Aquatic Odyssey

Objective: Students can identify various forms of aquatic animal life and their interrelations with aquatic plants.

Materials:

Dipping Nets	Hand Lenses
Magnifying Boxes	Laminated Field Guide Poster
Plastic Buckets	Plastic Tubs

Introduction: What plants live in and around the pond? *(cypress, willows, cattail, water lilies, etc)*
What animals live in and around the pond? *(fish, turtles, frogs, snakes, diving beetles, water lice, snails, etc)*
You may not have seen some of these plants and animals before. We will take turns dipping our nets into the water and emptying the contents into our buckets to see all of these plants and animals. When we are not using nets, we can use the magnifying boxes and hand lenses to take a closer look. It is important to:
1. Take turns and share
2. Treat tools and animals gently & with respect
3. Wash our hands

Activity:
1. Ask the students to partner up and give each team a net
2. Keep magnifying equipment next to the buckets
3. While some students begin dipping their nets, help the other students fill the buckets half full of water
4. As discoveries are made, help students identify and share their discoveries

Conclusion: How many different plants and animals did we find today?
Do you think it is easy for them to share the pond with each other? *(No, they eat one another; no, they fight for the same food; yes, they depend on one another to maintain the environment they're used to)*
It may seem like a crowd to us, but these animals depend on one another. The turtles eat the fish, the fish and frogs eat the insects, and plants provide food for the insects and fish.

Four Senses Walk

Objective: Students will discover how to best explore the outdoors using their senses of sight, hearing, touch, and smell to discover the sights, sounds, odors, and textures in the Arboretum. They will not use their sense of taste unless instructed by their Naturalist. They will learn some simple characteristics of plants based on their exploration.

Materials: None

Introduction: A good naturalist or scientist must be a keen observer of nature. The best scientists learn to use all their senses to explore subjects within their environments.
Using one's senses is a skill developed over a long period of time. Young children, with their sense of wonder *(is the "sense" of wonder a true sense?)* naturally tend to explore with all their senses. As you spend time exploring the outdoors, you will discover that your senses are important in identifying plants and animals.
What's an example of an animal you could identify without seeing it? *(skunks – can smell them, birds, can hear them, bugs – can feel them crawling on us)*
What's an example of a tree or shrub you might be able to identify by smell? *(pine, cedar, lilac, honeysuckle)*
How can your hearing tell you about your surroundings? *(if you hear gusts of wind, maybe you're somewhere more open with less windbreak; if you hear bugs/birds/frogs chirping, you must be in or near their habitat; if you hear running water, you might be near a stream; counting cricket chirps can tell you the temperature!)*
How can our sense of touch tell us more about our environment? *(sometimes it's a warning when we feel a sting from a plant or animal; we can feel the sun's rays on our skin if it's sunny or we can feel the breeze if there is one; we can feel if the ground is squishy which could tell us that it rained recently, or that we're near water)*
We will not be tasting things, but scientists who know more about plant and animal dangers DO use taste to identify and describe certain plants.

Activity: 1. Lead the students on a walk through the Arboretum, stopping to show them things they can see. Have the children point out other things that they see and discuss these things as they are discovered.
2. Gather the students in a circle. With a show of hands, find out what the students saw during the sight portion of your walk. Talk about what the distinguishing characteristics

were for each thing they saw. Go around the circle, allowing each student to describe his or her favorite item seen to the rest of the group.

3. Walk to a new spot in the Arboretum and have the children sit down and close their eyes. Discuss ways to increase awareness of other senses. *(For example, closing their eyes may ease visual distractions and allow better concentration on the remaining senses.)* Have the children announce things they hear and discuss these things. You may want to ask, "Does anyone hear a bird? Where is the sound coming from? Why do you think the bird would be making that sound?" etc. Continue with other heard sounds.

4. Walk to a new area and allow the group some time to make observations using the sense of touch. Discuss different textures the group finds.

5. Repeat the procedure with the sense of smell. Discuss the importance of smell to plants and animals that inhabit the Arboretum. *(Some plants and animals smell good to attract things to them, other plants and animals smell bad to keep things away.)*

6. If time allows, get into a sharing circle and have the children each share one of the things they saw, heard, felt, or smelled during the activity.

Insect Safari

Objective: Students will discover that insects are important animals that live in many different environments. They will learn the body parts of an insect. They will think critically about what insects eat and what might eat insects.

Materials:

Clipboards	Bug boxes
Pencils	"My Insect" worksheet
Insect Nets	Large insect anatomy picture

Introduction: Gather students in a circle. Ask the students, *"What are the smallest animals you might find here at the Arboretum?"* Discuss what kinds of insects we would expect to discover here and why. What is the role of each in the Arboretum community? Discuss habitat, community, and roles of predator/prey.

Show the students the large insect anatomy picture, naming the various body parts and the function of each. Have the children compare and contrast an insect's body parts to their own.

Activity: Give each student or pair of students a clipboard, worksheet, and bug box. Explain that, *"Today we are going to go on an insect safari to look for insects that make the Brenton Arboretum their home."* Designate boundaries for the search, and encourage the students to examine different microhabitats. The children will try to capture insects in their bug boxes, examining each and sharing with all of the other students. How are the various insects similar? How are they different?

Have the children begin the worksheets, detailing the habitat where each insect was found, what that insect might eat, and what might eat that insect. Discuss why it is important for each insect to be at the Arboretum.

Give the students time to make a simple drawing of their insects. Have the children change perspective and think about things from an insect's point of view, making a simple drawing of how the Arboretum might look through an insect's eyes.

Instruct the students to release their insects, explaining why it is important for them to be allowed to return to their habitat.

Insect Anatomy

Antenna- Sensory organs used to detect taste, smell, sound and movement.

Head- Brain, eyes, mouthparts and antennae.

