

The Urban Naturalist Program Student Handouts

Fall 2013: 2nd Edition

An Interdisciplinary Educational Program Designed to Facilitate the Exploration of Nature in the Urban Environment
Developed for Greenville, South Carolina

By Livability Educator, Jaclin DuRant



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Exploring Nature Safely

Animals and plants are an important part of our environment. When interacting with animals and plants, it is important that we respect and protect them, and follow guidelines for keeping ourselves safe as well as protecting the environment.

Personal Safety:

- Wear sunscreen. Any extended trip outside can lead to sunburn, even in winter.
- Wear appropriate clothing. Tennis shoes, socks, and long pants when walking in the woods. Rubber boots if wading.
- If going into the woods, marsh, wetlands, or other areas where you may find ticks and mosquitos, use bug repellent.
- Stay with a buddy and stay in sight of an adult. Wear your safety whistle at all times.
- Know what poison ivy and poison oak look like, and stay away from these plants even if you don't think you are allergic.

Handling and Collecting Specimens:

Be careful: exploring nature is a lot of fun, but we still have to be careful to protect ourselves and the environment.

- Walk, don't run.
- When lifting rocks or logs to look underneath, use a tool to flip the log, and lift it away from your body. This way, if there are stinging insects or snakes underneath, they won't be able to bite you.
- NEVER stick your hand or foot in a hole or under a log or rock without looking. Many animals hide in holes and under logs.
- Be careful where you step. Nature isn't flat, and you need to watch for holes, roots, plants with thorns, and other obstacles that can trip or hurt you.

Know and follow proper collection techniques

There are a lot of cool things to be found in nature. We will mostly observe animals and plants in the wild, but sometimes we may want to collect something. It is important to know how to collect a plant or animal without causing damage to the environment, the specimen, or ourselves.

We will learn a variety of collection techniques for plants and insects. Follow the instructions carefully, and when in doubt, ask an adult for help.

- Make sure that you are not killing something that is endangered or rare. A good rule for collecting plants is to look around. If you see more than 20 healthy plants, it is usually OK to collect one.

- Take pictures, and make sure to record where, when, and what the picture is in your field notebook.
- It is illegal to collect plants, animals, fossils, or other artifacts from many state parks, national forests, and preserves. In others, you must have a collection permit. Make sure that you know the rules and follow them.

Know and follow proper handling techniques

Most of the time, we won't be collecting animals, but we may want to hold them temporarily to photograph, identify, or share with the group. We need to be careful not to hurt the animal or it won't survive when we let it go.

- Don't touch amphibians (frogs and salamanders) if you have insect repellent on your skin. Amphibians absorb water through their skin and insect repellent can kill them.
- Don't touch the wings of moths and butterflies. Moths and butterflies have tiny scales on their wings. Touching their wings can damage moths and butterflies so that they cannot fly.
- Do not grab lizards or turtles by their tails. This can damage the spine and kill the animal. Lizards, salamanders, and skinks should be held gently in the hands. Turtles can be held by the back of the shell.
- If we catch animals or insects, it is best to keep them in a container for observation and make contact as little as possible.
- Aquatic animals (animals found in water) should be kept in a container with water from the same place that you found the animal.
- If you turn a log or rock over to look underneath it, put it back the way you found it. If you found an animal underneath the log or rock, return it near where you found it. Don't place the animal under the log, but instead, place it on the ground near the log. Putting an animal underneath a log or rock could crush and kill it.

IDENTIFICATION of Harmful plants and animals

It is important to be aware of animals and plants living in the same area that you do that could hurt you. Knowing what something looks like and how it behaves makes it easier for you to avoid being hurt and explore nature safely!

PLANTS:

Poison Ivy and Poison Oak



“LEAVES OF 3, LEAVE IT BE!”

- Poison Ivy and Poison Oak have 3 leaves.
- Leaves can be smooth, toothed, or lobed
- Sometimes, it is a short herbaceous plant growing on the ground.
- Sometimes, it is a vine growing up a tree.
- In spring and summer, poison ivy has green, sometimes shiny leaves. In fall, leaves range from yellow to red and even purple.
- Poison ivy vines can get thick and hairy.
- Poison ivy in the tree tops provides berries which are an important winter food source for birds.

What to do: When in doubt, don't touch it! If you do touch poison ivy, inform an adult immediately. Don't rub your skin or you will rub the oils from the ivy in. Rinse the area with rubbing alcohol if available and WASH the area immediately in cold water with soap.

INSECTS:

Most of the common stinging insects that we may encounter are in the order Hymenoptera and include Yellowjackets, Wasps, and Fire Ants. Though closely related, bees such as Honeybees and Bumblebees are less likely to sting people since they will lose their stinger and die after stinging.

If you encounter a honeybee or bumblebee, hold still. Once the bee realizes that you are not a flower, it will leave you alone. *Swatting at a bee will scare it and make it more likely to sting you.*

Yellowjackets



- Yellowjackets are small social wasps, which means that they live in a colony.
- Usually they build their nests in the ground
- Unlike bees, wasps can sting multiple times without losing their stinger. This is one adaptation that makes wasps more of a danger to humans than bees.
- Yellowjackets are attracted to garbage and sugar. Open soft drinks, juice, picnic food, and trash cans attract them.
- When threatened, they release a chemical into the air that alerts others to attack.

David Cappaert, Michigan State University, Bugwood.org

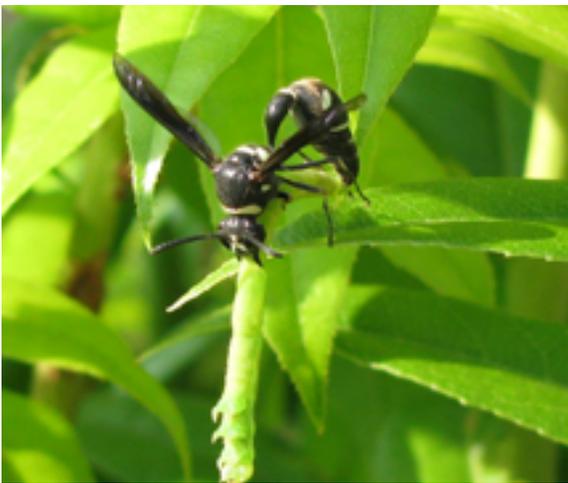
NEVER disturb a yellowjacket nest. If you see one, back away slowly and tell an adult where the nest is.

How to avoid yellowjackets:

- Keep food and drink in closed containers
- Be careful when turning over logs or digging in straw. Yellowjackets commonly nest in the ground, so if you see one going in and out of a hole, avoid that area.
- Stay calm. Swatting at a yellowjacket is likely to anger it. Calmly back away from the nest or wasp, and it will usually leave you alone.

Like many wasps and bees, yellowjackets are good to have around since they eat flies and caterpillars that feed on crop plants.

Solitary Wasps and Paper Wasps



Most solitary wasps are less aggressive than social wasps (yellowjackets and hornets), but will sting if disturbed. Wasps can sting multiple times.

The best way to avoid getting stung is to leave them alone. If you catch one in a collecting net, leave the net flipped over, lay it on the ground, and get an adult to help you release it safely.

Red Velvet Ant (Cow Killers)

Red Velvet Ants are not ants but wingless wasps. Usually, these animals are not aggressive, but will sting if cornered. The sting of the Red Velvet Ant is extremely painful. DO NOT try to collect these animals. Observe from a distance, leave them alone, and they won't hurt you.



Jerry A. Payne, USDA Agricultural Research Service, Bugwood.org

Fire Ants



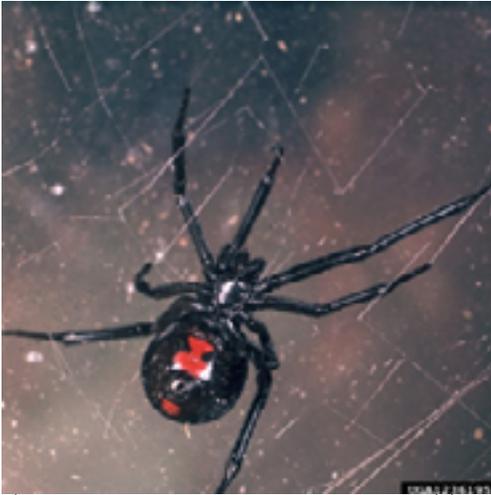
Pest and Diseases Image Library, Bugwood.org

Fire Ants are not native to the Southeast, but were introduced from South America in the early 1900s.

