
Concept Development Activity

Materials

(teams of 3 - 4)

envelope of PICTURES

blank cards

markers

Procedure:

1. Have students work in teams to group the pictures into subgroups they choose. Students should derive the pattern for grouping the examples.
2. Have students create a title and subtitle cards for their selected groupings. Using the example below, explain the relationship between title and subtitles and how they connect.

An example for grouping ANIMALS is shown below:



3. Once students have grouped and labeled their examples, have them share their grouping patterns with the class.
4. Next, have the students look at the pictures for plant **adaptations**. Tell students to group the examples using patterns they observe that fall under the title "Plant Adaptations." Once again, they should create cards for the title and subtitles. (Refer to the sheets, "Adaptive Characteristics" for background information.)

Concept Development Activity

Materials

(teams of 3 - 4)

Plant pictures

Blank cards

Markers

Procedure:

1. As a team, group the pictures into subgroups using any title or pattern you choose. Write your title on a blank card. The picture groups should fall under the title that you derive. An example for grouping animals is shown below:



2. Your team will decide the number of subgroups. Next, derive a title for each subgroup. Write these new titles on blank cards to label your subgroups.
3. Select a spokesperson for your team to present your grouping pattern to the class.
4. Once the class has completed the activity in the individual teams, you will share your individual information with the class.
5. Next, group the cards by a pattern specified by your teacher.

Concept Development: Plant Adaptations

Materials:

Concept Development Plant Cards

Environmental Conditions Cards

Preparation and Procedure:

1. Have each student in the class take one card from the Concept Development activity. The students will refer to their plant cards for each set of conditions provided in the evaluation.
2. Divide the room into two sides to represent the following groups:
 - Survive
 - Show characteristics needed to survive in this environment
 - Die
 - Lack overall characteristics needed to survive in this environment
3. Draw a card to introduce a set of environmental conditions, and have students observe their cards to determine “survive” or “die.” Next, they should quickly move to the side of the room that best describes the fate of their individual cards.
4. Once students are divided into two sides, have each group brainstorm by looking at the cards, collectively, to derive two or three characteristics that justify the choice to survive or die.
5. Get representatives from each group to share the characteristics with the class.
6. Draw a different card with a set of environmental conditions, and have the class repeat the procedure of choosing a side and brainstorming to find similar characteristics. Again, representatives from each group should share the information.
7. Repeat this procedure for each card drawn.

