

H2O Wetlands

Resource Book



What Makes a Wetland a Wetland?

The water's up to your ankles and a pungent smell reaches your nose. You move along slowly, watching a great blue heron fish for its lunch. When you round a bend, you're startled by a flock of ducks as they take off from the water. A dragonfly zips past your head as you watch the ducks fly up over the trees. You could be in a swamp. Or a salt marsh. Or any of a number of different types of wetlands.

Waterlogged Worlds

It's hard to find a lot of absolute characteristics that apply to all wetlands. That's because there are so many different kinds of bogs, marshes, swamps and other wetlands.—but all wetlands share some characteristics that set them apart from other kinds of habitats.

What they are and what they aren't: of course all wetlands are wet—but so are ponds, lakes, streams, rivers and oceans. Does that mean, then that these particular bodies of water are wetlands too?

In general, no. Most scientists who study wetlands restrict their definition of these habitats to areas that, at least periodically, have waterlogged soils or are covered with a relatively shallow layer of water. These areas support plants and animals that are adapted to living in a watery environment.

Soggy Surroundings: the reason that wetlands are wet, varies. Since most wetlands are located in low-lying areas, rain and runoff help to keep them saturated. Also, some wetlands lie in places where the groundwater is at or very near the surface of the ground, which means that they're next to rivers or other bodies of water that regularly overflow their boundaries. And along the coast, the tides keep many other wetlands saturated.

Beavers and other Builders: some wetlands get started with a little 'outside' help. Beavers, for example are important wetland builders. The rivers and streams that they dam often flood large areas, turning meadows into marshes or parts of forests into swampland.

People sometimes create wetlands too—both intentionally and unintentionally. For example, a state game and fish agency might flood an area so that waterfowl will have more places to breed. On the other hand, a swamp or marsh might get its start accidentally when construction blocks the natural flow of water and causes a stream to back up and overflow.

Wetlands at Work

Wetlands give the world a lot of "free services." Here's a look at some of the important functions they perform.

Flood Busters: an easy and cheap way of controlling floods is to leave wetlands in their natural state. That's because wetlands act like giant, shallow bowls. Water flowing into these 'bowls' naturally loses velocity as it collects and spreads out. Wetland vegetation helps to slow down fast-moving water too. As a result, flood damage to developed areas near wetlands is often much less than damage to areas located near wetlands that have been drained and filled.

Silt Trappers: when flood waters are slowed by wetlands, the silt and other sediments they carry settle out among the roots and stems of wetland plants. This helps to protect streams, lakes and other bodies of water downstream from a build-up of sediment that could otherwise clog aquatic animals' gills and bury their eggs. It also helps protect water supplies from pollutants and other impurities. That's because wetland plants can take up and use nutrients and chemicals that the silt may contain. If it weren't for wetlands, these impurities might eventually contaminate rivers, lakes, groundwater and other water supplies—some of which are used as sources of drinking water.

Storm Breakers: farms, forests and buildings that are located behind wetlands along the seashore and large lakes often fare much better during storms than those that aren't. wetlands serve as buffers between the winds and waves of storms and areas beyond. But 'taking the punishment' isn't all wetlands do during storms. They also bind soil and help to keep it from eroding. Mangrove swamps are particularly good at this. In fact, certain

islands cleared of their mangrove swamps have become so severely eroded that they're no longer visible above the ocean's surface.

Wetlands and Wildlife

Acre for acre, there's more life in a healthy wetland than there is in almost any other kind of habitat. These productive places can support huge numbers of insects, fish, birds and other animals. Below is a rundown of some of the ways wildlife uses wetlands.

Migration Vacations: If you visited a wetland in fall or spring, chances are you'd see many kinds of migrant birds. And depending on exactly where you were, you could see hundreds or even thousands of them: ducks and geese, herons and egrets, sandpipers and plovers; maybe even eagles and ospreys. These and other birds converge on wetlands en route to their winter or summer homes. Here they 'refuel' on the rich foods supply before getting on with their journeys. (Many birds nest and winter in wetlands too—but the bird population of most wetlands goes way up during migration.)

Natural Nurseries: There's another segment of wetland society for which wetlands are vitally important temporary homes. These are the young of certain fish, crabs and other creatures that spend their earliest days in wetlands before moving on to open waters. The thick vegetation of a wetland is a good place to hide, and the rich food supply gets growing animals off to a healthy start.

Havens for Rare Ones: Wood storks, snail kites, whooping cranes and American crocodiles are all endangered species—and they all live in wetlands. In fact, about 35 percent of all the animals and plants listed as threatened or endangered in the United States either live in wetlands or depend on them in some way. That means that more than a third of the nation's rare animals and plants are inseparably linked to areas that, altogether, make up only about five percent of the total land area in the lower 48 states. This fact doesn't seem to leave room for much optimism—especially since wetlands are still being dredged, drained and filled in for farms, houses and other developments. But wetlands are getting some protection.

Don't get Bogged Down: The word bog means different things to different people. In some parts of the world, it is used only when referring to acidic, sphagnum wetlands. In other places it is used to describe any type of wetland that has peat deposits. (Many scientists use the more general word peatland to describe a wetlands that has peat deposits. And they consider bogs to be one type of peatland. Fens, carrs, and even some swamps and salt marshes are also considered to be types of peatlands because they contain peat deposits.) In this issue we are generally referring to acidic, sphagnum bogs when we say the word 'bog'.

SWAMPS

Swamp Stories: Poisonous snakes hang from the trees. Quicksand is around every bend. Once you get lost, you'll never find your way out. Considering the abundance on these and other myths, it's no wonder that many people have strange ideas about swamps. But most spooky swamp images have been the product of imaginative writers, and have little to do with reality. Yes, there are poisonous snakes in some swamps, but most don't climb or hang from trees. Quicksand occurs in some swampy areas, but it's not very common. And you are just as likely to get lost in a desert, forest or other habitat as you are in a swamp.

The truth is that swamps are some of the most fascinating and diverse wetlands in the world. And they are no more dangerous than other types of habitats. From the cypress swamps of the Big Thicket in Texas to New Jersey's Great Swamp, each has it's own character and unique plant and animal life.

Down in the Swamp: So what makes a swamp a swamp? Scientists define swamps as wetlands that are dominated by shrubs to trees. They are usually saturated with water during the growing season, but may dry out in late summer. Swamps can have anywhere from a few inches to a foot or more of water. In northern swamps red maple, black willow, northern white cedar, alder and cottonwood are some of the more common trees. In southern swamps the forests are made up of such trees as water oak, tupelo and bald cypress. And in some swamp areas, where shrubs are the most dominant plants, you'll find water willow, pussy willow, leatherleaf, inkberry and buttonbush growing in the mucky soil.

Types of Swamps: There are many different types of freshwater swamps, but most fall into these two general groups:

Forested Swamps: Are often associated with major river systems, such as the Mississippi, and they often occur on river floodplains. Many of these swaps are famous for their huge trees, and contain stands of enormous bald cypress, overcup oak and tupelo. Most forested swamps are subjected to periodic flooding and usually stay wet during most of the year.

Shrub Swamps: In North America are characterized by scrubby, low-growing vegetation. Some of these shallow swamps are wet for only part of the year and often dry out during hot, dry summers. There are many different types of shrub swamps, from boggy, boreal swamps in the north called heaths to shrubby coastal swamps in the southeast called pocosins. Shrub swamps often form in poorly drained areas on the edges of lakes, forested swamps, marshes and streams.

Zoo in the Goo: Swamps are incredibly diverse and support a wide variety of animal life. Many swamp critters, such as alligators and cottonmouths, are especially adapted to the murky environment of a swamp. But others that usually live in upland areas, such as panthers, foxes, bears and raccoons, often wander into swamps to find food, shelter and water.

Explore the Wetlands

Take your troop on a wetland safari so they can get a firsthand look at a unique, watery community. Before setting out on an expedition with your troop, visit the wetland yourself to become familiar with its features and wildlife. Also, be sure to go over "Tips for Wetland Wanderers" on page 5. Go over the safety suggestions with the troop – then get them outside and into the wild world of wetlands!

Materials

Copies of page 8 for each girl

Pencils

Crayons or markers

Glue

Scissors

Paper

Field guide (optional)

Magnifying glasses (optional)

On the day of your wetland trip show the troop pictures of the kind of wetland they will be visiting. When you get to the wetland, try some of the following activities:

Have the girls make a list of the different kinds of numbers of animals they see. Even though they may see a lot of the larger animals, such as birds, remind them that there are many smaller animals living among the wetlands plants and in the soil.

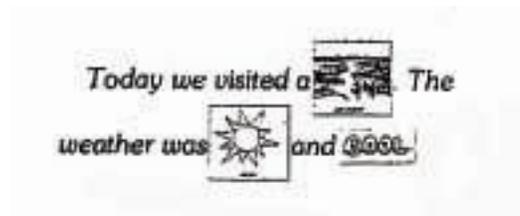
Let the girls look at a sample of wetland soil with the magnifying glasses. If you visit a bog, look at the sphagnum moss. Can you see any insects or other small animals moving around in it?

Keep an eye out for animal signs. For example, you might come across some animal tracks or droppings. Or you might discover a bird nest or the lodge of a beaver or muskrat.

Take the troop into a non-wetland area (forest, field or prairie) that is near the wetland you are visiting. Can they see any plants and animals that are different from those in the wetland?