- Fire Ants build mounds which the colony nests in
- Fire Ants are very aggressive and will sting and bite repeatedly if their nest is disturbed
- Fire Ants tend to build nests in sunny areas.
- If you see a fire ant mound, tell an adult and avoid the mound

SPIDERS:

Black Widow Spider



Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org

- Black bodied with a large rounded abdomen. Distinctive red “hourglass” on the abdomen
- Females build webs that are often near the ground, hidden in shady areas.
- The male is harmless. Females lay eggs in a round sack suspended in their web.
- The female tends to stay in the web, hanging upside down, protecting her young and catching prey.
- Black Widows are nocturnal and like to stay underneath things in the dark.

How to avoid black widow spiders:

- Use a stick or tongs to turn over logs and rocks.
- Look carefully before grabbing rocks, lumber, coiled water hoses, or other yard equipment that has been out. Be especially careful in out buildings and sheds.
- Shake out shoes, blankets and camping equipment, or anything else that has been stored outside for a long time before using it.

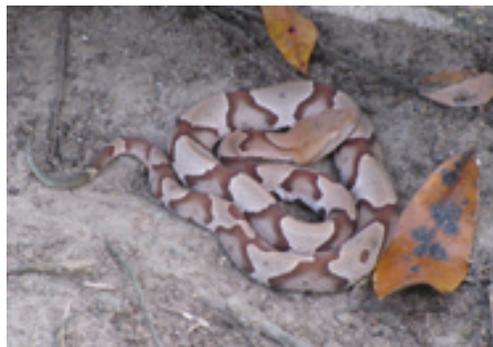
If you think you have been bitten, tell an adult immediately.

SNAKES

There are only 6 species of venomous snakes found in South Carolina, according to the South Carolina Department of Natural Resources, and only 3 occur in the upstate. The Copperhead is relatively common and can live in most habitats. The Timber Rattlesnake is less common but still occurs throughout a variety of habitats in the upstate. The Pygmy Rattlesnake is very rare. You are extremely unlikely to encounter one, though they are here.

Though most snakes that we encounter are not venomous, it is still important to know that even though they won't inject venom, they may still bite if frightened. Though nonvenomous snake bites aren't serious, they still hurt. Treat all snakes carefully and with respect. Most people that are bitten by snakes in the US are bitten while handling or trying to kill the snake. The best thing to do if you see a snake is to observe from a distance and leave it alone.

Copperhead Snake



Copperheads are the most common venomous snake in South Carolina.

- Young Copperheads have yellow tips on their tails.
- The coloring of Copperhead Snakes help them blend into leaf litter. (Like in the photograph of the Copperhead on the left)

Identification:

- Copperheads are light brown to tan in coloration with darker hourglass shaped patterns
- Triangular heads
- Slit pupils

Timber Rattlesnakes



J. D. Willson, UGA Savannah River Ecology Laboratory, srelherp.uga.edu

Identification:

- Light brown to black body with darker zigzag pattern
- Tail tends to be black with scaly “rattle” attached at the end
- Triangular head
- Slit pupils

Like it’s name suggests, the Timber Rattlesnake is often found in forested areas, brush piles, under logs, and sunning itself on rock outcrops. Like all rattlesnakes, it will often vibrate its tail to warn intruders to back away and leave it alone.

Urban Naturalist Checklist

of cool Plants, Animals, and Natural Artifacts

FOUND	NATURAL ARTIFACTS	LOCATION	DATE
	A Bird's Nest		
	Some Sort of Cocoon		
	Animal Tracks		
	A Spider Web		
	A Unique Rock		
	ANIMALS		
	Frog		
	Blue Jay		
	Millipede		
	Squirrel		
	Hawk		
	Carolina Wren		
	Cricket		
	Dragonfly		
	Skink		
	Beetle		
	PLANTS		
	A plant with berries		
	An aquatic plant		
	An evergreen tree		
	A plant with purple flowers		
	Moss		
	Lichen		
	Mushrooms		

The Field Notebook

A naturalist's field notebook is an important tool. Everything in nature is connected, and naturalists seek to find and understand these connections. The notebook allows a naturalist to take notes about what they observe when they are on a field expedition.

- Notes allow a naturalist to return to a particular location in order to find a plant or animal again.
- Notes help naturalists remember what they saw. When you are exploring nature, you will find a lot of different things and it can be difficult to remember all that you see. Notes, drawings, pictures, and other types of data will help you remember important or interesting things later.
- Notes and data in the field notebook allow naturalists to observe and identify **patterns**. Patterns in nature happen for a reason, and the first step to understanding "WHY?" is to find the pattern.

For example, many species of birds migrate south for the winter. We know that this occurs every year and scientists have learned a lot about the migratory behaviors of birds by observing and studying this phenomenon. But, at some point, someone had to notice that there was a pattern to the birds' behavior; that every year, many birds began to fly in the same direction at about the same time.

Data for the field notebook

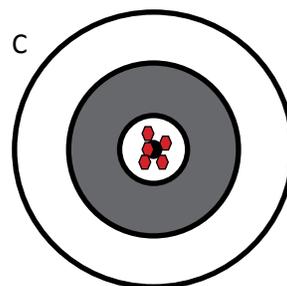
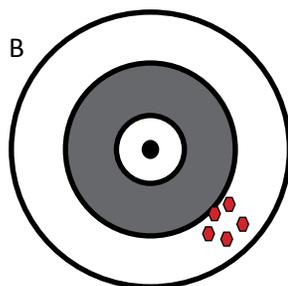
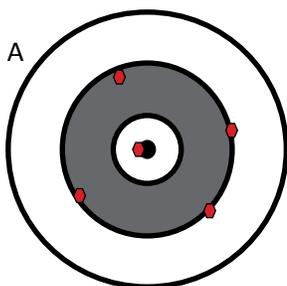
Your field notebook is YOUR work, and can include drawings, photographs, notes, pressed plant specimens, and more. When you are observing nature for fun or for personal study, it is up to you what data you feel is important, and how you will record that data.

When you are observing nature as a citizen scientist or a science student, you will need to record specific types of data. It is important to observe carefully and precisely follow any protocols that are specific to the science you are doing in order to generate good data.

Good data should be accurate and precise.

Accuracy = how close to the "true" or actual value

Precision = how close the data measurements are to one another



A: Accurate but not precise

B: Precise but not accurate

C: Accurate AND precise

Data can be *Quantitative* or *Qualitative*

- Quantitative data is something that can be counted or measured and expressed as a number. It has a quantity.

Examples include: the *number* of tree species in an area, *height* of a plant, *weight* of an animal, *how many* babies an animal has, the *length* of a leaf, *number* of petals on a flower, *diameter* of a tree, *velocity* of a stream, the *number of* wing beats per minute a flying bird makes, how *deep* a plant's root system goes, the *time* of day that something happens, etc.

- Qualitative data is all data that can not be represented by a number, but is descriptive. It is a quality.

Examples include: the *color* of a flower, the *smell* of soil, the texture of a tree's bark, the *sound* a bird makes, the *shape* of a plant, an insect's *behavior*, the *pattern* of a spider's web, etc.

Sample Field Notebook Page

Order: Odonata
Suborder: Anisoptera
Dragonfly Nymph

Date: Jan 7 2012

Location: Wildcat Wayside State Park
Greenville Co.

In the stream. Up stream of the first waterfall and the house foundation. Follow the trail to the right of the foundation. About a 2-3 minute walk, small series of short falls and riffle/pool microhabitat.

Organism: Aquatic Macro-invertebrate
Odonata nymph

Found underneath a flat rock in a shallow pool section of the stream directly beneath a short fall.
Dark brown to black in coloration.
Approximately 1.5 inches long



List 3 types of qualitative and 3 types of quantitative data that can be found in the sample field notebook page above.