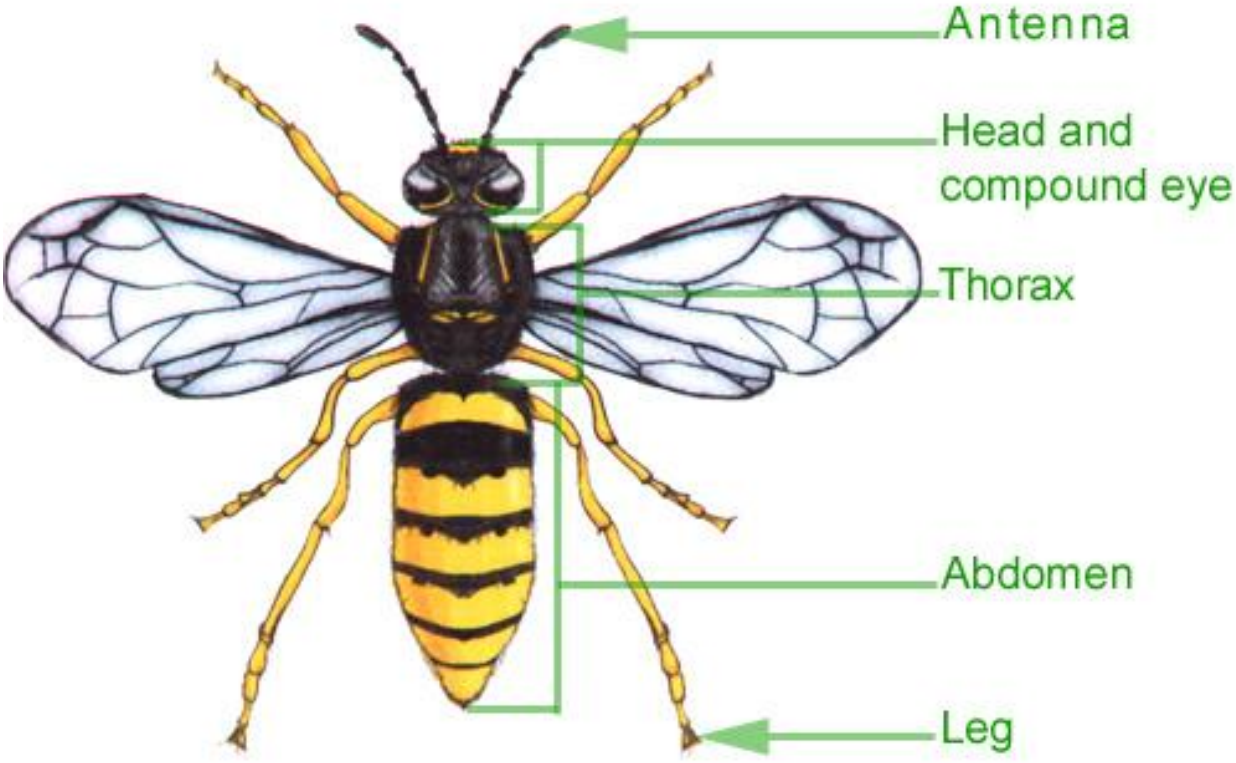
Compound Eyes- made of many lenses to provide good view, very sensitive to movement.

Thorax- Muscular portion behind head to which legs and wings are attached.

Abdomen- Includes the body parts necessary for digestion and reproduction.

Legs- All insects have six legs. The legs vary in size and shape from insect to insect. Some legs are highly modified for movement or sound.

Wings- May or may not be present. Insets may have no wings, one pair of wings or two pairs of wings.



Insect Safari

My insect's habitat is_____

My insect eats _____

My insect is prey for _____

My Insect:

(Draw a picture of your insect below)

What my insect sees:

Leaf Friend

Objective: Students learn to use their senses to carefully distinguish special characteristics of leaves.

Materials: Collection of laminated leaves, one per student (if they can't collect their own from the ground)
A cloth or blanket
Clipboards, paper, and crayons

Introduction: A good naturalist or scientist must be a good observer of nature. The best learn to use all their senses to explore their subjects and their environments.
Using one's senses is a skill developed over a long time. Young children, with their sense of wonder, are easily encouraged to use all their senses. As they spend time exploring the outdoors, students will discover that their senses are important in identifying plants and animals. A good place to begin is by exploring leaves. Leaves have a variety of shapes and textures, and often have very distinguishing characteristics. Some leaves even have a special odor. Only by careful observation and use of senses can a person really get to know a leaf. When children look for distinguishing leaf characteristics, they are ready to begin identifying species that belong to the huge and marvelous world of plants.

Activity: 1. Lead the students on a walk through the arboretum. Along the way, point out some interesting leaves on trees. Using their fingers, ask students to count how many colors they see in the leaves around them. How many do they see? Are there different shades of green, brown, and yellow? Point to some leaves blowing in the wind. Some leaves blow straight across, while others seem to flip-flop and dance in the breeze.
2. Gather the students. Have each choose a leaf from the collection provided or from the ground for field trips in the fall. The leaf they choose should be whole, although it is alright if it has a few holes in it. It should be a leaf they like.
3. Gather the students in a circle. As a group, lead the students through some careful observations such as:

Shake hands with their leaf friend. Say hello.
Look carefully at the shape of the leaf. Is it triangular, rounded, or irregular?
Look at the leaf's color(s). How many colors are there?

Look around the entire outside margin of the leaf. Is it smooth or bumpy?
Hold the leaf up and look at it backlit by the sun. Can you see the lines? (veins) Do the lines have a pattern?
Hold the leaf stem (petiole) between your thumb and forefinger and try to twirl it. (just look on the laminated leaves). Is the leaf stem flat or rounded?
Rub the leaf on your cheek. Is it rough, hairy, or smooth? (try to guess texture on laminated leaves)

4. Tell the students it's time for their new leaf friends to go away for a little while. Allow them a chance to say goodbye and take one last good look. Tell the students to place their leaves in the center of the circle. Lay a blanket or cloth over the pile of leaves. Mix up the leaves under the blanket (carefully, so they don't get crushed if they aren't laminated). Now take the students away from the leaves for a short active break, such as running or rolling down a hill for a few minutes.
5. After a few minutes of activity, take the students back to their leaves and form another circle. Remind them that their leaf friend has been mixed up with lots of other leaves. Uncover the pile of leaves. Allow the students to come up, one at a time, and take their leaf back to their seat.
6. Once all the students are sitting in the circle again, ask them if they all found their friends. Go around the circle and allow each student to tell why he or she thinks (or maybe does not think) the leaf they have now is truly the same as the one they had before. What special thing(s) do they remember about their leaf friend that distinguishes it from other leaves?
7. If there is time, pass out clipboards and crayons. Have the students make leaf rubbings of their leaf friends. Once their rubbing is complete, they can add arms, legs, and a face to their drawing if they like, and even a name. Invite each child to show his or her drawing to the group.

Me, A Tree

Objective: Students will learn some of the important parts and functions of a growing tree. Students understand that every tree is unique and shaped by its environment.

Materials: Tree cookies
Hand lenses
Collection of tree seeds

Introduction: Using a larger tree cross section, show and discuss the roles of the various parts of the tree.
Heartwood: Old wood that supports the tree and xylem that moves water from the roots to the leaves.
Sapwood: New wood that moves food in the tree.
Cambium: Adds new growth rings (new xylem and phloem) and repairs wounds.
Bark: Old cambium that protects the tree.
Roots: Anchors the tree and absorbs nutrients.
Seeds: Disperse and grow new trees.
Pass out hand lenses to partners and allow students to examine tree cookies.
Can they see the difference in color and texture between the soft, thin cambium and the thick, hard xylem?