When you get back to the troop's meeting place or nature center, pass out copies of page 6. Explain that each person will be writing a paragraph or two about the wetland they visited, using these pictures that they may color, cut out and glue down. For example, a description of a trip to a swamp could start off this way:

For best results, the girls should color the pictures they want to use before they cut them out and glue them down. They might want to add a few original pictures too. Tell them that just about anything goes, and encourage them to use their imaginations. How about a fantasy story about the wetland? Or an account of life in the wetland from an animal's point of view? no matter what approach they take, they should include the following information in their paragraphs:



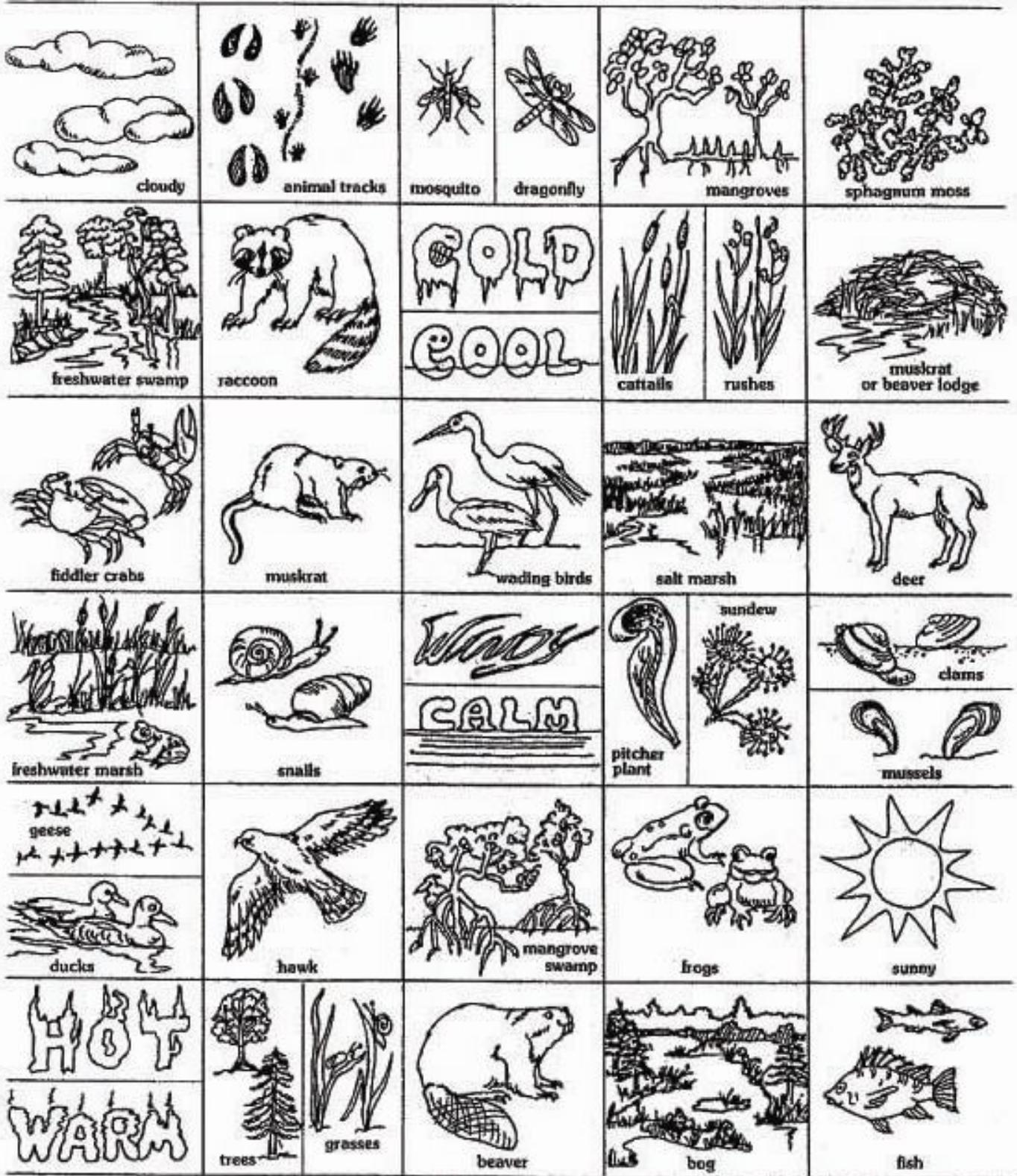
1. The name and a picture of at least one plant they saw on their visit.
2. The names and pictures of three or more animals they saw on their visit.
3. A description and a picture of at least one animal sign they came across.

When the troop is finished, talk about the pictures that each girl used. The pictures they chose will probably vary enough to give a good representation of the different things the girls saw on their wetland excursion.

Tips for Wetland Wanderers

- Bring along 'bug' juice—where there's a wetland, there are usually insects—especially on warm or hot days with no wind. (biting insects tend to 'lie low' on cool, windy days.) You can discourage mosquitoes and other biting insects by wearing long pants and long-sleeved shirts. And be sure to have some insect repellent on hand!
- Stay on the boardwalk—try to visit a park or reserve that has a boardwalk extending into the wetland area. A boardwalk can prevent a muddy hike—and it protects fragile plants and small animals.
- How about a boat? - consider taking a canoe through the tidal creeks or a salt marsh, around the cypress 'knees' in a swamp or just offshore from some tangled mangrove thickets. You may be able to get closer to wildlife this way (you can often approach more quietly on the water) and you'll be able to see fish and other aquatic life.
- Be prepared to get your feet wet—this holds true for any wetland you may visit particularly if it doesn't have a boardwalk. Old sneakers can be good wetland shoes—but if you step into a really soggy or muddy area, walk carefully (it's easy to lose sneakers in the muck). Old boots are more likely to stay on your feet. You might want to tell the kids to bring extra shoes and socks that they can change into later.
- Remember the first aid kit—just in case! It's also a good idea to carry some food and water, even on short trips.
- Take only memories—remind the kids not to pick plants or take animals from the wetland. Certain plants and animals that seem common in the wetland you're visiting may be very rare everywhere else. Some may even be endangered. It's against the law to collect endangered species without a special permit, and in many states, it's against the law to collect any species from parks or refuges.
- Don't go poking around! Tell the kids not to put fingers under rocks, logs or in other hidden from view places. As with almost any habitat, some wetlands are home to critters that bite or sting—and a few of these animals are poisonous. Such animals often live or hide in secluded places.
- Try a winter walk, don't rule out winter as a time to visit wetlands particularly marshes. If the ground is frozen, it can be much easier to walk on. Tell the girls to wear shoes or boots with slip-resistant soles, though, just in case you come across any icy spots. Insects usually aren't a problem in winter, since most die or go into hibernation when the weather gets cold.

Explore a Wetland

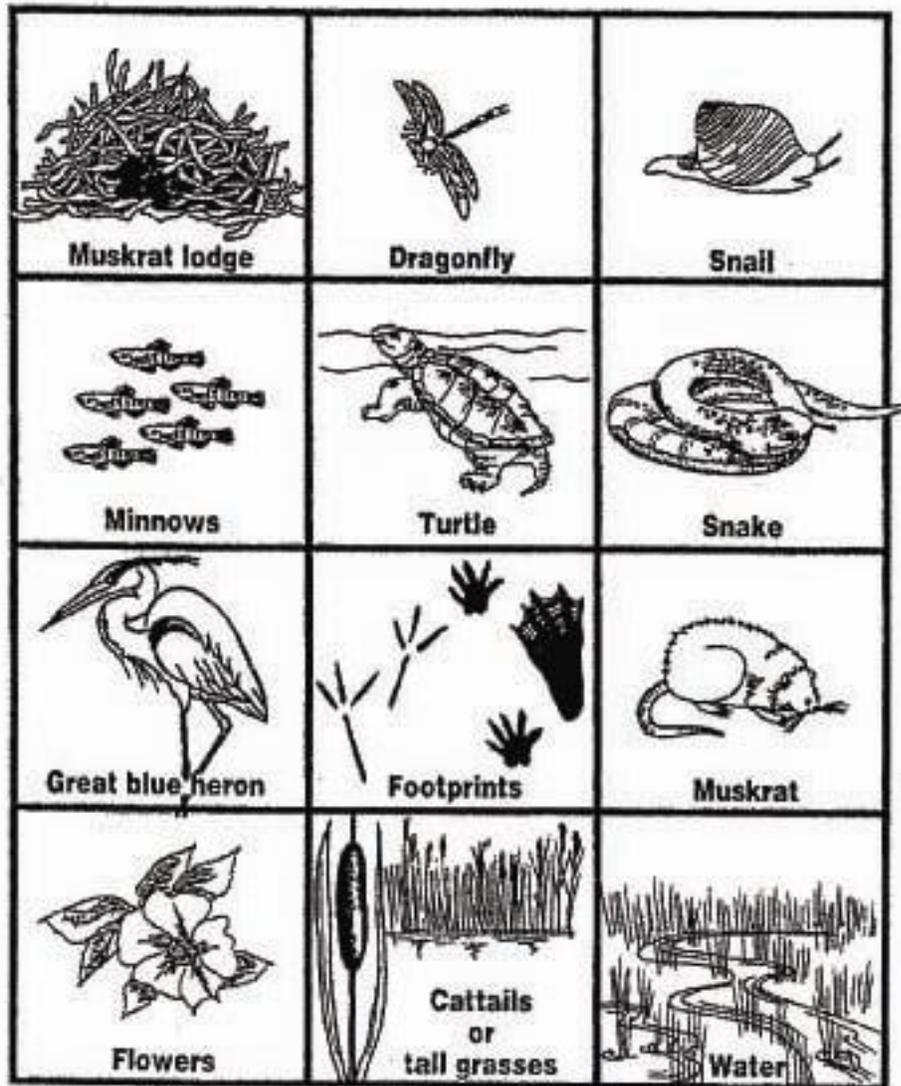


SPRINGO!