Reading Maps

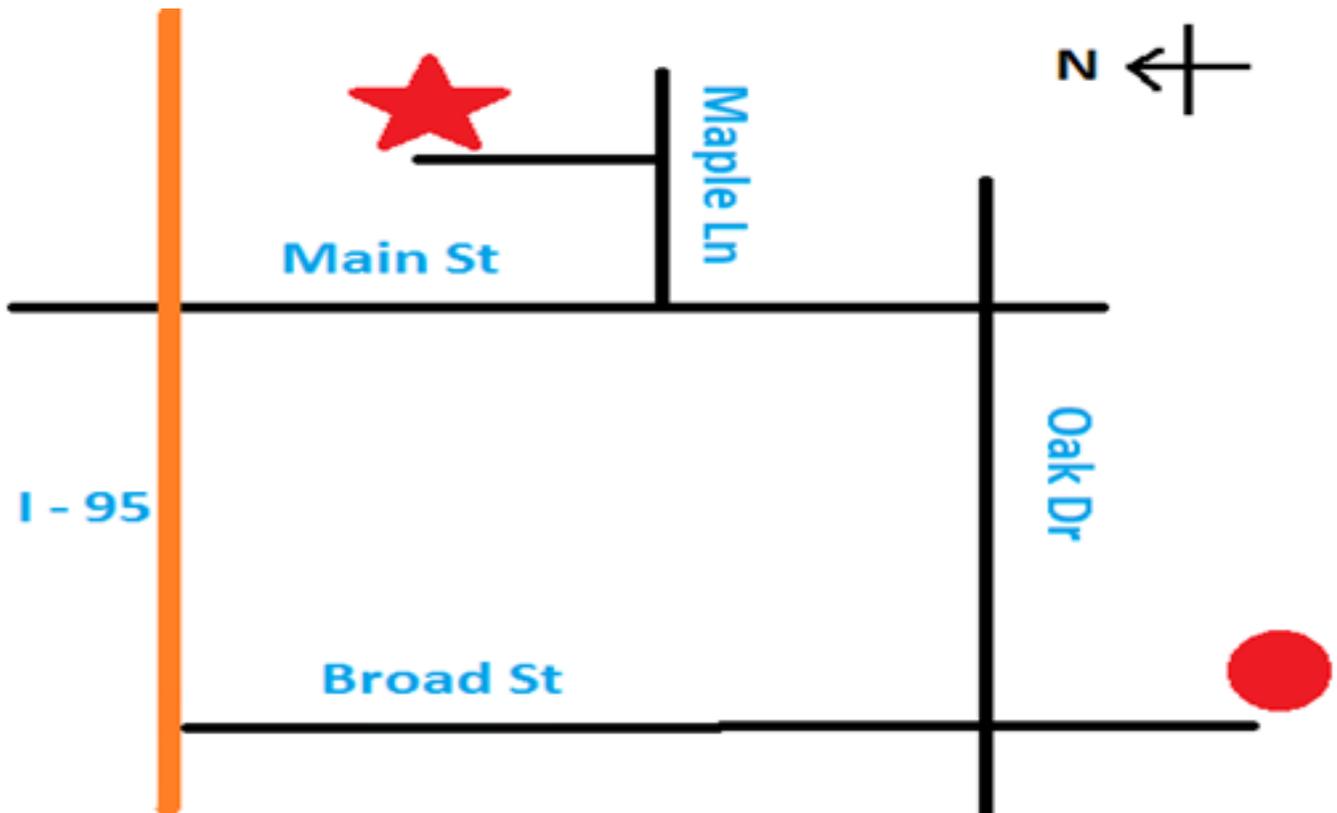
A map provides information about a place such as:

- How to get from one place to another (Navigational Maps)
- Location or boundaries (Political Maps)
- Elevation (Topographical Maps)
- Data about populations or resources (Resource Maps)

Parts of a Map

- Title or Description
- Legend or Key
 - An explanation of what the symbols and colors on a map mean
- Scale
 - What the distance on the map means in real life
- Compass Rose
 - Provides direction so that you can orient yourself and the map to the real world

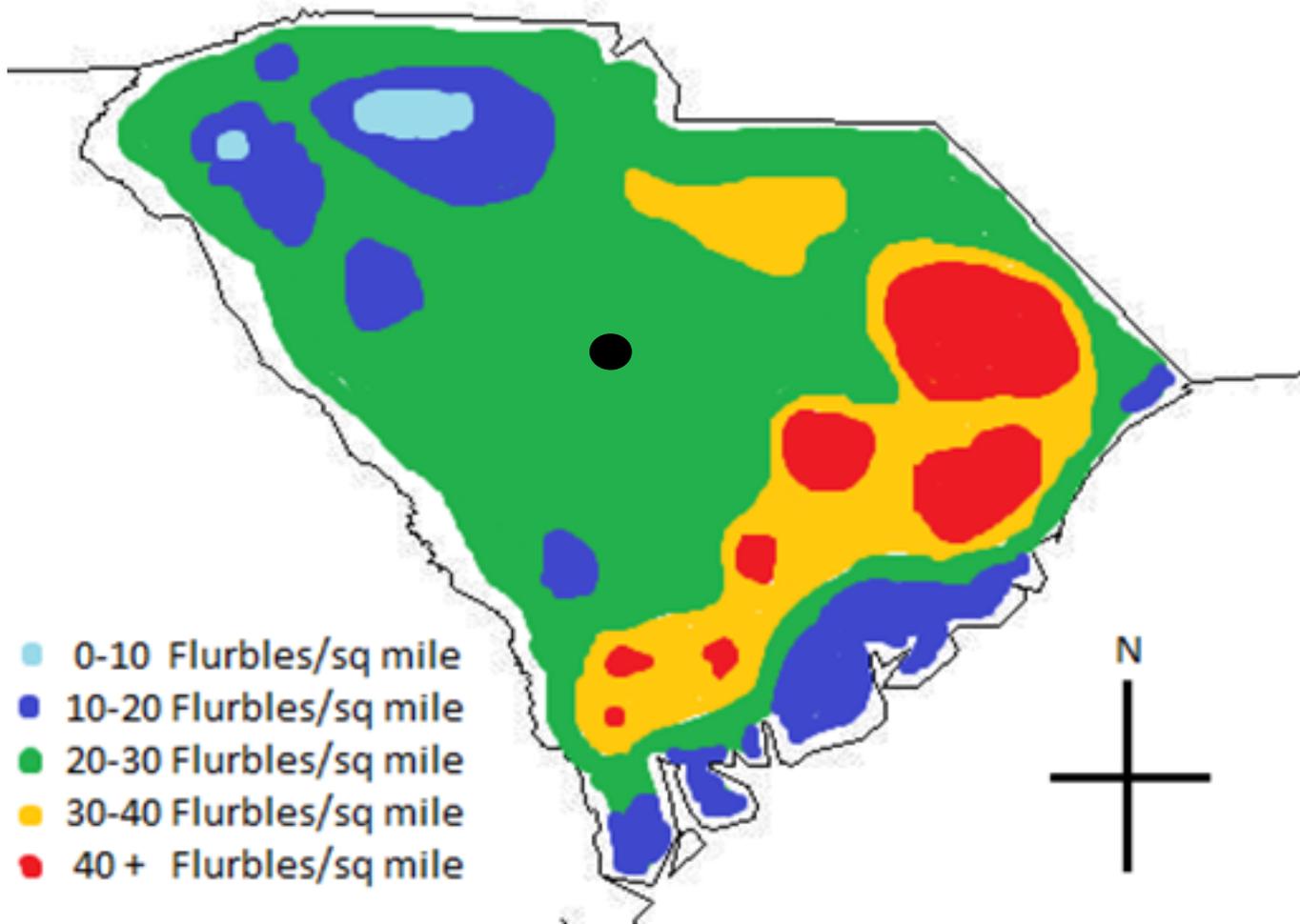
Navigational Map:



Map reading practice:

- 1) What direction would you have to drive to get from the red dot to the I-95?
- 2) Write instructions for driving from the red star to the red dot.
- 3) This map is “not to scale.” What does that mean?