Activity: 1. Gather the students around a small tree. Explain that this tree is only a few years old, but could possibly live a very long time. The tree will grow both taller and thicker around the trunk. Like people, trees need energy in the forms of food and water in order to live and grow.
2. How might trees obtain their food and water? *(Trees make food in their leaves and draw water and nutrients through their roots)*
3. Choose two or three students to come forward and become the leaves. Discuss how the leaves are able to make food using water, air, and sunlight. Only green leaves can do this. The leaves are found on parts of the tree where they can gather as much sunlight as possible. These students, on your command, will thrust their leafy hands high in the air, shake them, and continuously cry out, "Come on sun! Come on sun!"
4. Choose one student to come forward to be the heartwood. Remind them that the heartwood supports the above-ground portion of the tree. On your command, this

student will stand up straight with their hands at their side and chant, “I support! I support!”

5. Choose four more students to come forward and kneel in front of the leaves, facing away from them. These students will be the roots. Discuss how roots can absorb nutrients or provide anchoring for the tree. Choose two of the roots to be absorbers and two to be anchors. The absorber roots will lean far forward, plant their rootlets (fingers) into the ground and slowly pull their hands along the ground back to their knees. They should make a slurping sound as they “draw” water and nutrients up from the ground. On your command, the anchor roots will chant, “Stay in place! Stay in place!” with hands and feet firmly planted on the ground.

6. Choose two or three more students to come forward and kneel upright behind the roots and in front of the leaves. These students will be the sapwood, with the important job or transporting food and water throughout the tree. Upon your command, they will repeatedly move their hands from the ground to high above their heads making a swooshing sound as the move nutrients up the trunk.

7. The remaining students form a circle around the leaves, roots, and sapwood. They will be the bark and cambium, protecting the tree (bark) and growing during the growing season (cambium). When the tree is growing quickly, the cambium makes new material, and the bark/cambium students move in a circle around the tree.

8. Now to make it grow, you will play the role of “Nature”, narrating the change in seasons. Go through a few “years” by having them run through the summer and rest in the winter.

> *In winter, the ground is frozen. The roots cannot gather water; the sapwood cannot send food and water to the leaves and other parts of the tree; the leaves lay dead on the ground or still barely clinging to branches. A spring arrives, the ground thaws. Roots begin doing their job.* Go roots!
>
> *The sapwood begins to transport water and food.* Go sapwood!
>
> *The leaves come out to obtain sunlight and make food.* Go leaves!
>
> *The tree grows.* Cambium and bark, start circling the tree.
>
> *As more water and sunlight are available, the tree grows quicker.* Cambium and bark, circle the tree quicker. Perhaps run around the tree.

As winter approaches, the leaves begin to lose their chlorophyll and die. Leaves, drop your arms.

As the ground freezes, the roots can no longer get water. Roots, stop absorbing, but keep anchoring.

The sapwood has nothing to transport since the flow of nutrients and water from the ground has stopped. All parts of the tree stop moving and stand quietly.

9. After a few "year" cycles, gather the students again and ask them if they know how a tree begins its lifecycle? *(seeds)* Pass around a few tree seeds from the collection you brought. Discuss the differences in the seeds and talk about how the seeds might travel or get planted. *(wind, water, animals, and people can all spread seeds)*

Nature Games

Objective: Students will practice using their senses to explore nature through guided games.

Materials: Blindfolds (one for every 2-3 students)
4 stout sticks 12-18" long

Introduction: We use our five senses to interpret the world around us all the time without even thinking about it. What are the five senses? *Hearing, touch, eyesight, smell, taste*
What sense do you think we use the most? *Probably sight, maybe touch*
If we didn't have our sense of sight, what would we have to do? *Adapt! Learn to use other senses better.* This could happen if we lost our sight, or if we suddenly found ourselves living in a very dark environment.
Animals are adapted to their environment in order to survive. Following the example of sight above, think about a mole. These animals are adapted to live underground, so their sense of eyesight is very poor (because they don't really need it) but their sense of smell is heightened by a patch of skin on their snout that has special receptors to help them detect movement of prey and other moles. Bats hunt in the dark, so they've adapted their sense of hearing to help them locate food. Some animals have also adapted to blend in with their environments, either to help them from being seen by predators. For example, snowshoe rabbits have a white winter coat to blend in with a snowy environment and a tan summer coat to blend with summer ground and vegetation colors.

Activity: <u>Tree Huggers</u>
Students will use their sense of touch to identify a tree.
1. Ask students to form partners
2. Explain that each partner will take turns being blindfolded and leading. Blindfolded partners will be led to a tree. Leaders should walk slowly and guide their partner around things they might trip over.
3. They should take time to feel the bark, roots, and any branches, smell the tree, and listen to the sound of its leaves.
4. Then their partner will lead them back to the starting point, spin them around (gently!) 3 times, and then help them remove their blindfold.
5. The partner that was blindfolded will try to identify which tree they were taken to.

Then the partners will switch roles and repeat the process.

Questions to conclude the game:

What did you notice first about your tree?

What made it difficult to find your tree?

What gave away which tree was yours?

Fire Keeper

Students will use their sense of hearing to protect their "fire".

1. Select one participant from the group to be the Fire Keeper. They will be sitting on their knees with their hands on their lap and will be blindfolded.
2. The Chief (group leader) will place several sticks in a fire shape on the ground in front of the fire keeper.
3. The other participants are all Wood Gatherers and should be sitting a few yards from the Fire Keeper facing the "fire".
4. The Chief will then say "Wood Gatherers, we need wood" and point to one of the wood gatherers.
5. That wood gatherer has to stealthily move towards the fire (and Fire Keeper) and try to steal one stick of wood.
6. Wood gatherers cannot run or rush at the fire, because the goal is to move stealthily. The Fire Keeper tries to tag the wood gatherer as they are stealing their wood.
7. If the wood gatherer managers to steal a piece of wood without getting tagged, they become the new Fire Keeper.
8. If the Fire Keeper tagged the wood gatherer, then they must return to the gatherers and the Fire Keeper remains the same.
9. Be sure to pick new participants to be wood gatherers trying to steal wood, and change up the Fire Keeper periodically if it isn't happening through the rules of the game.

Bat & Moth

Students will use their hearing to simulate the echolocation that bats use to find food.