Use this bingo card to help young students concentrate on looking for things that live and grow in a wetland. This game works well when the class is walking along the boardwalk or the edge of a wetland. You can play the game any way you like, but here are two suggestions. If you're not playing in spring you can just call it Wetland Bingo):

Make copies of this card, cut the squares apart, and rearrange them to make three or four different cards (optional). Have students work in groups, with adult leaders. Groups that spot one of the items (or something similar or an animal sign such as a footprint), should shout SPRINGO! And point it out for all to see. Then everyone can mark off the item on the cards. Try to find as many as possible.

Or make copies of the card, cut out spares, and use 9 of the 12 squares to make cards that are 3 squares by 3 squares. Have the groups find items until they have marked off a horizontal, vertical or diagonal line, the shape of a T or L, or the whole card. The first group to make the designated pattern shouts SPRINGO BINGO! And wins.



We All Need Nutrients

(Sung to the tune of "When Johnny Comes Marching Home")

The water's full of nutrients, hurrah, hurrah!

The soil's full of nutrients, hurrah, hurrah!

We need these things to make us strong,

And that is why we sing this song,

And we all need nutrients,

To grow, to grow, to grow!

Plants roots take up nutrients,

Slurp, slurp!

Nitrogen and phosphorus,

Slurp, slurp!

They use these things to build proteins,

It makes them grow up tall and green.

And we all need nutrients,

To grow, to grow, to grow!

The animals that eat the plants,

Chomp, chomp!

Reuse the nitrogen themselves,

Chomp, chomp!

It gives them muscles and energy,

So they can grow up in harmony.

And we all need nutrients,

To grow, to grow, to grow!

We all use energy to live,

To work, to play.

We all need nutrients every day,

Hooray, hooray!

We need these things to make us strong,

And that is why we sing this song,

And we all need nutrients,

To grow, to grow, to grow!

"Nutrients" dance around and wave their hands

(same)

Make muscles with arms.

Stoop low, then "grow" up to stand with hands in air.

Cross outstretched arms and clasp a partners hand, forming a bond between nutrients. (Slurp loudly)

The "*proteins*" turn halfway around without letting go, singing arms over their heads.

(Same as the last verse)

Proteins turn back around and let go.

Others make eating motions with hands

All link arms side-by-side.

No "*energy*" let go of the others and turn halfway around, then link arms again.

(Same as other verses)

The "*energy*" wiggle in place

Shake "*scolding*" fingers

Make muscles with arms

(Same as other verses, but jump at the end)

Did you know?

Materials:

Plates and eating utensils

Ingredients and utensils for making wetland treats (see individual recipes)

Cranberries

- Wild cranberries grow in bogs and marshes. The cranberries people buy at the store are usually cultivated in specially prepared bogs in Massachusetts, New Jersey, Washington, Wisconsin and other states.
- Early settlers called cranberry plants “crane berries” because they thought the pale pink cranberry blossoms looked like the head and neck of a crane. Later, “crane berry” got shortened to ‘cranberry’.
- Cranberries are high in vitamin C. In the 1800’s, sailors took the berries on long voyages and ate them to prevent scurvy.
- Indians ate cranberries and used them to make medicines and dyes.

Cattails

- Cattails grown in freshwater marshes and swamps.
- During WWI, cattail down (the fuzzy brown fluff from female flower heads) was used to make artificial silk.
- Indians used cattails in many ways. For example, they used the flower to make soups, breads and puddings, and they used the pollen to make breads. They also roasted and ate the seeds.

Mint

- There are more than 3,000 different species of plants belonging to the group known as mints. Some of these plants aren’t commonly known to be mints. For example, catnip, rosemary and thyme are all mints.
- Many mints grown in fresh water marshes and along stream banks.
- Indians used mint medicinally . For example, some Indians fed their children a special mint tea to get rid of worms.
- Some mints are good sources of vitamins A and C.

Shrimp

- Many kinds of shrimp hatch at sea and then travel into salt marshes or mangrove swamps, where they grow to maturity.
- In the US, shrimp is the most commercially valuable seafood. About three-quarters of the catch is harvested from the Gulf of Mexico.
- Some female shrimp can lay more than 500,000 eggs in less than five minutes.
- Some shrimp start their lives as males, then become females later.
- Some species of shrimp look more like tiny pears than shrimp when they hatch. They go through about 15 stages before they finally look like ‘real’ shrimp.

Cattail Pollen Pancakes

1 cup cattail pollen (see end of the recipe for directions on how to collect cattail pollen)

1 cup flour

1 teaspoon baking soda

3/4 teaspoon salt

2 1/4 cups buttermilk

2 tablespoons vegetable oil

Shortening or butter for frying

Sift together the cattail pollen, flour, soda and salt. Stir together the buttermilk and oil. Add the liquid ingredients to the dry mixture. Mix and set the batter aside until it thickens (about 10 minutes). Cook the pancakes on a hot, greased griddle. (makes about a dozen six-inch pancakes. Try folding some of them and filling them with jam, jelly or whipped cream.)

Collecting Cattail Pollen: cattails usually bloom from May through July. The pollen is bright yellow and forms on the male flower spikes, which grow up from the brown, fuzzy 'sausages' of the female flower heads. To gather the pollen, just bend the cattail stalk over and shake the pollen into a bucket or bag. (Get permission from landowners or park officials before collecting cattail pollen.)

Tangy Mint Tea

1 cup dried mint leaves (spearmint or peppermint both work well)

1 quart boiling water

1 cinnamon stick

Honey

Crumble dried mint leaves into small pieces and add them to the boiling water. Boil for about a minute then remove the tea from the heat and let it steep for 15 minutes. For the last five minutes of steeping, add a cinnamon stick. Strain into cups. Add honey to taste, and serve hot or cold. Makes about four cups of tea.

Exceptionally Easy Cranberry Mold

1 package raspberry gelatin

1 cup hot water

1 can cranberry sauce (jelly style)

1 pint sour cream

Dissolve the gelatin in the hot water. Pour this mixture along with the rest of the ingredients, in a blender. Blend until the mixture becomes frothy. Pour it into an oiled mold and chill until firm.

Spicy Shrimp Dip

1 five-ounce package of cooked, frozen shrimp

1/2 cup sour cream

1/2 cup mayonnaise

1/4 cup mild picante sauce

2 teaspoons lemon juice

1 teaspoon prepared horse radish

Dash of pepper and Tabasco

Thaw the shrimp according to the directions on the package and cut them into small pieces. Mix them together with the rest of the ingredients, let chill and serve with corn chips or crackers. Makes about 1 1/2 cups of dip.

Persimmon Pudding

Persimmons, also called "sugar plums" are most abundant in the southeastern states. The trees grow along streams, roadsides, fields and sandy bottomlands. They are a food source for foxes, raccoons, opossums, skunks and birds. Collect the soft orange fruits well after fall frost or they'll make your mouth pucker! Press pulp through a colander.

2 1/4 cups flour
1 teaspoon allspice
1/2 cup sugar
1/2 teaspoon salt
1 cup packed dark brown sugar
2 cups persimmon pulp
1 teaspoon baking powder
1 cup buttermilk
1 teaspoon baking soda
2 eggs
1 teaspoon cinnamon
Whipped cream for garnish

Blueberry Grunt

The blueberry is a very common shrub found in forested wetlands, shrub swamps, bogs and even wet overgrown fields. These similar-looking huckleberry can be substituted in this recipe. The sauce makes a delicious topping for pancakes or ice cream as well.

Sauce:

4 cups blueberries
1 1/2 cups sugar
2 tablespoons lemon juice
2 lemon rinds grated
1/2 teaspoon cinnamon
1/2 teaspoon salt
3 cups water

Dumplings:

1 cup sifted flour
1/2 cup sugar
2 teaspoons baking powder
1/2 teaspoon salt
3 tablespoons shortening or margarine
1/3–1/2 cup milk

Combine sauce ingredients in a heavy saucepan. Bring to a boil, then reduce heat and simmer 5 minutes. Remove from the burner and set aside.

Sift dry ingredients together into a bowl. Cut in shortening until crumbly. Add enough milk to make a sticky dough; do not over mix.

Simmer sauce again until bubbly. Drop dough from greased spoons onto the surface of the sauce cook uncovered 10 minutes. Cover tightly and cook 10 more minutes without lifting the lid!

Let the Cattail out of the Bag!

Summary

Girls prepare for some of the sensory experiences they may encounter on a visit to a wetland when they explore a “touchy-feely” bag full of wetland objects.

Objectives

Girls will become aware of some sensory qualities of wetland inhabitants.

Materials

Sample wetland artifacts are listed here; you can add your own too. If there isn't a wetland nearby for collecting these items, you might want to find some through seafood markets, biological supply companies, local nature centers or even a government agency that works with natural resources. Most staff members tend to collect odds and ends, which they may be willing to loan or donate.

A bag, such as an old pillowcase or sturdy paper bag

Cattail stalk and flower (fuzzy ‘hot dog’ part)

Feather

Shell (clam, oyster, scallop, mussel)

Crab claw or dried shell

Wetland mud (in baggie; smells like rotten eggs)

Turtle shell

Fur (small piece, pelt or stuffed specimen—muskrats, beavers and other mammals have fur)

Flower (wetlands have many beautiful ones; avoid endangered species)

Tap water (in small container)

Leaves (grasses, wetland trees)

A toy frog, fish, insect, duck etc.

Snake skin

Bird's nest (only one that has fallen from a tree)

Making Connections

Wetlands are full of fascinating plants, animals and microscopic aquatic life. Students' curiosity about wetlands will be awakened when they feel the textures and shapes of special wetland objects. This hands-on learning game encourages an appreciation of the uniqueness of wetlands.

Background

Wetlands cover about six percent of the earth's surface. They can be found in every one of the United States and on all continents except Antarctica. They are found in rain forests, river deltas, coastal swamps, peatlands, salt pans, cranberry bogs, river estuaries, salt tidal flats, moist alpine tundra and wet river bottom forests.

To be a wetland, an area must have three characteristics during most of the growing season: hydric (saturated) soils, water-tolerant plants and enough water to either saturate the soil or cover the land to a shallow depth. A variety of plants and animals make their home in this unique environment, often with adaptations that help them thrive in wet conditions.

Procedure—Warm up

Introduce wetlands to the girls with the help of a colorful wetland poster.

The Activity

Call a volunteer to the front of the room. Blindfold the volunteer and ask her to reach into the bag and remove one object, or place one object in her hands. The object should be held out for the class to see. Younger students may need a reminder to put hands over mouths so they don't give away the object's identity.

Ask the volunteer to feel (and smell, if appropriate) the object, then describe her sensations to the class. Provide descriptive words to choose from if the volunteer needs help. The volunteer may then try to guess what the

objects, if necessary, the girls may help.

Remove the blindfold so the volunteer can see the object, then ask the girls to locate it or something similar to it on the poster.

Repeat for several volunteers and objects or until all have had a turn.

Wrap up

Ask students to review all of the objects they felt in the bag. Which ones were plants? Which ones were animals? Ask students why they think the objects in the bag belong in a wetland. Would any one of the objects appear in a dry area? Why or why not? Do students have a wetland in their area, or have they ever been to one? Have them describe the wetland and the plants and animals found there.

Assessment

Have girls : describe a wetland and identify plants and animals that live in a wetland.

Extensions

Go to a wetland near your meeting place and have girls create their own grab bag of one or two objects (avoid gathering endangered or rare species). Take the bags back to the meeting place and ask them to 'let the cattail out of the bag' with their troop. Have girls lead each other on a blind walk in a wetland. Each blindfolded girl should be led by a girl who is not blindfolded. The seeing girls present the blindfolded girls with the sounds, smells and tactile sensations wetlands provide.

Insect Dance–Along

Move like insects and dance to insect songs. Here's a active way for the girls to learn about some common insects and how they move. Have them sing and dance along with each verse of the insect songs that follow. Show them pictures of each insect before you begin. Also practice crawling, hopping, flying, swimming and digging.

Objective: describe how different kinds of insects move in different ways. Demonstrate insect movements through song and dance.

Materials: pictures of insects

To the tune of "Frere Jacques":

- Crawling beetle, crawling beetle,
On the ground, on the ground,
Crawling, crawling, crawling,
Crawling, crawling, crawling,
All around, all around.
- Hopping Cricket,
Hopping cricket,
In the grass, in the grass,
Hopping, hopping, hopping,
Hopping, hopping, hopping,
Very fast, very fast.
- Busy bumble bee, busy bumble bee,
In the air, in the air,
Flying, flying, flying,
Flying, flying, flying,
Buzzing here, buzzing there.

Other ideas: Swimming Backswimmer, digging mole cricket.

To the tune of 'you are my sunshine':

- I am a cricket,
A big black cricket,
I have 6 legs and 2 pairs of wings.
My body's covered
With an exoskeleton,
And I rub my wings to sing.

Surveys and Slogans

Take a wetland survey and design a wetland stamp, poster, t-shirt or bumper sticker.

Materials

Paper to copy questions below (4 sets per girl)

Scissors

Crayons, markers or poster paints

Glue

Cardboard

Reference books

Objectives: Describe several animals that depend on wetlands. List an endangered species that lives in a wetland.

Hundreds of species of plants and animals depend on wetlands for food, water, shelter and as a place to raise their young. By making posters, t-shirts, stamps and/or bumper stickers, your troop can let others know that wetlands are valuable wildlife habitats.

Before starting this activity, write the four questions below on a piece of paper, leaving space for answers between the questions. Make enough copies so that each girl can get four copies of the survey.

Wetland Questionnaire

Is there a swamp, bog, freshwater marsh, saltwater marsh or other type of wetland in or near your community? If so, describe it.

Can you list several reasons why wetlands are important?

Can you name several animals that depend on wetlands?

Can you name two famous wetlands in North America?

Pass out one copy of the survey to each girl in your troop then have them answer each question as best they can. To get them started, talk about the characteristics of wetland (see background information on pages 3 & 4). Freshwater marshes and swamps, bogs, salt marshes and mangrove swamps are all types of wetlands.

Afterwards, collect the papers and explain that you will be discussing the answers later. Then pass out three more copies of the page to each person. Tell the troop that they are to find three adults who are willing to fill out the survey. Give the troops several days to get their surveys completed, then discuss the answers using the background information on pages 1-3. Ask the group if most of the people that they surveyed were familiar with wetlands. Have them describe some of the local wetlands that were mentioned on the surveys. Then ask them to list some of the better-known wetlands in North America.

Finally, talk about how wetlands are important to wildlife. List some of the animals that depend on wetlands, including endangered, threatened and rare species (see questions 2 and 18 on pages 16 and 17.)

Now tell the troop that each girl is going to get a chance to tell others about the importance of wetlands by designing a wetland stamp, poster, t-shirt or bumper sticker. Explain that their creations should include a catchy slogan, as well as a design or picture that symbolizes a way that wetlands are important to wildlife. Each girl can focus on a specific type of wetland or come up with a general wetland theme. Give the troop research time to find out more about the plants and animals that live in the types of wetlands they chose.

Afterwards, display the finished wetland posters, t-shirts, stamps, and bumper stickers so that other people can learn more about why wetlands are important.

What's your Wetland IQ?

Play a wetland trivia game.

Objectives: Describe several ways that wetlands are important to people and wildlife. Describe several ways people have abused wetlands.

Materials:

Copies of What's Your Wetland IQ? cards

Chalkboard or easel paper

Index cards

Crayons or markers

Glue

Scissors

Large sack

Paper

What kind of animal is a snail kite? Name two carnivorous plants that grow in wetlands. Are most of the snakes that live in swamps poisonous?

In this activity your troop will get a chance to answer these and other wetland trivia questions by playing a team trivia game. At the same time they will learn more about how wetlands are important to people and wildlife.

Start the activity by asking the girls to describe ways that wetlands are important to people and to wildlife. List their answers on a chalkboard or large sheet of easel paper. Add to their list, using the background information on pages 1-3.

Then tell the girls they are going to play a trivia game, but that first they each need to make a set of wetland cards.

Pass out a copy of page 18 to each person. Explain that each of the pictures on the top half of the page matches one of the clue cards on the bottom. Then see if the kids can find the matches. Discuss the answers, using the background information.

Next pass out index cards, crayons or markers, scissors and glue and have each girl turn her sheet into a set of game cards. First have them color the pictures and then cut out all of the rectangles on page 18 (pictures and clues). Tell them to glue each picture to a separate index card and then trim off the extra cardboard from the sides. Have them glue the matching set of clues to the other side of the picture card.

Each girl can also make one wild card. (Wild cards will speed up the game.) just have the girls glue blank paper to each side of an index card or write on the index card 'wild card' on both sides.

When all the cards have been made, collect them in a large sack. Then divide the group into two teams. (You might want to give each team a few days to brush up on and review their wetland facts.) Explain that the object of 'What's Your Wetland IQ?' is to be the first team to collect a complete set of wetland benefit cards—five in all. To get the cards, each team must correctly answer wetland trivia questions. (You might want to list the titles of the five wetland benefit cards on the board so the girls can keep track of what they need to win.) Here's how to play:

Have each team appoint a spokesperson. Then alternate from team to team, asking each a different trivia question from the list at the end of the activity. Explain that team members can discuss each question, but the answer must come from the spokesperson.

Each time a team correctly answers a question, one of the members gets to pick a card from the sack. If a team picks a wetland destruction card, the card should be put aside and the team must give up one of their other cards. (Don't put the destruction card back into the sack. If a team picks a wetland destruction card on the first round or before they have other cards they just lose their turn.) There is no penalty for missing a question.

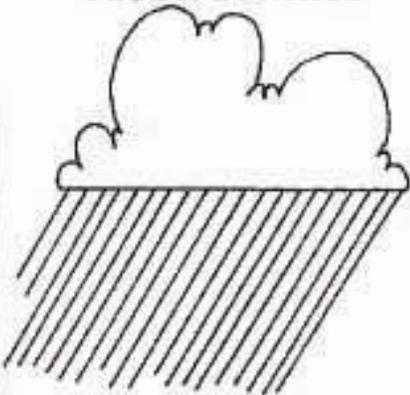
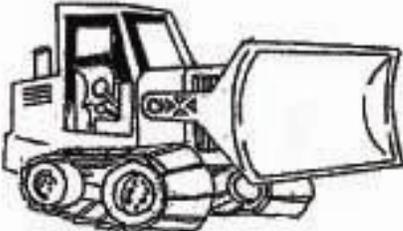
If you decide to use wild cards, explain that a wild card can replace any of the five wetland benefit cards. So if a team has all the cards but one and then picks a wild card, they win.

Trivia Questions:

1. Name two kinds of freshwater wetlands. (swamp, freshwater marsh, bog)
2. Name three animals that might be found in a wetland. (frog, duck, fish, mosquito, beetle, spider, deer, beaver, muskrat, crab, snail etc.)
3. Many carnivorous plants grow in wetlands. Name two. (sundew, pitcher plant, bladderwort, venus flytrap, butterwort)
4. What term is used to describe the twice daily rising and falling of seawater in a saltwater wetland? (tide)
5. Which fiddler crab has one claw many times larger than the other—the male or the female? (male)
6. True or false: if you go to a swamp you are likely to drown in quicksand. (false)
7. What state is the Everglades in? (Florida)
8. What part of a bald cypress tree produces the tree's knees—the trunk, roots or branches? (roots)
9. What is the most abundant tree growing in coastal saltwater swamps? (mangrove)
10. What is the name of the people, famous for their spicy cooking, who were driven out of Nova Scotia by the British in the mid 1700's and finally settled in Louisiana's bayous? (Cajuns)
11. What is the name of the plant that is grown in bogs and whose berries are harvested to make jellies for traditional Thanksgiving meals as well as to make breads, juices and other foods? (cranberries)
12. Name a city in the US that was built on a wetland. (Washington DC, Boston, San Francisco etc.)
13. What bird is among the largest living birds, often builds its nest in mangrove trees and feeds on fish which it catches in a huge pouch underneath its bill? (pelican)
14. Approximately what percentage of the commercial fish catch taken along the Atlantic and Gulf Coasts in the US depends on wetlands for survival—25%, 50% or 66%? (66%)
15. Along what three large bodies of water are the coastal saltwater wetlands of the US located? (Gulf of Mexico, Atlantic Ocean, Pacific Ocean)
16. The Great Dismal Swamp is one of the largest swamps in the US and stretches across the borders of two states. Name one of these states. (North Carolina or Virginia)
17. What wetland is often called a 'river of grass' (Everglades)
18. Name an endangered animal that lives in wetlands. (whooping crane, American crocodile, snail kite, Florida panther, red wolf, pine barrens tree frog, etc.)
19. "The Land of the Trembling Earth" is the Indian name for a large swamp that is found in Georgia. The name of the swamp has five syllables and starts with the letter 'o'. What is this swamp? (the Okefenokee)
20. The skins of which wetland reptiles have been used by people to make purses, belts and other accessories? (alligators and crocodiles etc)
21. Name two ways people abuse wetlands. (filling, dumping, dredging, draining)
22. The 'quaking' movement of some bogs is caused by: A. small, localized earthquakes centered underneath the bogs. B. the movement of underground water to the surface. C. People walking or jumping on the thick layers of spongy peat (c is correct)
23. True or false: most of the snakes that live in swamps are poisonous. (false)
24. True or false: there are wetlands in Israel. (true)
25. The dam-building practices of this mammal have helped create wetlands. What is it's name? (beaver)
26. What advantage are prop roots to red mangroves? (the prop roots help give the trees support in unstable soil and are covered with lenticels through which oxygen passes.)
27. Is the wetland animal called a snail kit a snail, bird or mammal? (a bird)
28. True or false: male fiddler crabs make a strange, fiddle-like noise with their huge claws. (false—male fiddler crabs use their big claws to defend their territories and to attract females)

29. True or false: If it hadn't been for glaciers, many of the bogs in North America wouldn't be here today. (true, the glaciers that once covered much of North America gouged out basins that bogs later formed in)
30. In what kind of wetland would you most likely find an American crocodile; a bog, a prairie pothole or a mangrove swamp? (a mangrove swamp)
31. True or false: in North America, mangrove swamps are most common in Canada. (false, mangrove swamps are tropical wetlands. In North America, they're most common in Southern Florida.)
32. True or false: a man who fell into a bog and died about 2,000 years ago was found in the 1950s in an almost perfectly preserved state. He was even still wearing his hat! (True. Decomposition occurs very slowly in many bogs)
33. Which of the following fish or shellfish doesn't depend on saltwater wetlands in some way: shrimp, tuna oysters or salmon? (tuna)
34. The menhaden is a commercially harvested fish that spends a lot of time in salt marshes. Which of the following products is not a big use of menhaden: fertilizer, paint, food or soap? (food)
35. Which two states have the most acres of wetlands? (Alaska and Florida)
36. About what percent of endangered and threatened animals and plants in the US depend on wetlands in some way: 10%, 35% or 60%? (35%)
37. True or False: some crabs live in mangrove trees and feed on their leaves. (true)
38. Which of the following agencies is in charge of giving permission to build on wetlands: The US Fish and Wildlife Service; the US Army Corps of Engineers or the National Park Service? (the US Army Corps of Engineers)
39. Which of the following is known for the huge numbers of ducks that are born there each year: the Potomac river, prairie potholes or northern bogs? (prairie potholes)
40. Parts of what freshwater wetland plant have been made into flour for pancakes and stuffing for mattresses? (the cattail)
41. Many wetland areas have been drained, filled or dredged. What does the word dredge mean? (to deepen a body of water by digging up the bottom)
42. Name two reasons that wetlands are often drained, filled, channelized or dredged. (to create agricultural fields, marinas, parking lots, airports, dumps and so on)
43. True or false: people can build artificial wetlands that can help filter pollution. (true)
44. Name a well-known swamp (dismal swamp, great swamp, Okefenokee swamp, Atchafalaya swamp etc.)
45. Which country in North America has the most bogs? (Canada)
46. Name a crop that is sometimes grown in wetlands (mint, cranberries, wild rice)
47. Which of the following presidents gave an executive order to protect wetlands: Carter, Nixon or Reagan? (Carter)
48. What do the bog turtle, whooping crane and green pitcher plant have in common? (all live in wetlands and are endangered species)
49. How much water can a brown pelican's pouch hold? 1/2 gallon, 1 gallon or 2 gallons or more? (2 gallons or more)
50. Spartina grass is the most abundant plant in which kind of wetland—a salt marsh, freshwater marsh or bog? (a salt marsh)
51. Sphagnum moss is one of the plants that grows in bogs. Although people have used sphagnum moss for many things, it has never been used for: fuel or heating houses, diapers, food or wrappings for wounds (food)

What's Your Wetlands IQ?

<p>FLOOD CONTROL</p> 	<p>RECREATION</p> 	<p>HABITAT FOR WILDLIFE</p> 
<p>POLLUTION CONTROL</p> 	<p>PREVENT SOIL EROSION</p> 	<p>WETLAND DESTRUCTION</p> 
<ul style="list-style-type: none"> • wetlands trap silt • some wetland plants can filter pollutants from water • many wetland plants can absorb some pollutants as nutrients <p>A</p>	<ul style="list-style-type: none"> • wetlands provide food, water, shelter, and living space for many types of wildlife • many birds, fish, amphibians, and other animals lay their eggs in wetlands • salt marshes, mangrove swamps, and other wetlands act as natural nurseries for many types of wildlife <p>B</p>	<ul style="list-style-type: none"> • roots of wetland plants help bind soil • wetland vegetation and soils help slow runoff from storms and melting snow • wetlands help protect shorelines by slowing down the waves and water currents <p>C</p>
<ul style="list-style-type: none"> • people alter and abuse wetlands by dredging, dumping, channelizing, filling, and draining • altered wetlands often become farmland, housing sites, marinas, grazing land, highways, and other developed areas <p>D</p>	<ul style="list-style-type: none"> • wetlands provide opportunities for canoeing, bird watching, fishing, hunting, photography, and hiking • wetlands often inspire painters, writers, poets, and others <p>E</p>	<ul style="list-style-type: none"> • wetlands help soak up rain and melting snow • some wetlands can temporarily store storm waters • wetlands often help contain flood waters and slow them down <p>F</p>

Treatment Plants

Summary

Going Up? Demonstrate the uptake of pollutants into plant tissues.

Objectives

Describe how plants remove pollutants from the water. Analyze the limitations of this ability when wetlands are overloaded with pollutants from the surrounding land.

Materials

Fresh celery stalks, with leaves

2 beakers or jars

Red or blue food coloring

Water

Paring knife

Making Connections

Many people do not realize that plants are vital to the health of our water supply. In fact, wetlands and their plants are an increasingly popular alternative for filtering wastewater from homes, schools, factories and businesses. This activity helps students appreciate wetlands plants' natural ability to help keep our water supply clean.

Background

Healthy wetlands perform some very important functions in the cleansing of polluted runoff and wastewater. Pollutants include petroleum products, heavy metals, pesticides, industrial wastes, pesticides, industrial wastes, excess nutrients (such as nitrogen and phosphorus) from household or commercial use, and even litter). The soil layer and the tangle of stems, leaves and roots in a densely vegetated wetland impede the flow of water and act as a natural sieve. As a result, the water that is processed by a wetland usually enters an open body of water in a much cleaner state. Not surprisingly, a growing number of communities around the world are using the wetlands as part of a comprehensive waste water treatment program.

Wetlands also provide a flood control benefit. The wetland zone along the edge of a stream, river or pond can temporarily capture and hold flood waters. The excess water is released gradually from wetlands and the destructive effects of sudden storm surges are avoided. Similarly, when a heavy load of pollutants enters a wetland, the wetland can hold the pollutants for a while and release them into nearby bodies of water slowly. This often minimizes or prevents the harmful effects that would result if most of the pollutants entered the water within a short period of time.

The soils and plants in a wetland can capture and hold, maybe even use and change, many pollutants. Because of the relatively slow movement of water through a healthy wetland, plants form a barrier that allows many sediments and suspended pollutants to settle down to the soil level. Larger floating materials, such as litter, often get caught in the vegetation as well. All these pollutants are buried as new soil materials settle over them. Soil particles often bind with pollutants and prevent them from moving into an open body of water, thus protecting the quality of water. In some cases, the microbiological activity in the soil can actually render pollutants harmless.

Wetland plants play other roles in the preservation of water quality. During plant metabolism, plants draw water, air and nutrients through their root system. In the daytime, plants use carbon dioxide and product oxygen during photosynthesis. At night, plants product carbon dioxide during respiration. Much of this gas exchange occurs through pores (stomata) on the plant surface. These pores also allow water to escape to the atmosphere as vapor (transpiration); some minerals are excreted during this process.

As plants draw water into their roots they also take in nutrients for metabolic activities. Wetland plants can metabolize excess nutrients from human activity, thus protecting the open water bodies that receive wetland runoff. The cattail is a prime example of a wetland plant that will readily use these available nutrients. Of course, there are limits to what a wetland can do, and it is possible to so overload a wetland with nutrients that eutrophication results.

Plants also take up toxic materials when the draw water from their environment. Toxins are stored until the plants excrete them or die. The toxins are then rereleased in the water and soils of the wetland, where they may be captured by other plants or bind with soil particles. Even so, some pollutant materials do find their way

through the wetlands and into our rivers, streams and ponds.

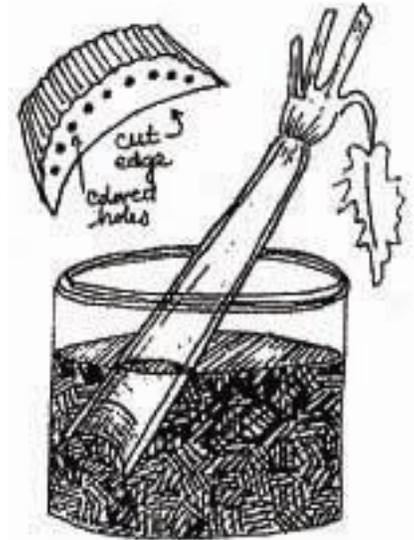
Procedure—Warm-up

Ask girls what they think happens when pollutants such as toxic chemicals and garbage flow through a wetland. Explain what happens.

The Activity

Note: prepare steps one and three one day prior to the lesson. Repeat these steps in front of the troop to show how the demonstration was prepared.

1. Add several drops of food coloring to a water-filled beaker or jar. In class, explain that the food coloring represents pollution by a toxic substance such as a pesticide. Let students suggest other toxic substances.
2. Ask the girls to imagine that the water is flowing through a wetland and the celery stalks are the many plants (cattails, sedges, grasses, etc.) growing there.
3. Cut the bottom half-inch of the celery stalks and place the stalks in the water overnight. Over time, the colored water will travel via capillary action up the stalks, showing how plants can absorb pollutants with the water they 'drink'. The colored water may or may not be visible on the outside of the stalk. Cut off 1-inch pieces of the celery and hand them out for students to study closely. They will see colored dots on the cut surface. Explain that these are vertical, water-filled channels in the celery see in cross section.
4. Discuss what happens to pollutants when they pass through a wetland.



Wrap Up

Ask the girls:

How do wetland plants help purify water?, Why is the water remaining in the beaker still polluted?, where does the water go after uptake into the plant?, what happens to the pollutants?, why can't we dump all of our waste into wetlands?

Assessment

Have girls interpret the role plants play in water purification.

Extensions—nature in your neighborhood

Lots of pollutants run off of the land from construction sites, streets, highways and the communities in which we live. Sometimes ditches or storm water management ponds are built to filter polluted runoff and excess rain water from these sites. These ponds are often planted with wetland plants to aid in the filtering. As the runoff and rainwater rest before flowing on, many of the pollutants, especially soil particles, settle to the bottom and the cleaner water drains off from the top.

Is there a storm water management pond near where you live? Find one in a safe spot, away from speeding cars. If it is fenced off, stay outside of the fence. Visit the pond on a dry day and again just after a heavy rain. Is there a difference in the appearance of the water in the pond and/or the water washing into the pond? Where is the water flowing from and where do you suppose it is going? You may be able to see water leaving the pond—is this water cleaner? It should be!

This is how natural wetlands work. In fact, this is a wetland—a human-made one. If the pollutant load is managed with care, the pond will evolve into a beautiful wetland for all to enjoy! For assistance in finding a pond, contact your highway department, office of public works.

Jumpin' Jehoshaphat

Materials

Crayons

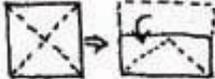
Markers

Heavy construction paper

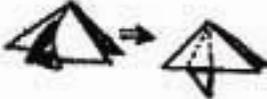
The troop can make paper frogs that really jump when pressed on the back end like a tidily-wink. Follow the directions below to make Jehoshaphat, the jumping frog. Color Jehoshaphat with crayons or markers and make a wetland out of construction paper for him to jump into. You may want to set up a frog jumping contest to see whose Jehoshaphat is the best jumper!

Directions

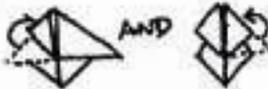
1. Start with a square piece of paper. fold like this:  then like  this:

2. Now open it up again, then fold in half to make a rectangle. 

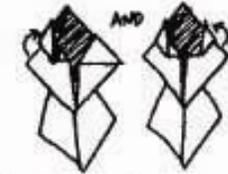
3. Hold the rectangle in the middle and pull the top of the fold down on one side to the center and flatten to make a triangle. Then do the other side. (the folds will be introverted.) 

4. Next, fold one of the triangle corners in to meet the center. 

5. Do the same for the other side. It will look like this  or like this is you turn it over 

6. Now fold the remaining corners up to meet the center line. 

7. Then fold those pointed ends as in the pictures.

8. 

9.  

10. These are the front legs  these are the back legs 

11. Now fold the whole thing in half to look like this: 

12. Then fold it partway back down again. Turn it over and press on the fold on the back to make it jump!



Wetlands Around the World

Materials

Paper and pencils

Library resources

Many cultures throughout history have evolved around wetlands, which exist on every continent except Antarctica. Have the girls research and report on how different societies worldwide have used wetlands for food, housing and economic gain. Two good sources of information are National Geographic and encyclopedias.

Ideas for Topics:

Cajuns of coastal Louisiana's Atchafalaya Swamp and the lumber industry

Archaeologists in the US and Europe who study ancient bodies preserved in peat deposits; early humans and their cultural practices.

Use of peat in gardening, as insulation, and as an energy source—US, Russia, Ireland, Germany, Belgium, The Netherlands, Denmark

Rice Production—Thailand and other Asian countries

Mangrove wetlands as a source of timber and other resources—the Malay Archipelago, East Africa, Central and South America

Use of Salt marshes for livestock grazing, hay production and thatching for roofs—Europe, British Isles, US (New England)

The cranberry industry—northern US (New Jersey, Massachusetts and Wisconsin)

Irish folktale about the will-o'-the-wisp, strange lights that led people astray on the bogs. The lights are actually produced by methane gas, also called swamp or marsh gas, which can catch fire briefly when released from many wetlands as a product of their chemical reactions

Colonial America, where towns and cities grew up around rivers for transportation and trade

Beaver Tales

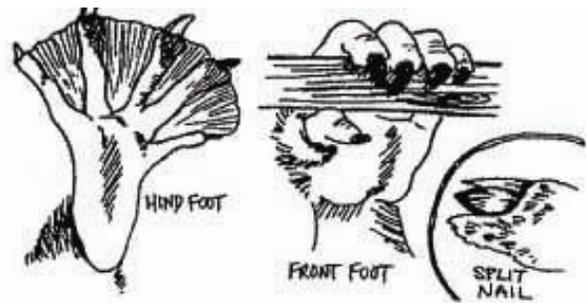
If you lived in a wetland, what kinds of special body parts or tools would you need to survive? The beaver is one of many wetland dwelling creatures equipped with a variety of unique and even weird, adaptations. The beaver's lifestyle requires specialized physical features and behaviors.



If you spent most of your life in the water or on wet ground, you'd get 'goose bumps' pretty quickly! To keep itself from getting cold, the beaver has a thick layer of fur consisting of a fine undercoat and long, protective guard hairs. Add to this a thick layer of fat under the skin. It also has a built-in radiator, a special kind of circulation that brings heat to its legs, feet and tail!

Sebaceous glands produce oil, which waterproofs the beaver's fur. The beaver also has musk sacs called castor glands which produce an oil the beaver uses to mark its territory. This oil has also been used to make some perfumes and medicines.

The second claw on each beaver's hind foot is split and used like a comb to keep the fur groomed for maximum water repellency. The webbed hind feet provide propulsion through the water. The outermost toes on the front paws are modified for grasping, much like the human thumb, and are used for holding food and working on dams. The long front claws are adapted for digging. The broad, flat, leathery tail is not used for scooping up mud, as shown in many cartoons. It actually serves as a propeller and rudder (for steering) when the beaver is swimming. The tail also supports the animal when it sits upright to gnaw on a tree. When danger is near, the beaver slaps its tail on the water's surface as a signal to others.



This animal's characteristic large front teeth grown continuously, keeping pace with the constant wear from gnawing on wood. These teeth project past the beaver's lips so it can gnaw, chew, and swallow underwater without choking. To seal out water during dives, the beaver's ears and nose have special flaps and the back of its mouth closes. It can stay underwater for up to fifteen minutes! A beaver's eyes have nictitating membranes, also called third eyelids, which serve as underwater goggles. Though the beaver's vision is weak, its hearing and sense of smell are acute. It finds most of its food (tree bark and soft vegetation such as grasses, ferns, mushrooms, leaves, stems and roots of water plants) by smell.

The beaver's remarkable behaviors have led many people to consider the animal highly intelligent, but most of these behaviors are probably instinctive.

The beaver is quite an engineer! It responds to the sound of running water by building dams of mud and wood chips to stop the flow. Small trees, branches, and twigs are stored in the mud at the bottom of their home ponds as supplies for winter, then the pond freezes. Large trees are gnawed until they topple, bringing the more tender parts at the top within reach. Leftovers are used to build the lodge. Lodges are intricate, with many rooms and underwater entrances. These unique behaviors have made the beaver a very successful survivor. Many species depend on the beaver's talent, since beaver ponds are home to many kinds of plants and animals.

After reading the information, write answers to the questions below:

- Does a beaver freeze when the water is cold or frozen? Explain.
- How do a beaver's toes help the animal survive?
- Why would a beaver bury sticks and logs in the mud under water?
- Why do beavers cut down large trees that are too tough to eat?
- Name some animals that might be attracted to an area after beavers have moved in.

Wetland Puzzle

Fill in the blanks with the answers to the definitions. Then, using the circled letters unscramble the answer to the last definition.

A wetland with trees and shrubs

S _ _ _ _ ()

Movement of the water level up and down the shoreline occurring twice a day

T _ _ _ ()

Body of water that mixes salt and fresh water; another word for bay

(E) _ _ _ _ _

Animals that are most active at night are called

N _ _ _ () _ _ _ _ _

Shelled animal who filters out dirt and algae from bay water and provides homes for hundreds of species

O _ () _ _ _ ()

Shelled animal with claws

C _ () _ _

A wetland with fresh or salt water and small plants, such as grasses and cattails growing in it

M () _ _ _ ()

Tiny microscopic plants and animals which float and drift in the water and are an important source of food for many animals

P _ _ _ _ () _ _ _ _

Largest estuary in the US:

Salt Marsh Players

Summary

How would you react if, for a part of each day, your house was covered with water?

Girls role-play how organisms adapt to life in a salt marsh—a coastal, marine habitat that is alternately flooded and drained by tides.

Objectives—students will:

Demonstrate how various salt marsh plants and animals adapt to environmental conditions.

Recognize various plants and animals that live in salt marshes.

Materials

Photos, slides or video of salt marshes and organisms that live in the salt marsh (optional)

Copies of the salt marsh players character cards (make duplicates for larger classes)

4 inch by 6 inch index cards

Glue

Scissors

String

2 cardboard tubes (paper towel)

Blue cloth, or a piece of blue ribbon approximately 12 to 20 feet long and 1 foot wide

Soap bubble bottle and bubble maker

Making Connections

People see, hear of, and read about salt marshes and other wetlands in the media. Some girls may have visited coastlines where salt marshes exist. Girls may also have learned how certain species adapt to various conditions. By physically enacting behavioral strategies of salt marsh organisms encountering high and low tides, Girls are introduced to the complex and interrelated world of animal and plant adaptations.

Background

Salt marshes are grassy wetland habitats that occur within temperate estuarine environments. In the US, marshes exist on the Atlantic and Pacific coasts and the shores of the Gulf of Mexico. They are part of the intertidal zone (between high and low tide) and are flooded once or twice a day by incoming tides.

The dominant plants of a salt marsh include grasses and algae. These plants die seasonally and regenerate, adding tremendous amounts of detritus (decaying organic matter) to the food chain. Scavengers and bacteria break down the detritus into nutrients and minerals. These provide the nutritional foundation for a complex food web, including fish, crabs, shellfish and larger animals.

The pulsing action of tides delivers and distributes nutrients that plants and animals can consume. The comings and goings of tides also pose great challenges to salt marsh life. Regularly, a salt marsh is flooded with salt water during high tide. When the tide recedes, the land becomes exposed, and fresh water runoff often flows through the marsh not only are organisms exposed to varying degrees of moisture but also changes in salinity and temperature.

These variations produce an obvious distribution of plants and animals that are adapted to specific conditions within the marsh. This situation is called zonation and is often described as:

High Marsh—covered briefly each day by the tides; Low Marsh—beneath the level of the tide for many hours each day.

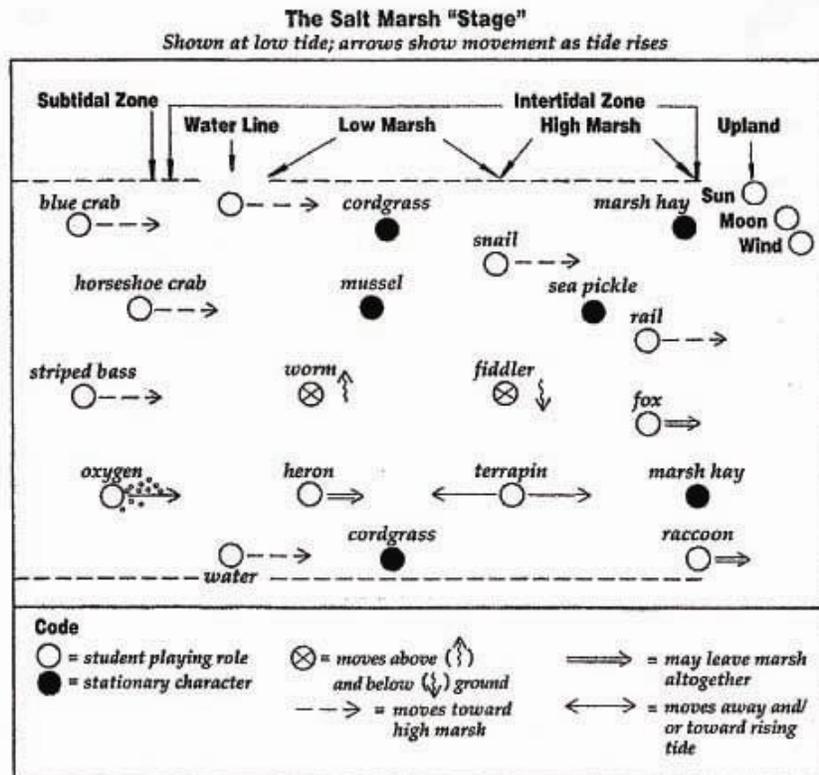
The area that is never exposed to the air is called the subtidal zone. Both the high marsh and low marsh comprise the intertidal zone.

The variability of the salt marsh environment requires residents to adapt, both physiologically and behaviorally.

Changes in physiology, like marsh plants' ability to excrete salt, have evolved over long periods of time.

Behavioral responses, like crabs burrowing into the mud at low tide, allow animals to adapt quickly to changes in the environment.

Some salt marsh species, like marsh snails, move away from incoming water. Others retreat into underwater burrows and remain inactive during high tides. Still others adjust their activities to suit the varying degrees of salinity or temperature. Salt marsh residents may have to adapt to both aquatic and terrestrial conditions within the same day!



Procedure—warm up

Ask girls to list human behavioral responses to environmental change. What do we do in response to heat or cold? How do we prepare for a flood, cope with lack of food or respond to physical pain?

Have the troop brainstorm some obvious behavioral adaptations of common animals to the environment (pet dogs begging for scraps from the table, cattle seeking shade, birds migrating away from winter conditions).

Describe display pictures of or show a video of salt marshes and the organisms that reside there. Have students list some basic characteristics of the salt marsh and some plants and animals they think may live there. Explain that the marsh is flooded by the tide each day. Have girls list ways they think plants and animals might adapt to life in the salt marsh.

The Activity

Hand each girl a salt marsh player character card, string and a large index card. Provide tape, glue and scissors. Ask the girls to read the cards. Have them glue the pictures to one side of the index cards and the descriptions to the other, punch two holes and thread the string so the cards can be worn around the neck.

Designate a section of the meeting place, at least 12 feet by 15 feet. One end of the area will be a body of water (subtidal zone) and the other end is upland. The marsh is located between the two. Low marsh lies near the subtidal zone and high marsh near the upland.

Ask the water character to unroll the scroll of water and take a place at low tide (see diagram). Tell her to read her card aloud and make gentle wave motions with the fabric.

Ask 'what makes waves?' have the student holding the wind card read about making waves, then make blowing sounds, dancing around while the waves move.

Taking turns, all the plants should read their salt marsh players character cards and move into the appropriate area of the marsh. Each animal character does the same. Fish and blue crab live in the water, moving forward and back with the tides. The rest of the animals should take their low tide positions.

When all are in place, tell the wind to blow again. Ask 'what makes the tides move in and out?' Sun and moon

should read their salt marsh players character cards, then stand on chairs making circles above their heads with their arms, indicating a full moon and bright sun.

Have the oxygen character enter the water and read her salt marsh player character card aloud. Tell students that wind churning the water helps mix oxygen into the water. Have the oxygen character blow soap bubbles while the wind howls.

Tell the characters to get ready to perform together. Remind students to notice what the other characters are doing. Announce that the sun and moon are high in the sky, the wind begins to blow, the waves start moving gently and plants sway.

After several minutes, say, 'the tide is rising!' the water character should walk very slowly toward the high marsh, with fish, crab and oxygen following behind. Remind plants that since they are rooted in the ground, they must stand in place but should bend and sway in response to wind and water movement; plants should duck below the scroll of water as it passes. Animals should adopt high tide behavior (as described on their salt marsh players character cards).

As the water reaches its high mark (just past the high marsh), announce that 'it is high tide!' ask the characters to explain their behavior briefly. Now reverse the sequence and have the water retreat back to low tide while players adjust their behaviors. The performance may be recorded.

Wrap up and Action

Have girls write character sketches and locate materials from home to create costumes to dramatize the hardships and rewards of their existence. They may wish to do additional research. They should include ways that plants and animals adapt to the changing tides. They may be interested in learning how people adjust who live in tidal or storm-boats instead of cars, etc.).

Assessment

Have the girls: identify various plants and animals that live in salt marshes

Enact the behavioral responses of salt marsh characters to tides

Describe how various salt marsh plants and animals adapt to environmental conditions

Write a sketch of a salt marsh player

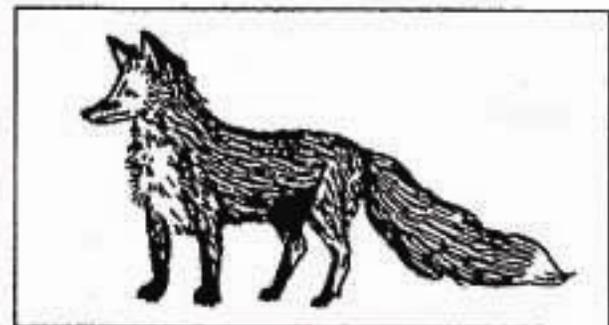
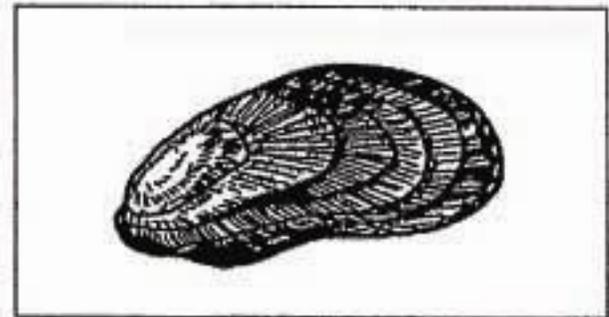
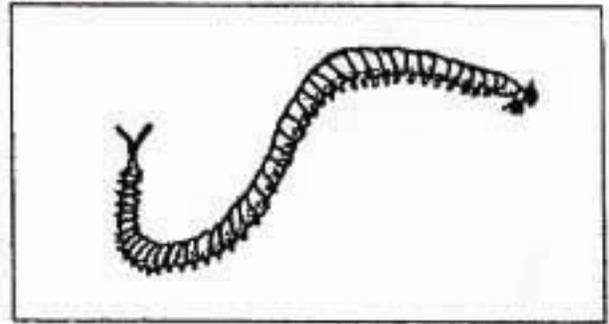
Design a costume to characterize a salt marsh player

Extensions

Take a field trip or show a video of a salt marsh and have students look for plants and animals from the play.

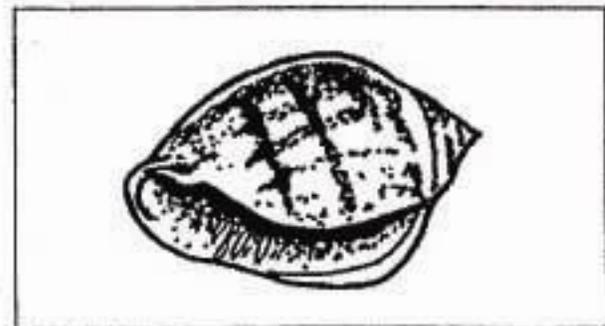
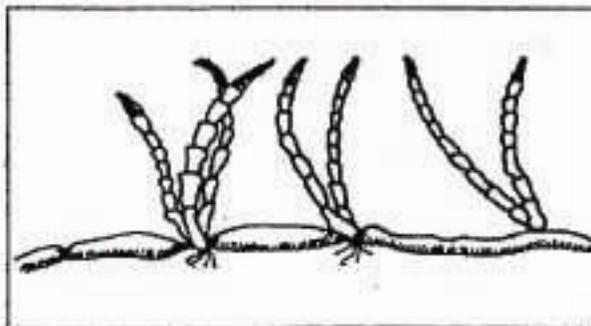
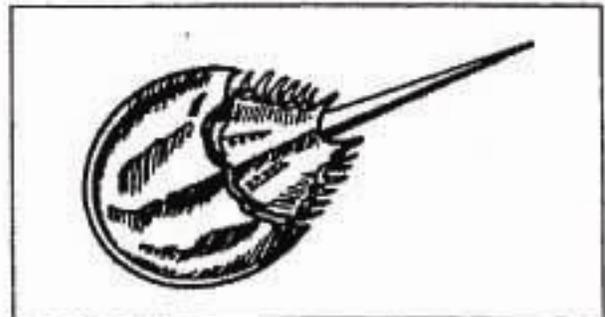
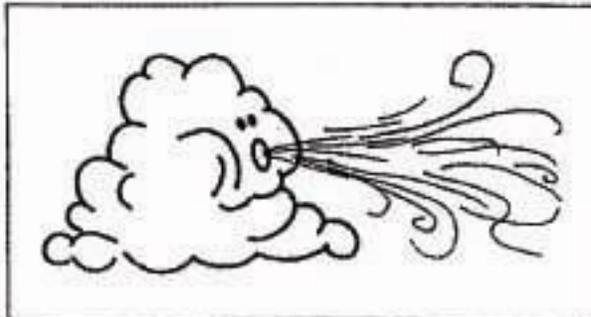
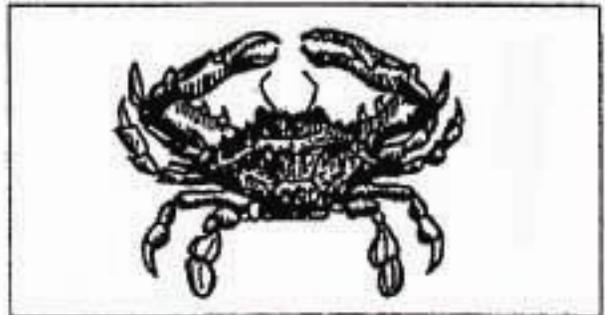
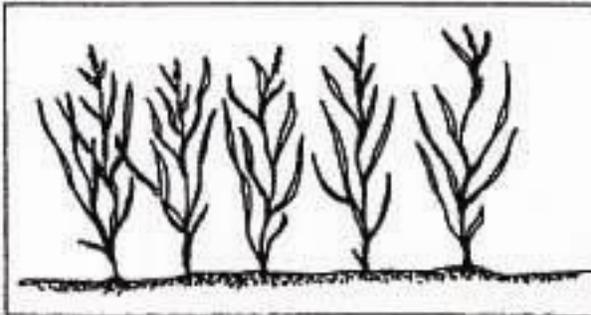
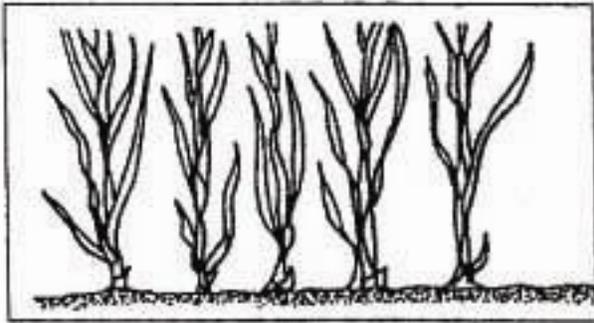
Classes might study other environments (rain forest, desert, tundra, etc.) and pinpoint the adaptations of plants and animals that live there. A class can develop a similar game for the residents of another environment, using seasonal change as the environmental factor, for example.

The Salt Marsh Players Character Cards



The Salt Marsh Players Character Cards

These characters represent the mid-Atlantic coast of the United States—species are different for other areas.



The Salt Marsh Players Character Cards