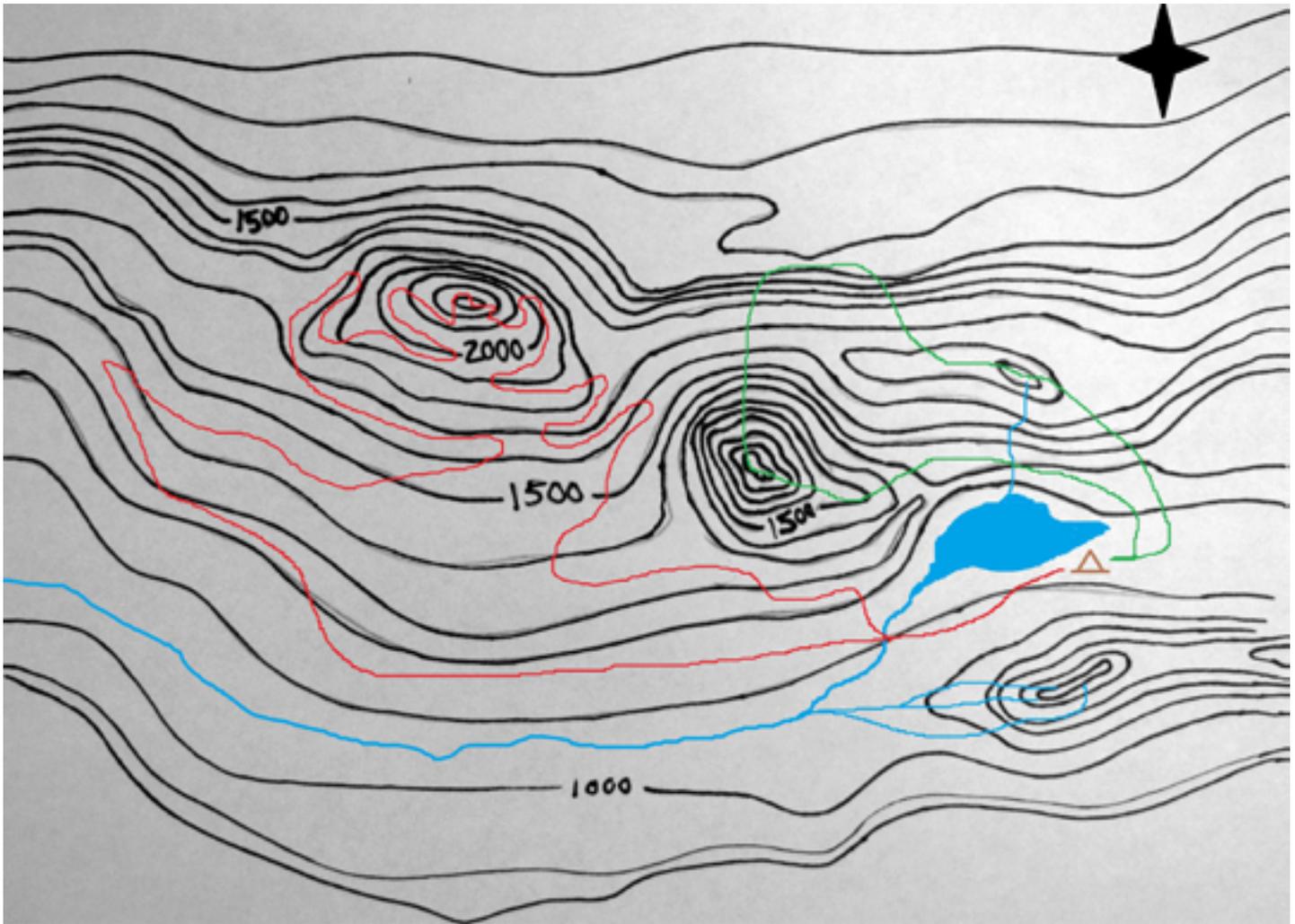
Resource Map: Flurble Populations in South Carolina



- 1) If you wanted to hunt Flurbles, what part of the state would you want to go to?
- 2) What is the most common population density of Flurbles in South Carolina?
- 3) If you were allergic to Flurbles, what direction from Columbia (black dot) would you want to live?

Which of the three maps provided would you be most likely to use if you were hiking?

Topographic Map



1 inch = 1/4 mile

- 1) Which of the two hiking trails (red or green) is steeper?
- 2) What direction is the river flowing?
- 3) What elevation is the lake?
- 4) Each line represents how much of a change in elevation?
- 5) Draw an arrow to the highest point on the map.
- 6) Approximately how long is the green trail?

Using a compass:

Set the compass on a flat surface.

First, turn the compass until you have found North.

Next, orient your map so that the compass rose on the map is lined up with North on your compass.

Now you should be able to tell what direction you need to travel.

Compass Practice

How to Use a Compass:

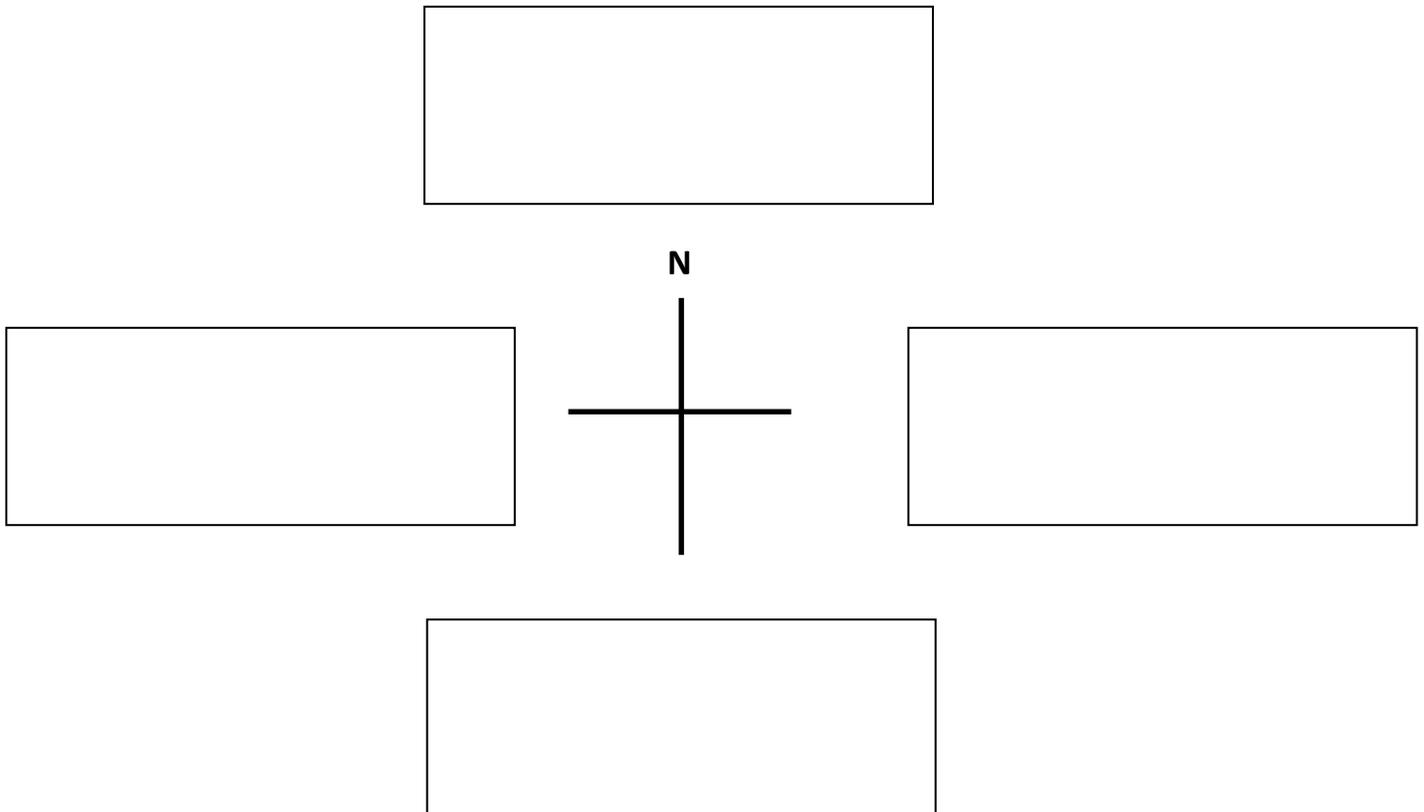
Set the compass on a flat surface.

First, turn the compass until you have found North.

Next, turn your body and your map so that the compass rose on the map is lined up with North on your compass.

Now you should be able to tell what direction you need to travel.

- 1) Use a compass to find North. Go to another place in the room and use the compass again to find North. Are you facing the same direction?
- 2) Use your compass to find North. Walk 10 paces to the WEST.
- 3) Turn and face South East.
- 4) Use a compass to orient yourself to face North. Label the cardinal directions on the compass rose below and write an item in each box that you see when you face that direction.



Plant Growth Habit Check List

Find and photograph or draw the following:

- Moss
- Fern
- Trailing Vine
- Climbing Vine
- Conifer Tree
- Shrub
- Herbaceous Plant
- Hardwood Tree
- Grass
- A plant with a flower

Plant Growth Habit Scavenger Hunt

Find and photograph or draw the following:

- A plant that reproduces through spores
- An herbaceous plant with seeds
- The leaf from a hardwood tree
- A vine
- Fruits or flowers on a tree
- A fiddlehead
- A cone
- A plant with a hollow stem
- A non vascular plant
- A woody plant with multiple trunks
- Flowers from an herbaceous plant
- Adventitious roots
- A leaf that isn't green

Identifying Trees

- *Make sure you have a tree.* Trees are usually medium to large sized plants that are woody and have a single stem (the Trunk) from which branches grow. Smaller woody plants and medium sized woody plants with multiple stems are usually considered shrubs, not trees.
- Identify the parts of the tree.
In order to determine what kind of tree you have, you must first make some observations about the tree.
 - Size – how tall and how big around is the tree? (estimate)
 - Shape – is the tree larger at the bottom than the top? Are the bottom branches close to the ground or higher up?
 - Leaf shape and arrangement
 - Bark (color, texture)
 - Fruit or Flower
- Record your observations
 - Take a picture of the tree along with a close-up of a branch with leaves, and fruit if you can. OR Draw a picture of the tree and a twig with leaves
 - Collect a leaf for your field notebook
 - Make sure you write down WHERE and WHEN you saw the tree.
- Use a dichotomous key to identify the tree

Using a dichotomous key.