1. Briefly discuss the concept of *echolocation* and tell the students you will be playing a game where they will pretend they are looking for food.
2. Have the children stand in a circle. Choose one child to be the bat and another to be the moth. The children that remain standing in the circle are the trees. Give both the

bat and the moth a blindfold to wear. The bat relies on its hearing to find the moth. The moth has adapted to hear the high pitched squeaks emitted during echolocation, so they will rely on their hearing to escape.

3. Explain the rules of the game: Both the bat and the moth must always maintain three points of contact the ground – two knees and one or two hands is best. Everyone in the circle must be quiet. The bat tries to catch the moth. If the bat calls out "bat", the moth must answer "moth". If the bat gets close to the edge of the circle and bumps into the trees, the trees can say "trees". When the moth is touched by the bat, the round is over. *Variation: Have the bat and moth stand. The bat claps once to represent the echolocation sound being emitted. The moth must clap twice to show the sound has bounced off the moth. The bat must track down the moth by walking around the circle trying to touch the moth. The moth must try and evade capture. The trees keep the bat and the moth contained by holding their arms out to prevent escaping the circle. The round ends when the moth is touched by the bat.*

4. Play several rounds to give all children a chance to be in the middle of the circle as either the bat or the moth.

<u>The Thicket</u>

Students will practice using camouflage in simulated predator-prey scenario.

1. Explain that we will play a game to illustrate the importance of camouflage. The group leader should designate boundaries for where the students are allowed to hide.

2. One student will start as the coyote. The remaining students are rabbits.

3. The coyote will be blindfolded as they count to 20. During this time, all the rabbits hide as best they can in the thicket. The group leader should watch to ensure rabbits are staying within the boundaries. Rabbits must be able to see at least some part of the coyote at all times.

4. When the coyote reaches 20 all the rabbits must freeze. The coyote may remove their blindfold. They should call out all the rabbits that they are able to see from their position. The only allowed movements are to squat, turn around, or stand on tip-toe.

5. If a rabbit's name is called, it should come to the coyote's location as it will also be a coyote in the next round. *Variation: If a rabbit's name is called, it should stand up in place. These students should remain standing in place, as they will be coyotes in the next round, representing a spread-out population of coyotes.*

6. Once the original coyote has called out all the rabbits they can see, give all the new

coyotes blindfolds and have the original coyote count to 10. The remaining rabbits must move at least 10 feet closer to the coyotes while still trying to remain hidden. All the coyotes remove their blindfolds and take turns naming the students they can see.
7. Play as many rounds as necessary until only one or two students are left hidden. At that time, have the remaining students stand up and identify themselves. It may be surprising how close the rabbits got to the coyotes without being detected. Both the ability to remain undetected and the ability to detect others are examples of successful adaptations.
8. Do the activity in a new location. Discuss what made coyotes and rabbits successful. Were they quiet? Clever? Camouflaged? Or good listeners? Ask students to identify animals that are adapted with similar characteristics to survive.

Nature Photographer

Students will gain a greater awareness of the beauty of nature so often overlooked by slowing down and moving at the speed of nature.
1. Start by pairing players up. One person is the photographer, while the other is the camera. The camera is blindfolded and led by the photographer. Set boundaries for where they are allowed to go.
2. The photographer chooses something in nature that they want to take a picture of. Once they have chosen their subject, they position the "camera" just like they would a real camera.
3. When the photographer is ready, they should tap the camera on the shoulder and say "Click!" to release the shutter. The "camera" then removes their blindfold for just 10 seconds (the photographer should count) while the camera savors the beauty of the image.
4. Have the photographers take several "photos" before switching roles.
5. Discuss with the students what it was like to view someone else's perspective on nature. Did they see anything they may have otherwise overlooked?

Food Chain Game

This game teaches students about the food chain in a fun, active way. Good game for large groups.
1. Split the kids into two teams. Establish a safety zone for each team. The safety zones should be behind parallel lines about 40 feet apart.

2. Explain how a food chain works, then explain that this game will use eagles, trout, and mosquitoes to represent a food chain in an ecosystem. Show them the gesture or symbol for each animal. Eagles flap their wings and screech; trout make swimming movements in front of their body with their hands together and make splashing noises; mosquitoes point their index finger from their nose and buzz.
3. The teams will be trying to choose the higher animal on the food chain, like a variation of rock-paper-scissors. Eagles eat trout, trout eat mosquitoes, and mosquitoes eat eagles.
4. Send the teams to their safe zones to decide on their animal for the first round; then after about 30 seconds call them to the center line. On the count of three, each team then holds up the stance of the animal they chose. If both teams chose the same animal, they both return to their safe zones and start again. If one team chooses a creature that would eat the other team, that team chases the other back to their safety zone while attempting to tag their players. If a player gets tagged before making it back to safety, they leave their team and join the other.
5. The game continues until all players are on one team.

The Lorax

Objective: Students will see firsthand how pollution affects the environment by watching how it can move through both water and plants.

Materials:

- Copy of The Lorax
- Large seeds or candies
- Pitcher of water
- Air pollution maps/keys, worksheets optional
- Celery stalk & clear plastic cup for each group
- Food coloring & dropper

Introduction: Gather the students in a comfortable area, have them sit on the ground facing you, where they will be able to see you while you read The Lorax. Tell them that this activity starts with a story about people, animals, and trees. Tell them that they will help you read this story.

Assign seven students to be the Truffula trees. Stand them in a row behind you so they are facing their classmates. Each time you say "Truffula trees" they wave their hands over their heads. They should stay standing for the entire story.

The remaining students should stay seated in front of you. Assign one quarter of the remaining students to be barbaloots. Each time you say the word "barbaloot" they jump up and down three times while yelling "BAR-BA-LOOT!"

An equal number of students are humming-fish. Each time you say the word "humming-fish" they jump up, place their hands on their cheeks like gills, and hum loudly.

An equal number of students are swomee swans. Each time you say the word "swomee swans" they jump up and sing "swomee-swomee-swo".

The remaining students are Thneed salespeople. Each time you say the word "Thneed" they jump up and shout "You need a Thneed!"

Finish the story by passing out a large seed such as a chestnut or buckeye, or a candy for each student as the "last seed".

When you finish reading the story, ask the students if they know what pollution is. Have them give you some examples, they may be air pollution, water pollution, or just general environmental pollution like litter.

What types of pollution did the Once-ler create with his Thneed factory? *Smogulous smoke/smog, gluppity-glup, schloppity-schopp, leftover goo*

Where does pollution come from? Who creates it? *Help them find the answer "people"*

What parts of the environment can get polluted? *Air, water*
What types of living things are affected by pollution? *People and animals that breathe air, polluted water contaminates soil and harms plants, aquatic animals can't live in polluted water*

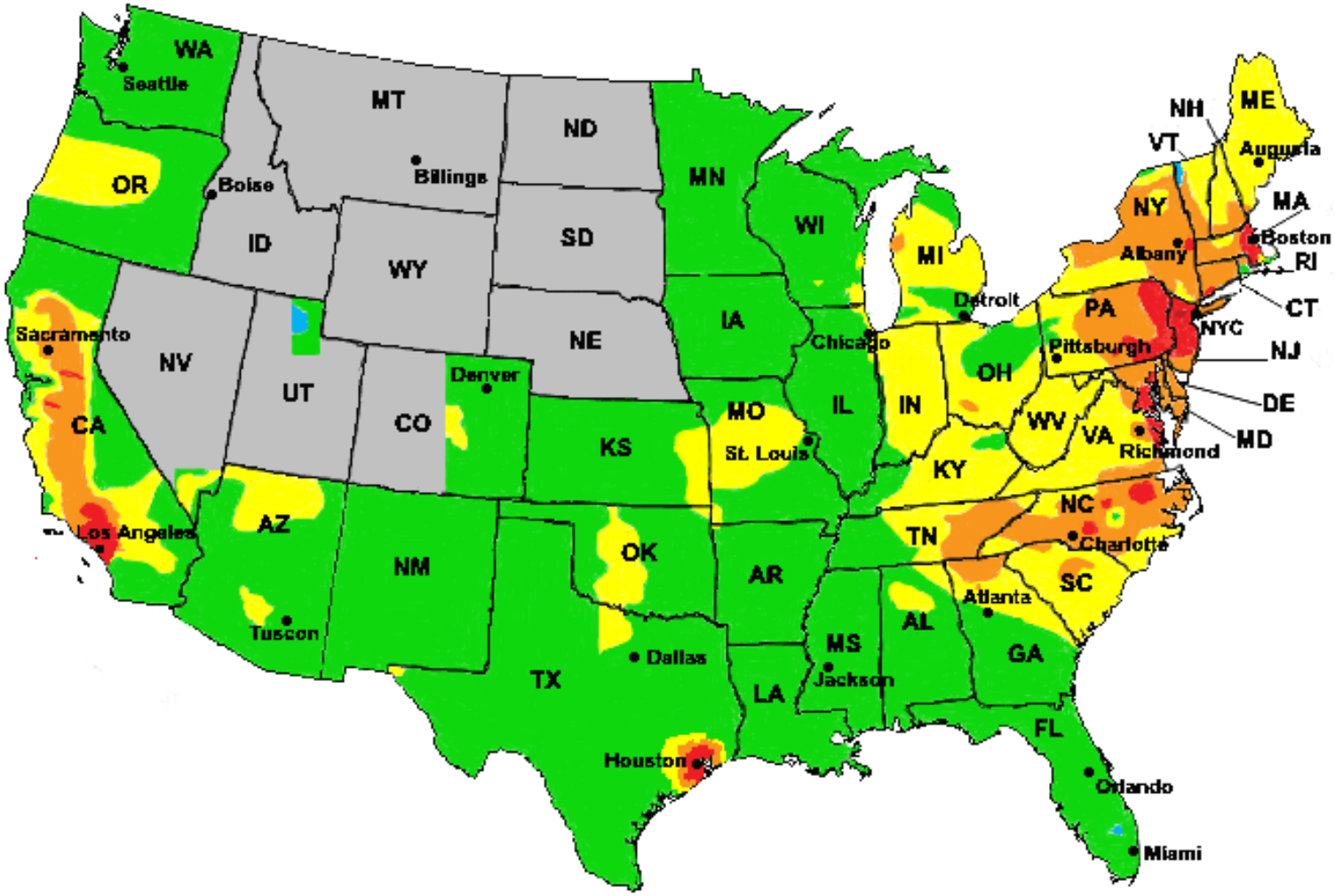
Activity:

1. For the first activity, keep the students seated. Pass out the air pollution maps. Ask the students to find Iowa and find out what the air pollution here is. Why is it so good? *We have lots of plants in Iowa that help clean the air, we don't have many factories, less people so fewer cars.* Where on the map is the pollution worse? *Big cities, coasts*. Why? *Lots of people, lots of industry/factories, lots of vehicles.* Older students may do the worksheet instead of just looking for Iowa before discussing.

2. Collect the air pollution maps. The second activity will show the students the effects of water pollution. Dip a clear plastic cup into the aquarium to fill it half full of water. Explain to the students that the water in your cup represents a pond. You're going to add a few drops of food coloring that represent pollution. They should watch what happens to the water when the pollution gets added. The color spreads throughout the water, eventually it'll be evenly mixed and there will be no clear parts left. Now, ask how plants get their water. *Its absorbed through their roots.* Place a celery stalk in the colored water and tell the students it represents trees growing near our pond. What do they think will happen to the trees? *They'll absorb the water AND the pollution, they will get sick*. What if the tree provides food for other animals? *They may eat it and get sick, or it may not produce food for them because it is sick.* What happened in the Lorax when the trees weren't around to produce fruit anymore? *The Brown Bar-ba-loots that ate Truffala Fruits had to leave because there wasn't any more food for them.* It will take several hours for the celery stalks to really change color, so make sure everyone sees the first group's results when they leave as it will have the most color. Consider starting one before the group arrives or sending them back to school with them (maybe in water bottles instead of cups) to observe the changes over a longer period of time.

3. Group student into small groups of 3-4. Tell them that they are now charged with carrying forward the message of the Lorax to protect the trees and the environment. As a group, they must come up with ONE specific promise they will make to care for the environment after their field trip. Have them share their promises with the rest of the group.

Air Quality Map



Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: everyone may experience more serious health effects.
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected.

Tree House

Objective: Students will identify plants and animals that depend on trees for habitat and how they influence those trees.

Materials:

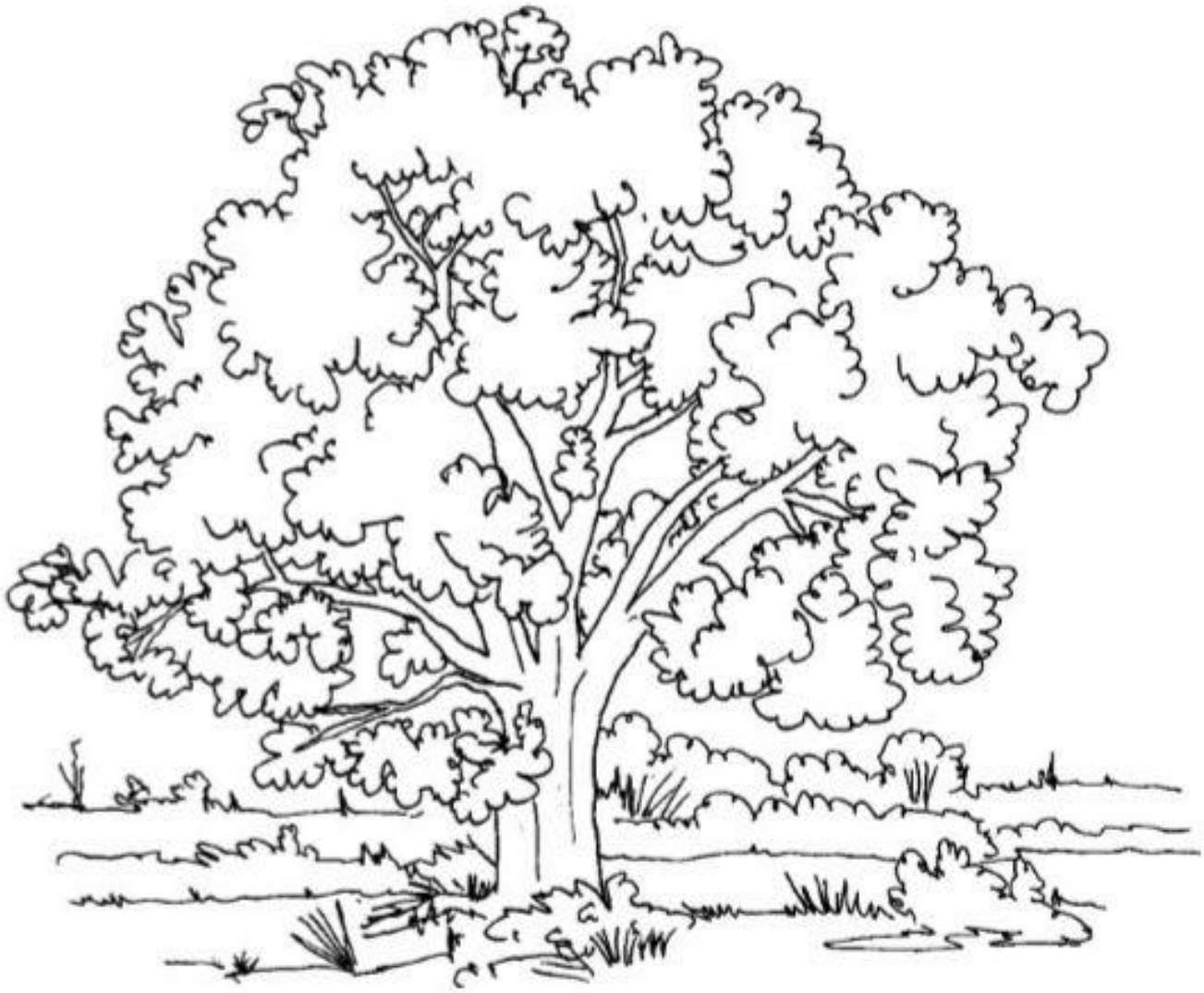
Tree House worksheet & pencil	Butterfly nets	Optional: animal tubes
Clipboards & blank paper	Bug boxes	
Field guides	Binoculars	

Introduction: Lead the students to a spot with many trees and shrubs nearby. Seat everyone in a circle. Ask everyone to think of an animal. *(Alternative: pass out animals from the animal or insect tube)* What does your animal eat? How big is your animal? Does your animal walk, fly, or climb? Now look around and think about where your animal should live. Go around the circle and ask each student what their animal and where it lives.

Activity:

1. These animal homes are called "habitat", just like we live in houses and communities, those are human habitats. Ask students to pair up. Partners must stick together. Define boundaries for the students. Explain that they will take turns scouting and recording observations. One partner will record or draw plants and animals they find in, on, and around the trees and shrubs while their partner scouts and reports. They should write down where they saw the plant or animal. Partners can use nets to catch (demonstrate proper use), binoculars to look (demonstrate proper use), and bug boxes to examine details (demonstrate proper use).
2. Give the students a few minutes to explore, then have them switch recorder/scout roles and give them a few more minutes.
3. Call everyone back and have a seat in a circle again. Ask them some questions about their observations. What did you find in the grass? *Leafhoppers, insects, mice* What about beneath the shrubs? *Mice, rabbits, moss, crickets* In the branches? *Squirrels, birds* On the tree trunks? *Squirrels, birds, moss*
4. Go around the circle and have each pair of students name one of the animals they found and what it eats. Discuss how animals can modify their habitats by living in them. *The plant may struggle if too many leaves get eaten. Eating fruit or berries helps spread seeds for plants to propagate further. Some plants even REQUIRE passing through the digestive system of an animal to germinate and grow.*

5. If there is time remaining, pass out the Tree House worksheet and have students draw the animals listed where they belong in the picture.



Describe the type of habitats present in the drawing. Where would each of the below animals live? Why?

Tree Life Scavenger Hunt

Objective: Students will be guided to a better understanding of how trees benefit both people and wildlife.

Materials: Clipboards
Scavenger hunt sheets
Pencils

Introduction: This is a different type of nature walk. Instead of trying to specifically identify plants and animals, students will be hunting for the *signs of life* surrounding the trees and shrubs at the Arboretum.

Explain to the students that they will be taking a walk through the community of trees, plants, and animals at the Arboretum. As the trees grow, they provide a lot of benefits to both people and wildlife. Many of these benefits are hard for us to see – like how trees clean the air for people or turn sunlight into food for animals (photosynthesis) – but we can look for signs of life in, on, and around our trees that will help us know about the benefits they provide.

Activity: 1. Pass out the clipboards and scavenger hunt sheets. Instruct students to walk quietly and calmly, as being noisy or moving too quickly may make it difficult to see some of the things they are looking for. Give them boundaries for looking, and if you are walking with them, be sure they don't get ahead of the group leader.

2. Give them a majority of the time to quietly explore the area around you or as you walk to let them search for the items on their list. If they find something, they should find an adult leader – either a Naturalist or a chaperone – and show them before checking it off their list.

3. When there are just a few minutes remaining, regather the students and ask them to share some of the evidence they found indicating life around trees. If there is time remaining, explain how scientists record their observations for further research and have them draw a picture of something new they saw today so that perhaps they can identify it when they get home.

Tree Life Scavenger Hunt

1. Animal droppings or tracks _____
2. An animal burrow or hole _____
3. A nest in a tree (bird or squirrel) _____
4. A bird perched on a branch or twig _____
5. A spider or spider web on tree branches _____
6. A chewed nut or seed _____
7. A chewed leaf _____
8. An insect _____
9. A worm or other animal without legs _____
10. Rubbed or chewed bark or branches _____

Draw one new plant or animal that you had never seen before today!

Un-Nature Walk

Objective: Students will be able to distinguish between natural and unnatural items. They will discover the most difficult items to find are those which are camouflaged, small, hidden, and/or off the ground. Looking carefully in all directions is important when exploring nature at the Arboretum.

Materials: Box of items to be placed along the path ahead of time: tennis ball, foam cup, blue pencil, film canister, green pipe cleaner, orange pipe cleaner, rubber band, fishing bobber, crumpled paper, chip bag.
Worksheets, clipboards, and pencils

Introduction: **This activity requires advance preparation!** Choose a path or small area in the Arboretum (about 20 yards long) and place the unnatural items on and under the trees and plants. This can be done prior to the students' arrival, or an adult leader can be asked to occupy the students facing away from the area while you quickly place the items – this is handy if you want to move items between groups. Boundaries may be marked with flags or cones to define the area of the search. The trail should be set up in a way that requires the students to constantly look high and low, forward and behind them. Vary the sequence of placement with camouflaged, not camouflaged, high, low, large, and small items.

Before beginning out on the walk, lead the students in a discussion of the meaning of the terms "nature" or "natural" and "human-made" or "unnatural". Ask the students how many of them have ever been on a nature hike. What types of things would they expect to see on a nature hike? List some items and have the students decide as a group if the items are natural or unnatural. Be sure to throw out some difficult ones. *Dead, dirty leaves; hiking boots; bird-watching binoculars; dead bird; etc*

Activity: 1. Explain that they are *not* going on a nature walk now. They are going to go on an *un*nature walk. Explain the rules of the unnatural trail. The students will have to look hard to find human-made objects, and they will have to look up high, down low, and even behind themselves. When they find an unnatural item, it is a secret. They should not point, touch, or say anything, just count the item on their worksheet and move on. *You will need to reinforce this as you go, the students will get excited over their discoveries*. Show the students where the trail begins and where it ends.

2. While the student are waiting for their turn to go through the trail, pass out

clipboards with a hidden objects worksheet. Children who are among the first to finish the trail may work on this activity as they wait for the others to finish.

3. **First Time Through**: The students should go through one at a time, allowing approximately ten paces between students. If possible, have an adult leader go first as an example of how they should be looking up, down, and all around, and how to secretly count items. When they get past the end of the trail, the student should sit and wait for the rest of the group. When they have all walked the path, gather the students to share what they found. Most likely, they will have found all the large, not camouflaged items that were on the ground, and perhaps a few of the more difficult items. Tell the students how many items were on the trail. The ones they found were the ones that did not blend in with the colors of the surroundings and were on the ground. They were very good at finding these items! The smaller, higher, and more camouflaged items have yet to be found.

4. **Second Time Through:** Allow the students to walk single file back through the unnatural trail, this time looking especially hard for smaller, camouflaged items off the ground. They should still keep their finds a secret. When the group has finished looking, discuss any new items they found. Tell the students about any items that have yet to be seen.

5. **Final Time Through**: Walk as a group and stop in front of each item on the trail. There are no longer any secrets. Allow the students to blurt out the name of any item they see. Choose a student to retrieve each of the items as you walk (unless you have more groups to go through the lesson with). For each item, discuss if the item has any traits that made it difficult to see. Relate each item to an element of nature (i.e. the green pipe cleaner could have been a rare caterpillar that no one saw!).

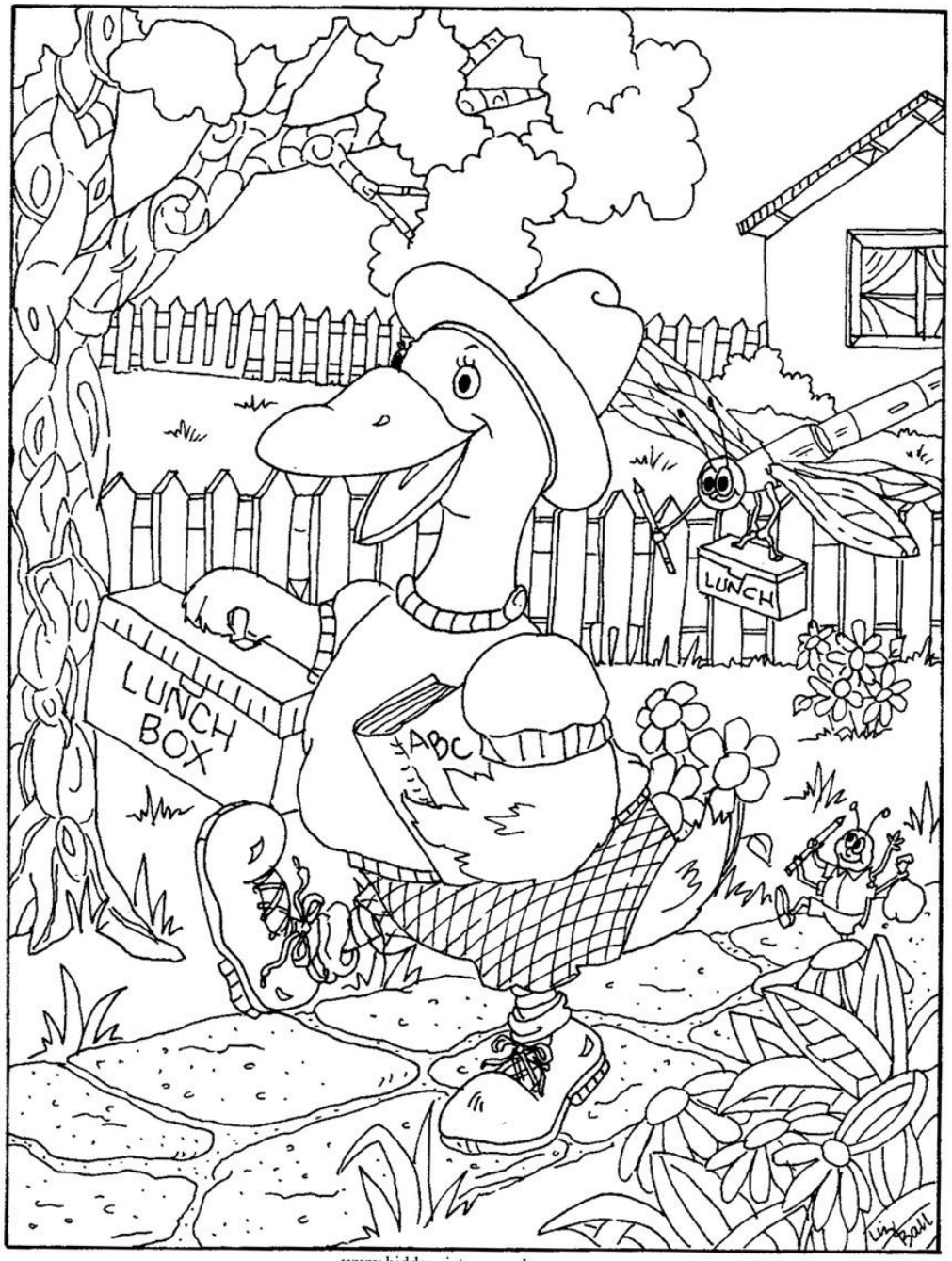
6. Discuss how plants and animals are often concealed in ways other than physical location. Camouflage coloration is the norm in nature. Bright, easy-to-see colors are the exception, and often are an indication of a species that benefits from being seen, such as warning colors or to attract a mate. Because most animals and plants blend in with their surrounding environments, a good naturalist learns to look very carefully through the environment. We have also now practiced looking for un-natural items, so if you see them in nature, you should remove them as you are picking up litter!

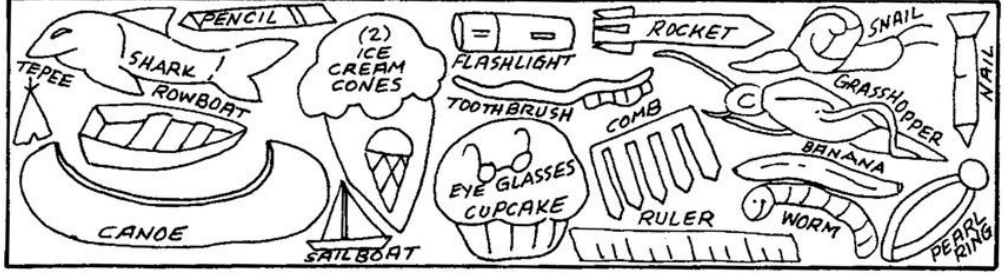
Un-Nature Walk

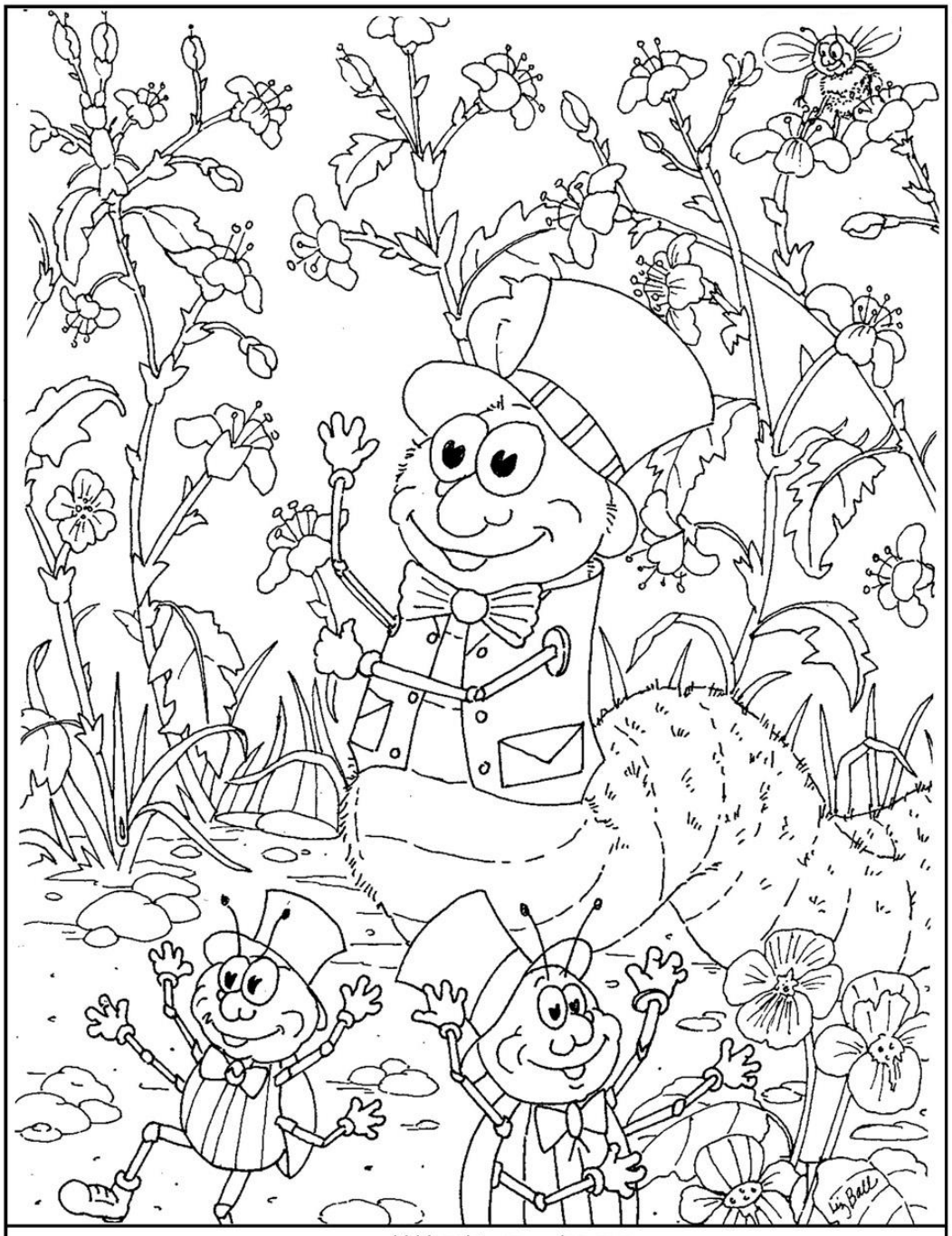
1. Tennis ball _____
2. Foam cup _____
3. Blue pencil _____
4. Film canister _____
5. Green pipe cleaner _____
6. Orange pipe cleaner _____
7. Rubber band _____
8. Fishing bobber _____
9. Crumpled paper _____
10. Chip bag _____

Which items were the easiest to find? Were they large or small, camouflaged or not, high or low?

Which items were the hardest to find? Where they large or small, camouflaged or not, high or low?







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