HOT DRY SUNNY	HOT HUMID SUNNY
COLD DRY SUNNY	COLD HUMID SUNNY
TEMPERATE HUMID SHADY	HOT SWAMPY SHADY



Duckweed



Blue Water Lily



Horseweed



Prickly Pear



Creosote



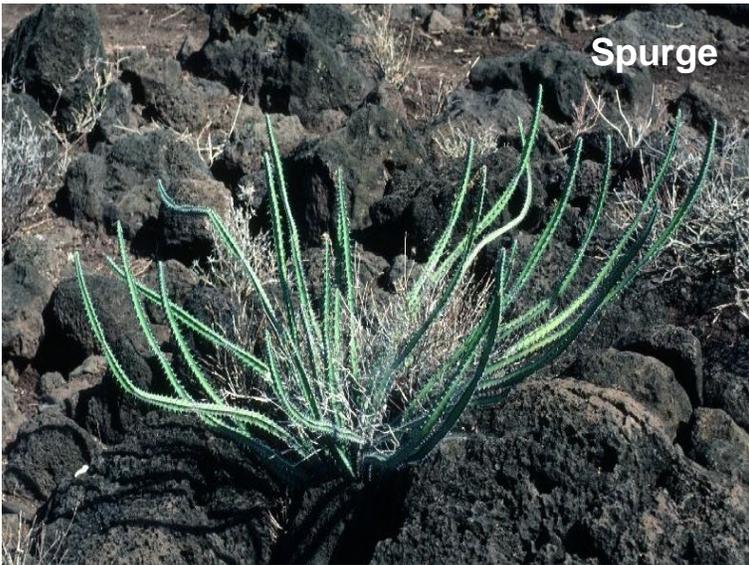
Dandelion



Pine Tree



Saltbush



Spurge



Joshua Tree



Cocklebur



Bluegrass



Cattail



Bermuda grass



Four-o'clock



Ephedra



Hibiscus



Poinsettia



Poison Ivy



Purslane



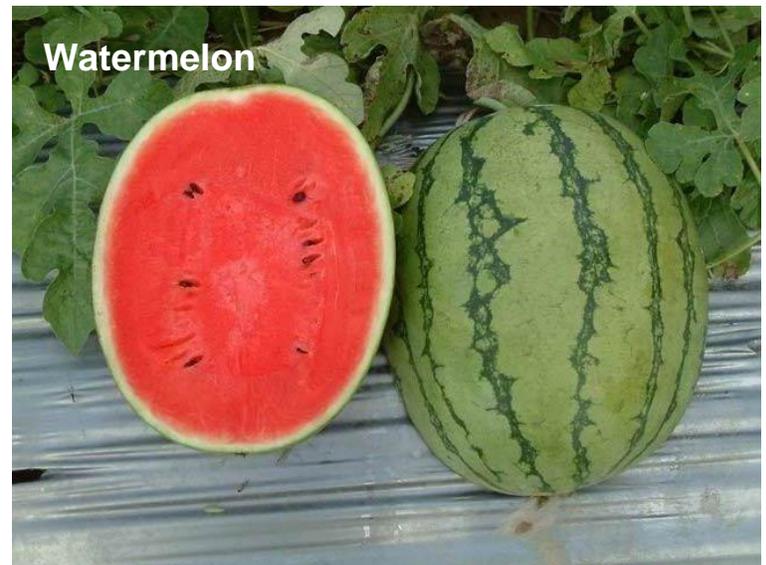
Jimsonweed



Mesquite



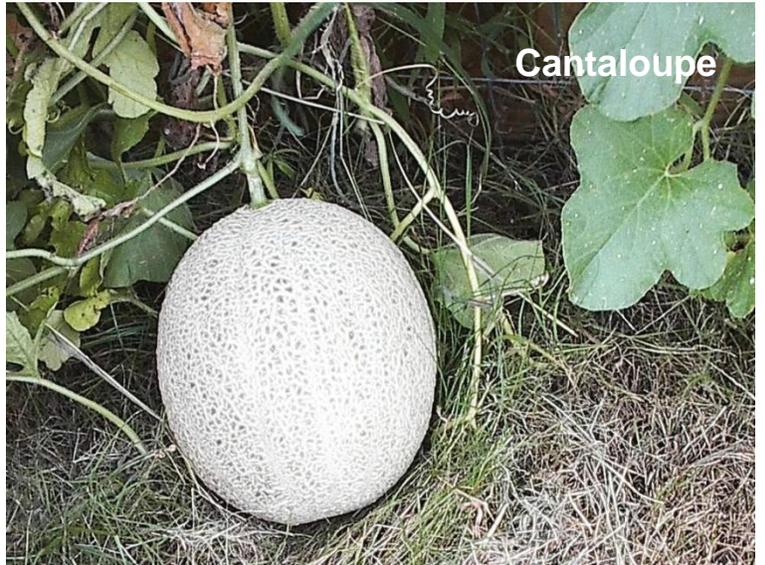
Potatoes



Watermelon



White Onions



Cantaloupe



**Poison
Hemlock**



**Water
Hyacinth**

PLANT	<i>ADAPTIVE CHARACTERISTICS</i>
1. Cattail	<ul style="list-style-type: none"> • Spread by numerous underground stems (rhizomes) • Tissue contains pockets of oxygen to stay afloat and allow gas exchange • Deep lateral roots anchor the plant • Numerous fruits –to insure seed production--are produced in a spike that resembles a cat’s tail • Leaf blades are strap-like and stiff with rounded backs for growing tall • Leaf blades spiral in the top half to facilitate plants getting sunlight exposure in thick stands
2. Creosote	<ul style="list-style-type: none"> • Small, shiny (waxy), thick leaves conserve water and reflect sunlight to stay cool • Loses most leaves during dry periods • Strong smell/taste and resin coated leaves to deter predators • Two types of roots – radial roots get surface water and deep roots grow towards ground water; both make plant a strong competitor in arid climates
3. Dandelion	<ul style="list-style-type: none"> • Deep root to anchor and absorb water • Many reduced flowers in a cluster resemble one flower and insure pollination leading to many seeds • Seeds blow in the wind
4. Ephedra	<ul style="list-style-type: none"> • Conifer with needle-like leaves that are circular in shape and covered in a thick cuticle to reduce water loss • Produces chemical (ephedrine) that is deadly in high doses
5. Four O’clock	<ul style="list-style-type: none"> • Bloom late afternoon through evening hours to reduce water loss during mid-day temperature peaks • Flowers release a musky aroma to draw pollinators
6. Poison Ivy	<ul style="list-style-type: none"> • Produces sap with chemicals that causes a rash; leads to pain, inflammation, and ulcers of skin
7. Jimsonweed	<ul style="list-style-type: none"> • Produces deadly chemicals, as do other members of its family, the nightshade family that includes potatoes and tomatoes • Produces a large flower to attract pollinators

8. Joshua Tree	<ul style="list-style-type: none"> • Succulent leaves with thick cuticles and reduced size to prevent water loss in this plant • Spiked leaves to deter predators - not a cactus, but actually the largest of the yuccas, which are members of the lily family • Clusters of flowers with unpleasant aroma to attract pollinators • Numerous surface roots to quickly collect water
9. Pine Tree	<ul style="list-style-type: none"> • Small, waxy, round needles reduce surface area and prevent water loss—small surface to volume ratio • Deep tap root grows to deep ground water needed in drought conditions • Produces resin to deter predators
10. Poinsettia	<ul style="list-style-type: none"> • Special leaves turn red to attract pollinators to small yellow flowers that are clustered in the center • Produces a milky latex sap that is an irritant to skin (studies show the sap is not deadly)
11. Water Lily	<ul style="list-style-type: none"> • Shiny leaves reflect sunlight • Large flat leaves (high surface to volume ratio) and oxygen pockets in the leaves help leaves to float • Flowers open in the morning to attract pollinators and close during the day to prevent water loss
12. Potato	<ul style="list-style-type: none"> • Stores food in an underground stem (not a root) • Like other members in the nightshade family, it produces a toxic substance in the leaves, stems and berries to deter predators
13. Purslane	<ul style="list-style-type: none"> • Low growing plant with succulent stems and leaves to prevent water loss • Small flowers to minimize water loss • Produces many seeds in each flower to assure future generations • Red coloration in the leaves and stems to reflect some of the high-intensity light
14. Saltbush	<ul style="list-style-type: none"> • Reduced leaf size to reduce transpiration and hairy to hold moisture • Light gray leaves to reflect light • Leaves weep salt that it removes from soils that are too salty for most plants
15. Onion	<ul style="list-style-type: none"> • Stem protected below the soil line by fleshy leaves that store food for the plant (bulb) • Strong smell deters predators

16. Cantaloupe	<ul style="list-style-type: none"> • Produces fleshy, smelly fruit with numerous seeds to draw animals that will eat the fruit and pass seeds • Thick epidermis protects fruit from small pests • Hairy leaves keep moisture close to plant • Hairy leaves and prickly stems deter pests • Large leaves maximize photosynthesis but curl in drought conditions • Produces tendrils that facilitate quick, aggressive growth
17. Cocklebur	<ul style="list-style-type: none"> • Reduced leaves to prevent water loss • Numerous, spiny fruits attach to predators for seed dispersal
18. Water Hyacinth	<ul style="list-style-type: none"> • Reduced roots • Shiny leaves to reflect light and stay cool • Flat, thick leaves with oxygen pockets for floating • Dominates ponds by growing so rapidly: abundant decaying biomass creates an anaerobic environment that eliminates other plants
19. Watermelon	<ul style="list-style-type: none"> • Plants produce fleshy, smelly fruits and numerous seeds to attract animals that will disperse the seeds • Plants have tendrils to facilitate quick spreading and aggressive growth • Leaves and stems have coarse, prickly hairs to prevent water loss and to protect the plant from predators • Thick epidermis protects fruit from small pests • Large leaves maximize photosynthesis but curl in drought conditions
20. Mesquite	<ul style="list-style-type: none"> • Has modified stem extensions called thorns that provide protection • Has deep roots that grow to the water table to get water • Reduces water loss by small leaf size; leaves fold to reduce surface area
21. Prickly Pear	<ul style="list-style-type: none"> • Conserves water by having reduced leaves: spines • Stores water in fleshy stems: cactus pads • Extensive shallow root system quickly collects water when it rains • Spines to protect form predators • Contains calcium oxalate under the skin that causes kidney damage when eaten • Fruits have thick, waxy covering with spines to deter predators

22. Poison Hemlock	<ul style="list-style-type: none"> • Reduced leaves in alternating pattern that reduces plant stress from sun • Numerous, tiny flowers in clusters facilitates pollination and seed production • Poisonous sap that causes paralysis and possible death
23. Bermuda Grass	<ul style="list-style-type: none"> • Deep root system; above ground stems (stolons) and below ground stems (rhizomes) for spreading • Leaves are a gray-green color and are short (usually 1 to 4 inches tall) and narrow blade to reduce water loss • During droughts the upper parts die off • Flowers in spikes are reduced in size to prevent water loss; numerous seeds are easily dispersed by wind
24. Duckweed	<ul style="list-style-type: none"> • Small water plant; grows in dense populations • Leaves and stems are not differentiated; air pockets keep the plant afloat • Stomata on top for gas exchange • World's smallest fruit (smaller than a salt grain) • Needs high levels of nitrogen and phosphorous; grows in non-flowing water where nutrients build
25. Hibiscus	<ul style="list-style-type: none"> • Large flower (to attract pollinators); large cluster of stamen in a tree shape surrounding pistil • Flower that closes at night to reduce water loss • Stomata on lower epidermis of leaves to reduce water loss • Large leaves with numerous chloroplasts in the palisade mesophyll, spongy mesophyll and guard cells
26. Horseweed	<ul style="list-style-type: none"> • Tall plant; narrow leaves (reduced surface area) • Inconspicuous flowers; wind-dispersed seeds • Oils that irritate skin
27. Spurge	<ul style="list-style-type: none"> • Succulent stem with spiny ridges; not a cactus (Euphorbia) • Minute, deciduous leaves; spines • Toxic chemical (latex); poisonous when eaten; skin irritant
28. Bluegrass	<ul style="list-style-type: none"> • Spreads by rhizomes or underground stems • Flowers in spikes are reduced in size to prevent water loss; numerous seeds are easily dispersed by wind • Winter annual; prefers cool and moist

1. Potato-- <http://www.buypotatoseed.com/potatopic.html>
2. Poison ivy-- <http://www.desertusa.com/mag01/feb/papr/ivy.html>
3. Creosote-- <http://www.desertusa.com/creoste.html>
4. Watermelon-- http://rkseeds.com/f1_hybrid_watermelon
5. White Onions - <http://aggie-horticulture.tamu.edu/plantanswers/publications/onions/whitebermuda.jpeg>
6. Blue Water Lily - <http://www.moplants.com/blog/wp-content/uploads/2006/07/water%20lilies.jpg>
7. Saltbush-- <http://plants.usda.gov>
8. Ephedra-- <http://plants.usda.gov>
9. Prickly pear-- <http://plants.usda.gov>
10. Joshua tree-- <http://plants.usda.gov>
11. Jimsonweed-- <http://plants.usda.gov>
12. Spurge-- <http://plants.usda.gov>
13. Four o'clock-- <http://www.desertusa.com/wildflo/images09/Four-o-clock8395b.jpg>
14. Purslane - http://upload.wikimedia.org/wikipedia/commons/b/b4/Portulaca_oleracea_g1.jpg
15. Water Hyacinth - <http://www.thedailygreen.com/cm/thedailygreen/images/1s/water-hyacinth-de.jpg>
16. Duckweed - <http://kaweahoaks.com/html/duckweed01opt.jpg>
17. Cantaloupe - <http://www.ultimate-photos.com/garden/cantaloupe1.jpg>
18. Pine Tree - <http://fineartamerica.com/images-medium/scotch-pine-cone-marilynne-bull.jpg>
19. Poinsettia - <http://z.about.com/d/houseplants/1/0/0/0/-/-/Poinsettia.JPG>
20. Mesquite - <http://corditecountryshownotes.files.wordpress.com/2010/03/mesquite-thorns.jpg>
21. Poison Hemlock - <http://www.ipm.iastate.edu/ipm/icm/files/images/poison-hemlock.jpg>
22. Bermuda Grass - http://img.hgtv.com/HGTV/2006/03/03/allergyplants_bermuda_grass_new2_lg.jpg
23. Cocklebur - <http://static.icr.org/i/articles/btg/btg-222b-cocklebur.jpg>
24. Hibiscus - [http://upload.wikimedia.org/wikipedia/commons/f/ff/Hibiscus_rosa-sinensis_\(bloom\).JPG](http://upload.wikimedia.org/wikipedia/commons/f/ff/Hibiscus_rosa-sinensis_(bloom).JPG)
25. Dandelion - <http://wineintro.com/making/batches/dandelion/dandelionwine2007/dandelion2.jpg>
26. Horseweed - <http://www.countyofkings.com/ag%20commissioner/Ag%20Services%20Pages/Ag%20Services%20Images/Weed%20pictures/big%20horseweed1.JPG>
27. Bluegrass - http://www.missouriplants.com/Grasses/Poa_annua_plant.jpg
28. Cattail - <http://www.treehugger.com/cattails.jpg>