What is a dichotomous key:

A dichotomous key is a tool used to identify something by asking questions. Each question leads you to a new question until you find the correct answer. Using a dichotomous key is kind of like the game 20 questions. Each question that we ask helps us narrow down the list of possible answers until we find the right one.

How to use a dichotomous key:

Answer the first question. For trees, the first question is usually “Is the tree coniferous or deciduous?” Use your field notebook, pictures, or leaves to answer this question.

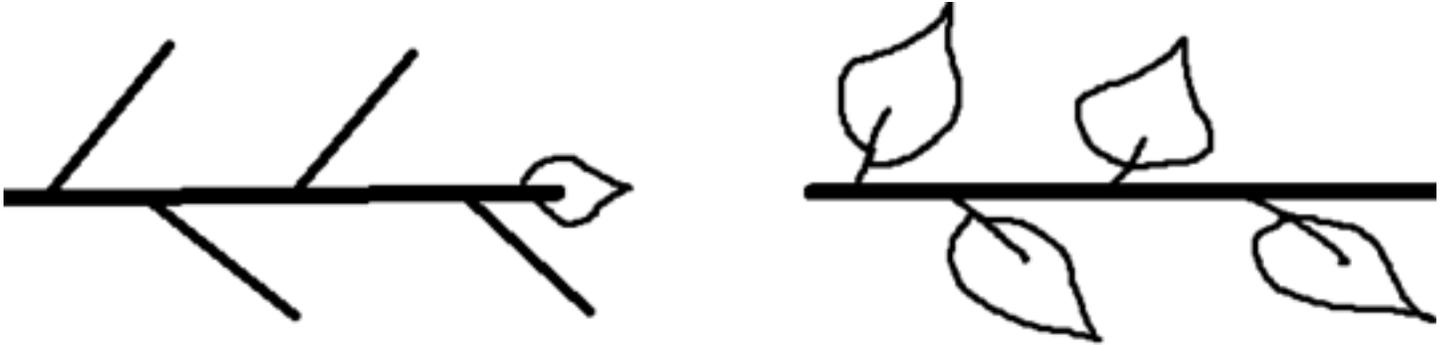
The answer will lead you to a new question. Continue using your photographs, drawings, or specimens to help you answer the questions until you have identified your tree.

Vocabulary for using a tree key

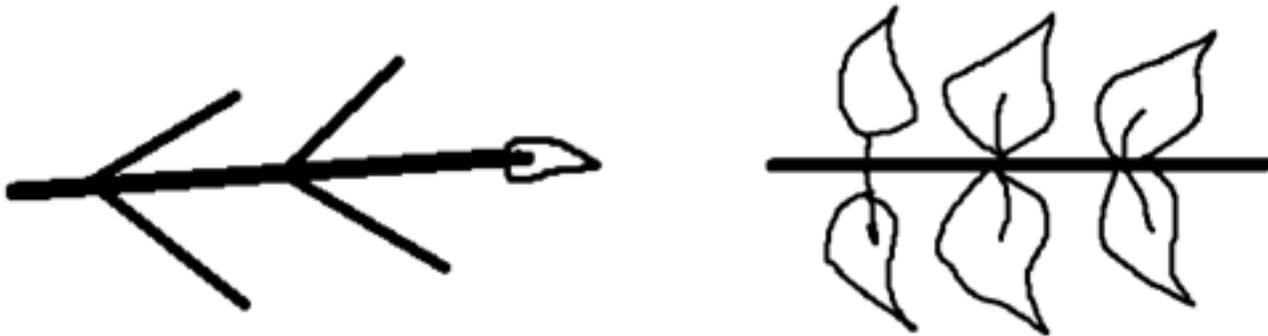
Coniferous (Evergreen) – trees that have needle or scale-like leaves, produce cones, and keep their leaves year round

Deciduous (Hardwood) – trees that shed their leaves in fall and winter

Alternate – a leaf or twig where two leaves or twigs grow in a zigzag pattern from different places on either side of a branch.



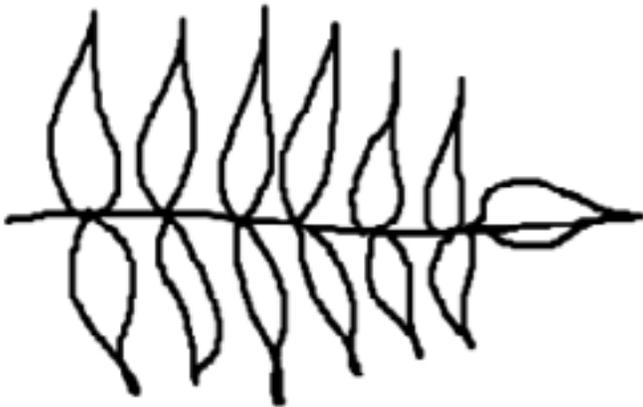
Opposite – a leaf or a twig where two leaves or twigs grow from the same place on opposite sides of the main branch.



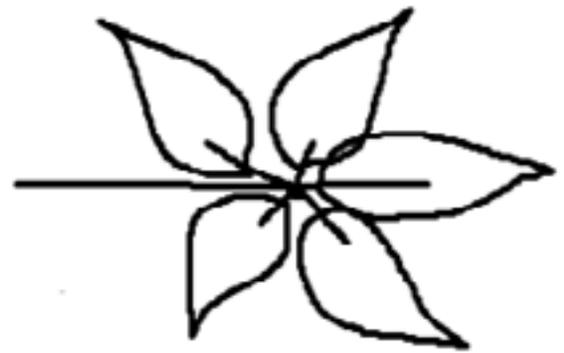
Simple Leaf – a single leaf coming from a leaf stem. The leaf stem becomes the midrib of the leaf.



Compound Leaf – multiple leaves (called leaflets) originate from a single leaf stem.



Pinnate Compound Leaf



Palmate Compound Leaf

Pinnate – “Feather” like. Pinnate refers to the shape of a leaf along the leaf vein or the arrangement of leaflets around a stem.

Palmate– radiating outward from a single point, like the fingers on your hand. Palmate refers to the shape of a leaf along the leaf vein or the arrangement of leaflets around a stem.

Leaf Shape:

Lobed – refers to a leaf with multiple deeply rounded edges.

Toothed – refers to a leaf edge that is not smooth, but has small pointy “teeth”

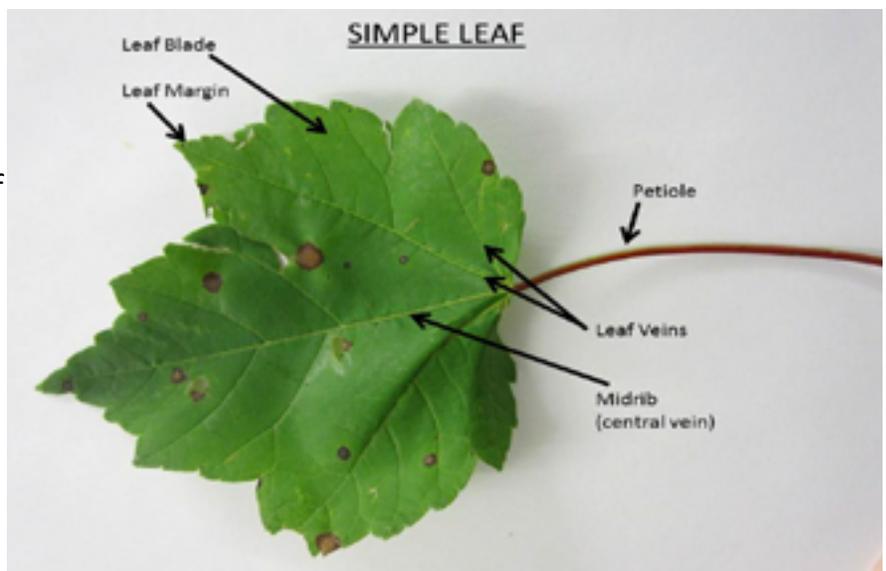
Smooth – refers to the leaf edge being smooth, without teeth

*a leaf can be lobed and toothed (below) or lobed and smooth

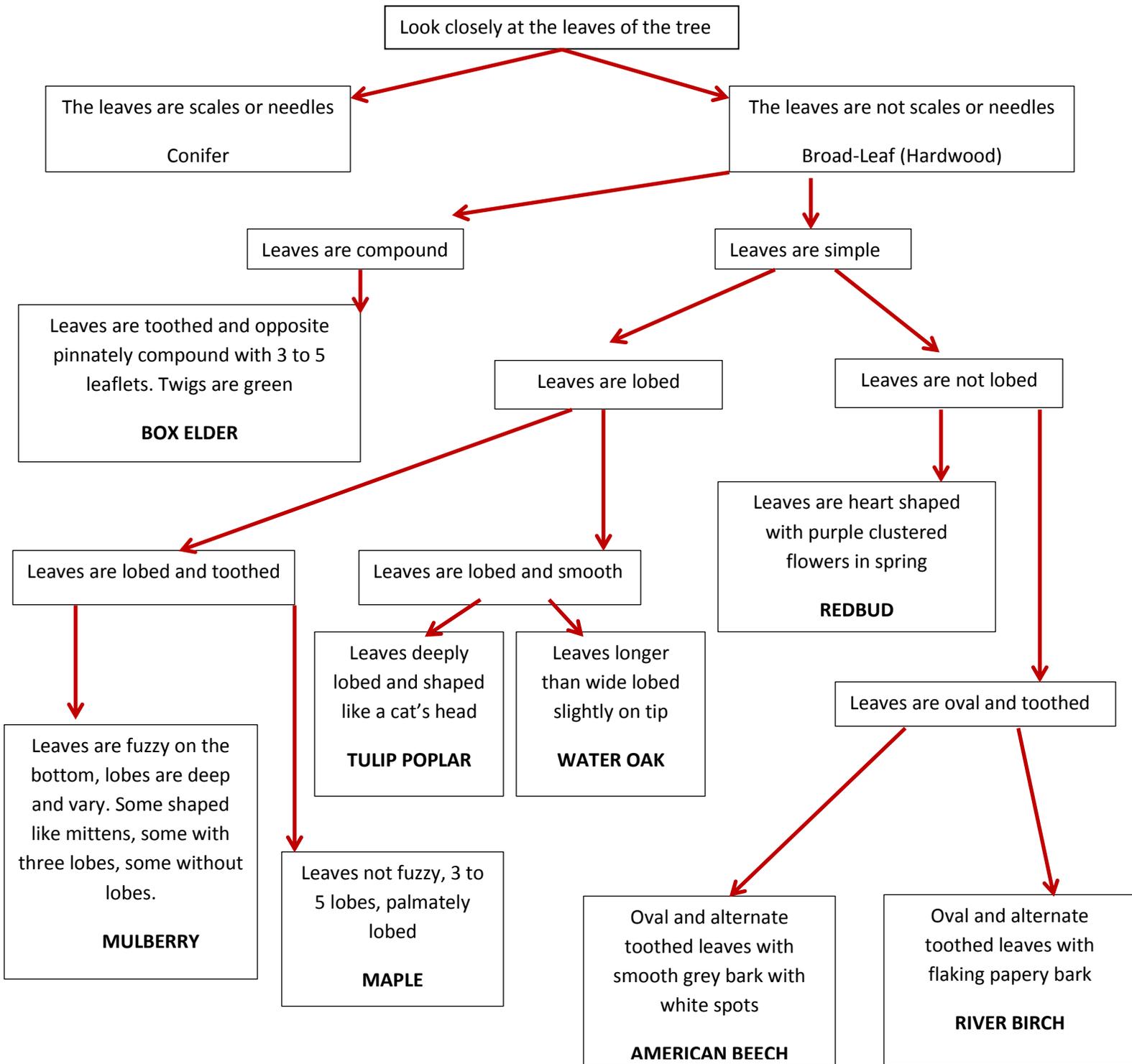
Leaf Margin - outer edge of the leaf

Leaf Blade - flat surface of the leaf

Petiole - stem of the leaf



Swamp Rabbit Tree Key



Swamp Rabbit Tree Identification

American Beech (*Fagus grandifolia*)

Simple, alternate, toothed oval leaves and smooth grey bark with white spots. Buds are long and pointed. Dead brown leaves remain on tree in winter



Box Elder (*Acer negundo*)

Pinnately compound leaves with 3 to 5 coarsely toothed leaflets. Twigs are green



Maple (*Acer rubrum*, *Acer saccharinum*)

Simple, opposite leaves. Palmately lobed with three to five lobes



Swamp Rabbit Tree Identification

Redbud

(*Cercis canadensis*)

Simple, smooth, alternate heart shaped leaves. Lavender flowers in clusters in spring



Mulberry

(*Morus rubra*, *Morus alba*)

Simple, alternate leaves. Leaves very variable: 3 deep lobes, mitten shaped, unlobed. Toothed margin. (Rubra leaves fuzzy underneath)



River Birch

(*Betula nigra*)

Simple, alternate, diamond to oval shaped toothed leaves. Papery, peeling bark



Swamp Rabbit Tree Identification

Tulip Poplar (*Liriodendron tulipifera*)

Leaves are alternate, simple, palmately lobed with a "cat's head" shape. Flowers are tulip like.



Water Oak (*Quercus nigra*)

Simple, spatula shaped leaves that are wider at the tip than the base. Slightly lobed, smooth and alternate. Bark is smooth when young and gets scaly as the tree ages.



Mushrooms

A mushroom is the fruiting body of a fungus.

The living part of the fungus, the part of the fungus that is actively growing and digesting food, is made up of very small filamentous (thread like) structures called **hyphae** that live in the ground or inside of decaying organic matter such as logs and leaf litter. Together, the group of hyphae that make up a single fungus is called the **mycelium**. When environmental conditions are right, the mycelium will produce one or more mushrooms.

The mushrooms create very small spores. The spores are carried by wind or water to a new place where they will germinate and become a new hypha. If the spore landed in a place where a food source is available for the fungus, then the new hyphae will continue to grow and become a new mycelium.

Fungi are highly variable in structure, form, and needs for survival. Some species of fungus are very specific and will only colonize a certain type of food while others are more general and will colonize many different types of food.



We will be looking for fungi that create mushrooms. These can be divided into three main categories:

Saprophytic fungi: A saprophyte is an organism that feeds on dead organic matter. Saprophytic fungi are important decomposers and can be found on logs, in leaf matter, and even on animal dung.



Mycorrhizal fungi: These fungi form a relationship with the roots of plants. The mycelium allows the plant to absorb nutrients from the soil and the plant provides food in the form of carbon for the fungus. Some mushrooms formed by mycorrhizal fungi can be found near the base of plants. (Remember that tree roots may cover a very large area)



Parasitic fungi: These fungi colonize other living organisms including plants, animals, and other fungi, and feed off of them. Many plant and animal diseases are caused by parasitic fungi. The easiest mushrooms to find from parasitic fungi are mushrooms growing on living plants.



Collecting mushrooms:

Mushrooms are the fruiting body of the fungus, so as long as the fungus is not a rare, threatened, or endangered species, it is OK to collect them for identification or to make a spore print. Use a small spoon to carefully cut around the stem of the mushroom and lift the whole thing. Try to disturb the area around the mushroom as little as possible and only take one mushroom from an area.

Caution: *Some mushrooms contain toxins that can cause serious illness and even death.*

Mushrooms in an urban environment that aren't naturally toxic, can act as sponges absorbing pollutants from the air and soil. **Never** eat a mushroom that hasn't been properly identified by an expert, and never eat a mushroom found in the city.

Name:

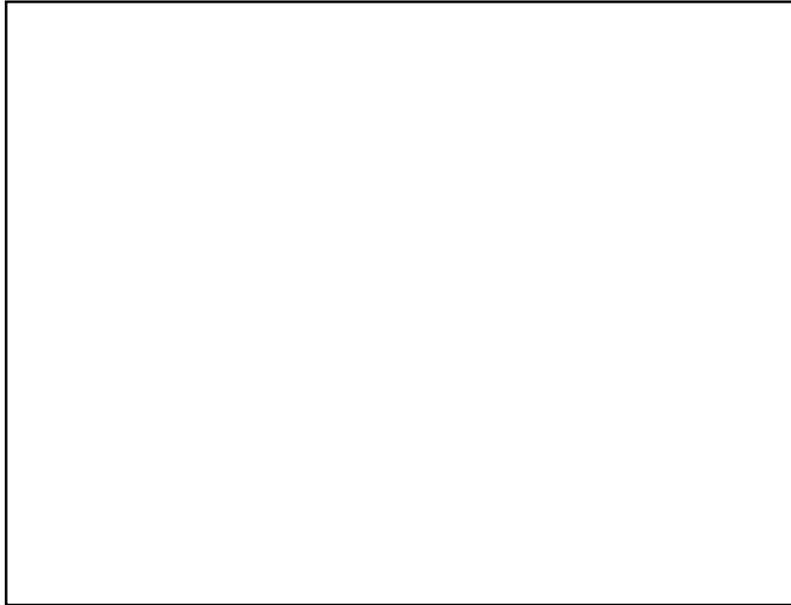
Date:

Location of mushroom:

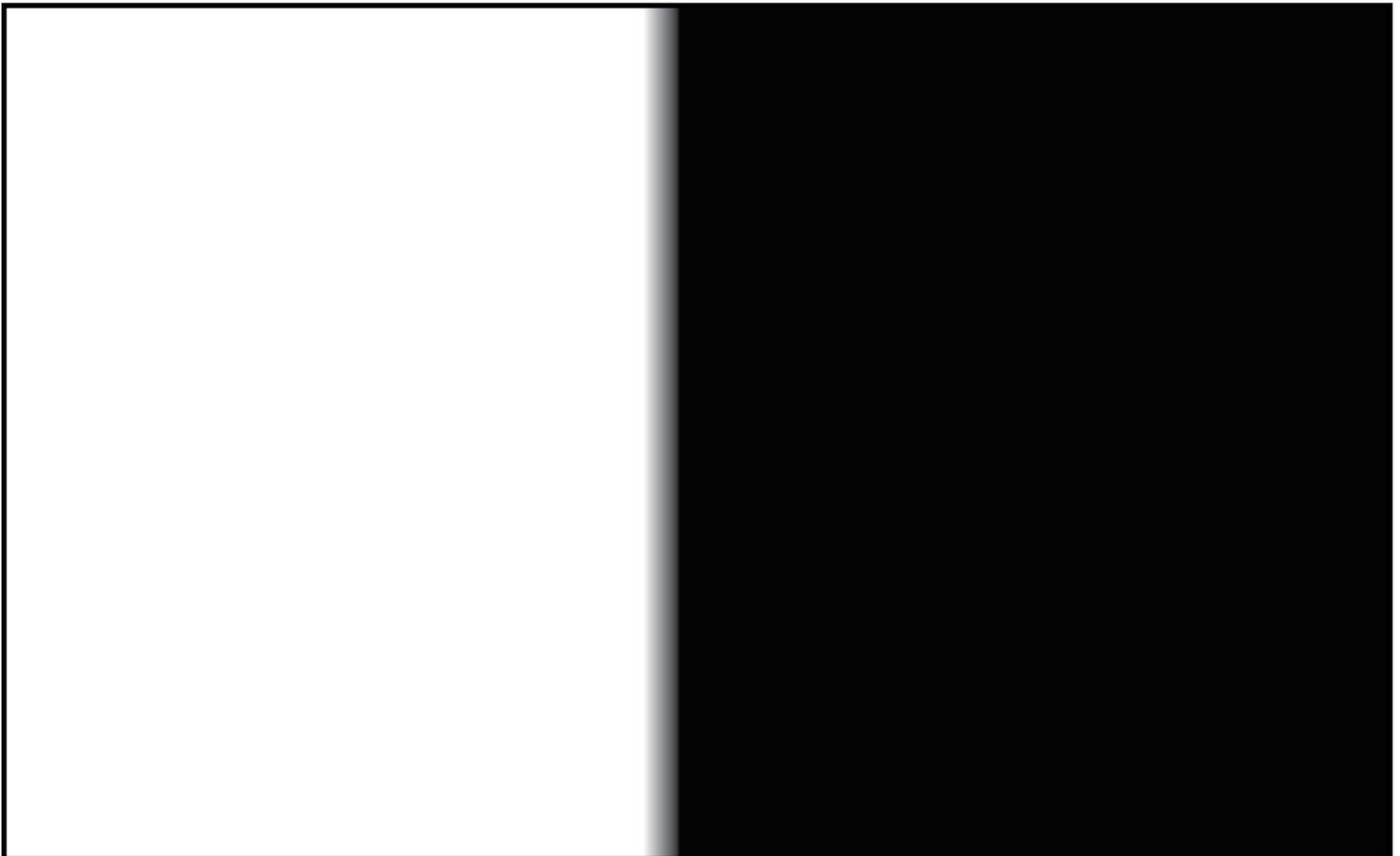
Mushroom habitat:

Other identifying features:

Photograph or drawing of the mushroom



Spore print:



Fungal Pathogens: Chestnut Blight

By Emily Hays

“Chestnuts roasting on an open fire, Jack Frost nipping at your nose...” are words to a popular Christmas-time jingle played on the radio every December. However, have you ever paused to consider that you don’t typically see or have “chestnuts roasting on an open fire” and why? Formerly one of the tallest trees in eastern hardwood forests, the American chestnut was infected and the population was decimated by a fungal pathogen known as chestnut blight in the early 1900s.

Believed to have originated in Japan, the chestnut blight spread rapidly throughout the American Eastern forests. The fungus, originating in New York, swiftly spread up to Maine and down to Georgia, infecting nine million acres of land and about three billion trees.

Chestnut blight attacks the bark, releasing oxalic acid that kills tree tissue. This causes cankers to form on the trees, inhibiting a tree’s ability to carry water and nutrients from the roots to its branches. The fungus spreads via many vectors, including insects, rain, wind, birds, and other animals. Once inside the tree, it multiplies rapidly. Chestnut blight does not kill trees, but infects them badly enough so that they are very susceptible to other diseases and inhibits their growth. In this way, the fungus virtually eliminated a quarter of the standing timber in Eastern United States forests.

The destruction of the American chestnut tree population redefined eastern hardwood forests, as its unanticipated removal impacted wildlife, the natural environment, and people. Wildlife populations were impacted because many species, including black bears, turkey, deer, and other animals, ate the chestnut fruits. The species composition of many forests changed completely. The disappearance of these trees is also believed to have contributed to an increase in mountain soil erosion. Additionally, chestnut trees grow straight and branch-free for about fifty feet, providing excellent wood for lumber. People depended on American chestnut trees for lumber and income. The chestnut tree was a crux in rural economies throughout the east and its disappearance altered eastern hardwood forests as other tree species became dominant and people were left without jobs.

There currently is no cure for chestnut blight. The fungus is still widespread and continues to infect American chestnut trees. Today, American chestnuts typically exist as an understory resprouts that reach only about 10-12 feet in height. Researchers are trying to find a solution to save the American chestnut by breeding it with Asian chestnuts, which are resistant to the blight in order to create a tree that will have the blight resistance of the Asian chestnut and the fruit and growth characteristics of the American chestnut. Whether or not scientists succeed, the chestnut blight has forever altered the ecology of American forests.

Insect Identification Checklist

Characteristics for Insect Identification: Answer as many of the questions as you can to help identify the insect to Order

How Many Legs?

Wings: Yes or No?

1 or 2 PAIRS of wings?

If 2 pairs: Are the front and hind wings the same size?

If 2 pairs: Are the front and hind wings the same texture?

If 2 pairs of wings with different textures, describe the textures.

How are the wings held when the insect is resting? (Draw)

Does the insect have antennae?

If the insect has antennae: describe them (Draw)

Is the insect fuzzy?

Is the insect's abdomen longer than its thorax?

If you can see the insect's mouth parts, describe them.

Does the insect have extra-large hind legs modified for jumping?

Does the insect have extra-large front legs modified for grabbing?

Does the insect have a "waist" between the thorax and abdomen?

Look at the end of the insect's abdomen. Are there any modifications? (hairs, bristles, or stingers) If so, Draw it.

What are the main colors of the insect

Simple Dichotomous Key to common insect orders

- 1a. The insect has wings.....Go to 2
1b. No wings, and more than 6 legs.....not an adult insect
- 2a. The insect has 4 wings (two pairs).....Go to 3
2b. The insect has only 2 wings (one pair).....Go to 12
- 3a. The wings are covered with tiny powdery scales.....**Butterflies and Moths**
3b. The wings are not covered with scales.....Go to 4
- 4a. At least one pair of wings is thick and hard or leathery.....Go to 5
4b. Both pairs of wings are thin and clear, like plastic wrap.....Go to 9
- 5a. Mouth parts are rolled into a tube for sucking.....**True Bugs**
5b. Mouth parts for chewing or biting.....Go to 6
- 6a. Body of the insect is flattened.....**Roaches**
6b. Body of the insect is round.....Go to 7
- 7a. The front pair of wings is hard and shell like without veins.....**Beetles**
7b. The front pair of wings is leathery but still has wing veins.....Go to 8
- 8a. The hind legs are large and modified for jumping.....**Grasshoppers, Crickets**
8b. The front legs are large and modified for grabbing.....**Preying Mantids**
- 9a. Mouth parts rolled into a tube for sucking.....**Bugs and Aphids**
9b. Mouth parts for biting and chewing.....Go to 10
- 10a. Abdomen has a thin “waist” and a stinger at the end.....**Bees and Wasps**
10b. No stinger or thin waist between abdomen and thorax.....Go to 11
- 11a. Very small insect, long antenna and wings folded flat on body.....**Termites**
11b. Larger insect, short antenna and wings held away from body.....**Dragonflies**
- 12a. Hind wings missing, and small knobs present in their place.....**Flies**

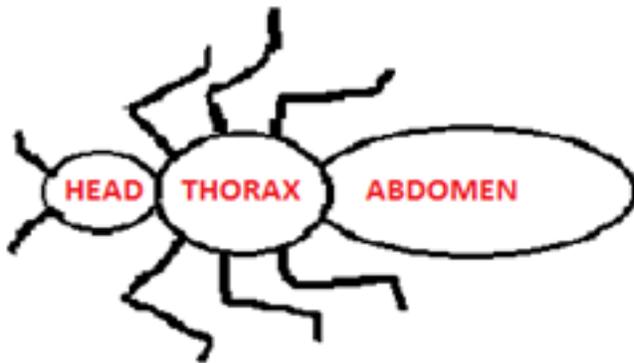
There are a lot more insects, but this is all that we will learn today!

Introduction to Insects

A few facts about Insects

- Insect comes from the Latin word for “segmented.” Insects have bodies that are segmented into 3 main parts and adults have 6 segmented legs.
- All insects have a hardened outer layer called an exoskeleton.
- Some insects have wings, while others do not.
 - Insects with wings may have one pair of wings, or two pairs of wings.
 - Sometimes when insects have two pairs of wings, the front pair has been modified to become a protective covering.

General Insect Body Plan:



Most insects go through a set of changes as they grow. These changes are called metamorphosis. In addition to other changes, because the exoskeleton is hard and cannot grow, the insect has to **molt**, or shed its exoskeleton during metamorphosis.

- Some insects go through complete metamorphosis
- Some insects go through incomplete metamorphosis
- Other insects go through gradual metamorphosis.

Insects do not breathe through their mouths but through small holes in their exoskeletons on the abdomen and thorax called spiracles.

Insects come in a variety of shapes and sizes and live in almost everywhere on Earth. Insects have adapted both physically (shape, size, color, wings, etc.) and behaviorally to live in a variety of habitats and make use of a wide variety of food types.

Insect Classification:

We have identified and classified (named) around 1 million insect species, and scientists believe that there are a lot more insects that have not been identified yet. Scientists are constantly learning new things about insects.

For our purposes, we will learn to identify insects to Order. An order is the broadest grouping of different types of insects. There are 31 Orders of Insects, but we will just learn the 15 that we are most likely to come into contact with.

Order	Common Name
Ephemeroptera	Mayflies
Odonata	Dragonflies and Damselflies
Orthoptera	Grasshoppers and crickets
Phasmatodea	Leaf and Stick Insects
Plecoptera	Stoneflies
Isoptera	Termites
Mantodea	Mantids
Blattodea	Cockroaches
Hemiptera	Bugs, Leafhoppers, Cicadas, Scales, Aphids
Coleoptera	Beetles
Neuroptera	Lacewings and Antlions
Hymenoptera	Bees, Wasps, and Ants
Trichoptera	Caddisflies
Lepidoptera	Butterflies and Moths
Diptera	Flies

Identifying Insects:

We will use a dichotomous key to identify insects that we find to order. The key we are using will help identify the 15 orders of insects in the table above by their ADULT form. We will also learn some important characteristics that can be used to identify insects while in the field.

*Remember that insects are everywhere, and that many are highly adapted to their environments. Often that means that they are camouflaged to blend in and may be hard to see. ***Never pick up an insect with your bare hands*** without first making sure that you have correctly identified it (get help from an adult!). Many insects can bite, and others may release chemicals that itch or smell bad as a way to keep from being eaten.

An identification check list has been provided to help you with insect identification. You will not always be able to answer all of the questions on the list, but the more that you can answer the easier it will be to identify your insect.

Capturing Insects for Observation or Collection

There are a variety of methods and materials used for capturing insects. If you are trying to catch a specific type of insect, it helps to know a little bit about that insect's behavior in order to know how and where to catch one. For example, you cannot catch a butterfly by turning over a log, but that may be a great place to find beetles or termites!

We will discuss some of the most common tools used to capture insects including aerial nets, sweep nets, aspirators, and traps.

Photo Scavenger Hunt: Beneficial Insects

- | | |
|---|---|
| <input type="checkbox"/> A bee | <input type="checkbox"/> A butterfly |
| <input type="checkbox"/> A pollinator on a flower | <input type="checkbox"/> A predator with cryptic coloration |
| <input type="checkbox"/> An insect predator | <input type="checkbox"/> A pest insect |
| <input type="checkbox"/> A larval insect predator | <input type="checkbox"/> Evidence of a parasitoid |
| <input type="checkbox"/> An insect that is neither a pest nor a beneficial insect | |

Photo Scavenger Hunt: Beneficial Insects

- | | |
|---|---|
| <input type="checkbox"/> A bee | <input type="checkbox"/> A butterfly |
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Photo Scavenger Hunt: Beneficial Insects

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| <input type="checkbox"/> An insect predator | <input type="checkbox"/> A pest insect |
| <input type="checkbox"/> A larval insect predator | <input type="checkbox"/> Evidence of a parasitoid |
| <input type="checkbox"/> An insect that is neither a pest nor a beneficial insect | |

Beneficial Insect Examples

Predators



Basic Characteristics: Most useful tend to be generalist feeders. Variable in size, predators can be found in most insect Orders. Some insect predators only feed on other insects as larva, like the Green Lace Wing, others feed on other insects throughout life.



Examples include: Lady Bugs, Dragonflies, Solitary Wasps, Lace Wings, Praying Mantis, Assassin Bugs, Damselflies, Flower Flies, Hover Flies

Parasitoids



Basic Characteristics: Most parasitoids are very small, often microscopic. It is easier to find evidence of parasitoids; such as eggs on host species (pictured), pupa on hosts, and discolored insect eggs. Parasitoids are very host specific.



Ken Chamberlain, The Ohio State University, Bugwood.org

All Parasitoids go through complete metamorphosis.
Examples include: Braconid Wasps, Trichogramma Wasps, Tachinid Flies such as Feather Legged Flies

Pollinators



Most pollinators feed on plant pollen or nectar. Bees are the most common and important pollinators, but butterflies, flies, wasps, beetles, ants, and more can be pollinators. Some pollinators are generalists, specializing



in a single species of flower, while others are specialists.

Stream Macroinvertebrate Bioassessment Data Sheet

Date:

Time:

Name:

Stream Name and Location:

Weather:

Physical Characteristics of the Stream:

Place an X next to each category of macroinvertebrates that you find

Highly Sensitive	Sensitive	Tolerant
<input type="checkbox"/> <u>Caddisflies</u>	<input type="checkbox"/> Dobsonflies <input type="checkbox"/> Alderflies	<input type="checkbox"/> Aquatic worms
<input type="checkbox"/> Mayflies	<input type="checkbox"/> <u>Fishflies</u> <input type="checkbox"/> Crayfish	<input type="checkbox"/> Black flies
<input type="checkbox"/> Stoneflies	<input type="checkbox"/> Crane flies <input type="checkbox"/> Scuds	<input type="checkbox"/> Midges
<input type="checkbox"/> Riffle beetles	<input type="checkbox"/> Dragonflies <input type="checkbox"/> Clams	<input type="checkbox"/> Leeches
<input type="checkbox"/> