Have each student choose one question on which to write a single page response.

Materials

- "Wildflower Adaptations Web Quest" worksheet (one per student)

Standards

Grade 3: ELA.3.C.2.1, ELA.3.C.3.1, ELA.3.C.4.1, ELA.3.C.5.2, SC.3.N.1.1

Grade 4: ELA.4.C.2.1, ELA.4.C.3.1, ELA.4.C.4.1, ELA.4.C.5.2, SC.4.N.1.1, SC.4.N.1.4, SC.4.N.1.7

Tip

One website for students to investigate is mbgnet.net/bioplants/main.html.

Note: Internet access is needed for this activity. If Internet or computer access is limited, students may work together to research the questions in the library or using texts provided by the teacher.

Wildflower Adaptations Web Quest

Search the Internet to find short answers to the following questions. Then choose one question and write a single page response.

1. What is an adaptation?

2. How do plants change to suit their environment?

3. Why do some plants have spines?

4. What adaptations does a wildflower that is pollinated by animals have?

5. What adaptations do wildflowers that are mostly pollinated by wind have?

6. List four ways wildflowers disperse their seeds.

7. Why are adaptations for wildflowers important?

8. List one adaptation for wildflowers found in each of these three Florida ecosystems: coastal dunes, wetlands and pine flatwoods. Explain why those adaptations are necessary.

9. How do epiphytes (air plants) survive?

10. What special adaptations do orchids have?

11. What special root adaptation does a dandelion have?

12. Why are wildflowers different colors?

13. What is the Venus flytrap's special adaptation?

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Unit 5 Activity 7 Writing Extension

Adaptations

Objective

Students will be able to demonstrate an understanding of wildflower adaptations through expounded research and writing.

Directions

1. Give each student one of the four "Adaptations" worksheets ("People and Plants," "Defend and Protect," "Finding Food," and "Life as a Vine.")
2. Direct students to write a single page response to the prompt on their worksheet.
3. Allow students to reference their work from previous activities in this section or use the Internet or other reference and resource materials to research their topic.

Materials

- "Adaptations" worksheets

Standards

Grade 3: ELA.3.C.2.1, ELA.3.C.3.1, ELA.3.C.4.1, ELA.3.C.5.2, SC.3.N.1.1

Grade 4: ELA.4.C.2.1, ELA.4.C.3.1, ELA.4.C.4.1, ELA.4.C.5.2, SC.4.N.1.1, SC.4.N.1.4, SC.4.N.1.7

Note: Copies of the adaptation descriptions from this section's introduction may also be provided to students for this activity.

Adapted from Pelotes Island Nature Preserve, JEA & FPL

Adaptations — People and Plants

Like people, plants must get food, deal with predators, and protect their young. Think about similarities between the ways that plants and people deal with these issues. Write an explanation of the similar ways in which people and plants try to survive.

Adaptations — Defend and Protect

Many plants have spines or thorns that protect them from being eaten by animals. Think about ways that people might protect themselves from animals. Write an explanation of the similar ways in which plants and people might defend themselves.

Adaptations — Finding Food

When plants need more of the sun's energy, they grow toward sunlight. Think about what people do when they need more energy resources (like food). Write an explanation of what a group of people might do if there was no more food where they lived.

Adaptations — Life as a Vine

Imagine that you are a green thorny vine growing in a shady area with lots of predators. Think about what your life might be like as you try to survive. Write a story about a day in your life as a vine.

Glossary

adaptation: a change or feature that helps a plant live and grow better in its environment; anything that helps an organism survive and successfully reproduce in an ecosystem

alkaloid: chemical substance produced by many flowering plants; serves mainly as a defense against herbivorous insects

aquatic: growing or living in or near water

cross-pollination: pollination of one flower with pollen from another flower

defensive adaptation: any adaptation that helps a plant defend itself from predation

drought: a long period with little to no rainfall

ecosystem: a community of living things (plants, anmimals and other organisms) interacting with each other and their non-living environment (soil, water, air, sunlight)

epiphyte: a plant that grows on another plant, using it only for support

evaporation: the physical process of liquid water converting into vapor on plant surfaces (leaves, stems), contributing to water loss

fire-dependent: plants that depend on naturally occurring fires for their survival, to clear out underbrush and make way for seedlings

functional adaptation: any adaptation that helps an organism survive

habitat: the natural environment in which an organism (plant or animal) lives

mimicry: the close resemblance of an animal or plant (or part of one) to another animal or plant

physical adaptation: any adaptation to the physical or structural part of an organism that helps it survive

photosynthesis: the process by which plants use sunlight to create food from carbon dioxide and water

pollen: fine, powder-like material that covers the anthers within a flower

Note: This is what bees and other pollinators collect. Pollen is needed by plants to make seeds.

pollinator: an organism (usually an insect, bird or small mammal) that moves pollen from one plant to another

predator: an animal that hunts and eats other animals; an organism that naturally preys on other organisms

reproductive adaptation: any adaptation that helps a plant reproduce successfully

(Continued on following page.)

Tip

Turn the vocabulary words into a Jeopardy-style game for a fun, interactive way to review with your students. Free online templates are available at JeopardyLabs.com, or you can download templates for PowerPoint or Google Slides.

succulent: a plant or leaf adapted to dry conditions and having fleshy tissues that store water

transpiration: the process by which plants release water vapor through tiny openings in their leaves

waxy: a coating on leaves (called a cuticle) to prevent excess water loss through transpiration

Note: This coating is similar to beeswax or paraffin wax and is usually on the leaf surface.

Wildflower Adaptations Crossword Puzzle

Use the clues and the Word Bank to fill in the puzzle on the next page.

Word Bank

alkaloid	ecosystem	habitat	predator	waxy
aquatic	epiphyte	mimicry	reproductive	
cross pollination	evaporation	physical	succulent	
defensive	functional	pollen	transpiration	

Across

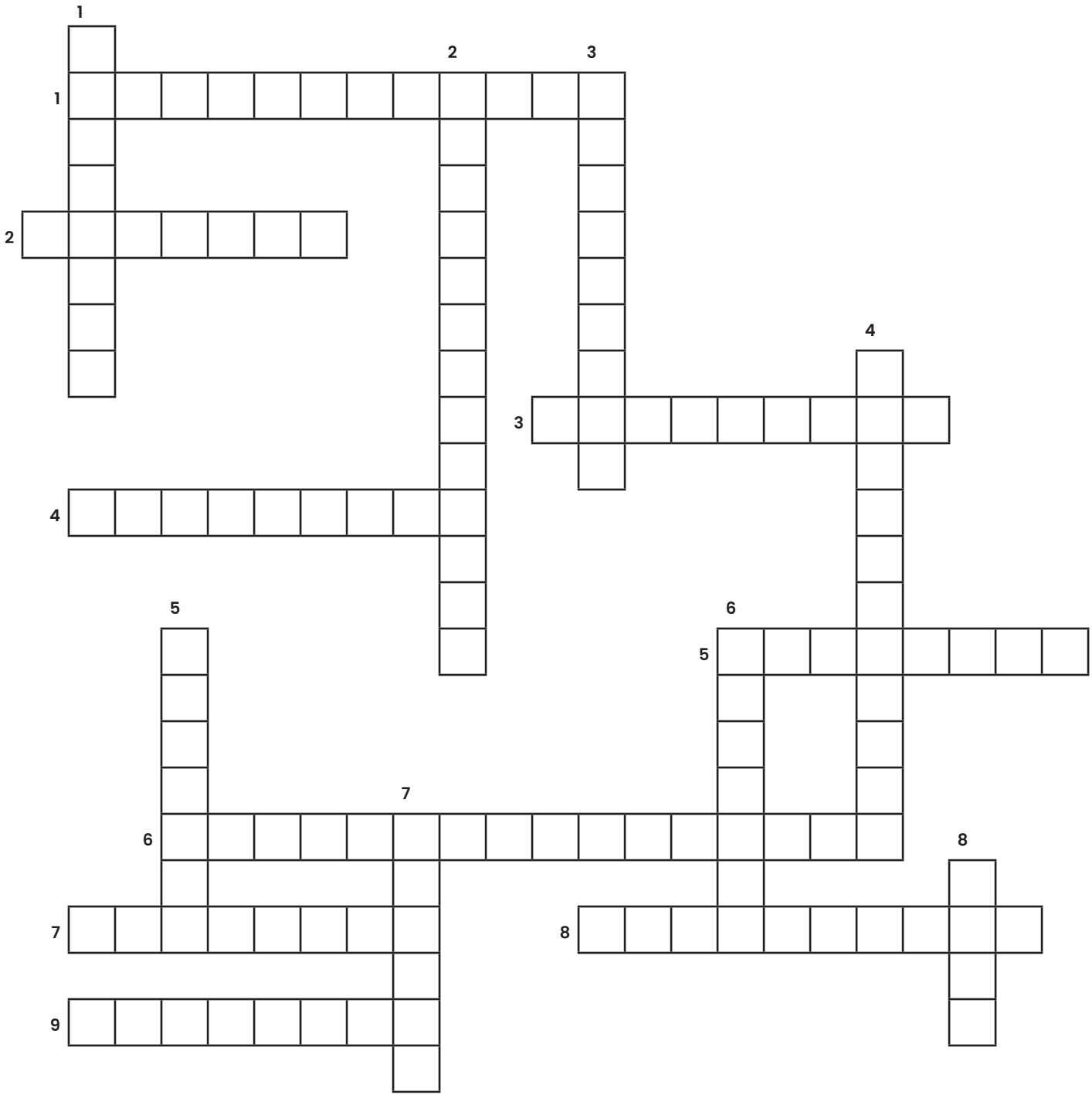
1. any adaptation that helps a plant reproduce successfully
2. the natural environment in which an organism (plant or animal) lives
3. any adaptation that helps a plant defend itself from predation
4. a plant or leaf adapted to dry conditions and having fleshy tissues that store water
5. chemical substance produced by many flowering plants; serves mainly as a defense against herbivorous insects
6. pollination of one flower with pollen from another flower
7. any adaptation to the structural part of an organism that helps it survive
8. any adaptation that helps an organism survive
9. a plant that grows on another plant, using it only for support

Down

1. an animal that hunts and eats other animals; an organism that naturally preys on other organisms
2. the process by which plants release water vapor through tiny openings in their leaves
3. a community of living things (plants, anmimals and other organisms) interacting with each other and their non-living environment (soil, water, air, sunlight)
4. the physical process of liquid water converting into vapor on plant surfaces (leaves, stems), contributing to water loss
5. the close resemblance of an animal or plant (or part of one) to another animal or plant
6. growing or living in or near water
7. fine, powder-like material that covers the anthers within a flower
8. a coating on leaves (called a cuticle) to prevent excess water loss through transpiration

Wildflower Adaptations Crossword Puzzle

Use the clues and the Word Bank on the previous page to fill in the puzzle.



Wildflower Adaptations Crossword Puzzle

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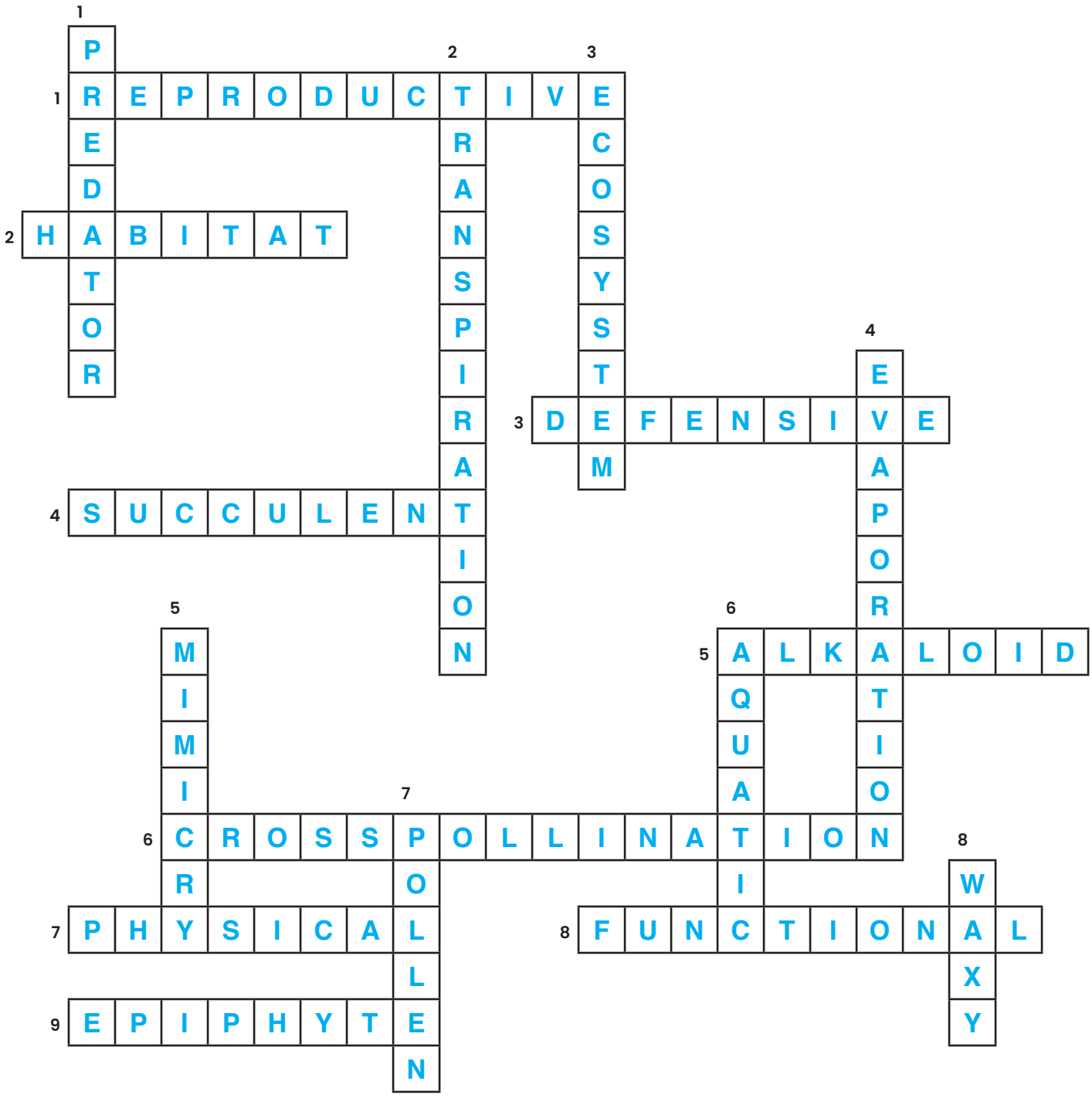

Resources

Literary connections

Echoes for the Eye: Poems to Celebrate Patterns in Nature by Barbara J. Esbensen

How Plants Survive by Kathleen Kudlinski

How Seeds Travel (A Lerner Natural Science Book) by Cynthia Overbeck

Lily's Pesky Plant by Kirsten Larsen

Max and the Milkweed by Auggie Grand

The Milkweed and Its World of Animals by Ada and Frank Graham

Mysteries & Marvels of Plant Life by Barbara Cork

The Nature And Science Of Flowers (Exploring the Science of Nature) by Kim Taylor and Jane Burton

Plants Bite Back! by Richard Platt

Pollination by Mary King Hoff

The Secret Lives of Plants! (Adventures in Science) by Janet Slingerland

Wetlands by Lynn M. Stone

Wetlands by Peter Benoit

What Do Roots Do? by Kathleen V. Kudlinski

What Is a Plant? (Science of Living Things) by Bobbie Kalman

Reference books

Complete Guide to Florida Wildflowers by Roger Hammer

Florida Wildflowers in Their Natural Communities by Walter Kingsley Taylor

Surviving the Wilds of Florida by Reid Tillery

Websites and other web resources

Biology of Plants (Missouri Botanical Garden) www.mbgnet.net/bioplants/main.html

Florida Wildflower Foundation (plant profiles, photos and other resources on Florida natives) www.FlaWildflowers.org

iNaturalist SEEK (image recognition app for identifying plants and animals) www.iNaturalist.org/pages/seek_app

Lady Bird Johnson Wildflower Center (national database; search by state, family or habitat) www.Wildflower.org/plants-main

Plant defense against herbivory en.wikipedia.org/wiki/Plant_defense_against_herbivory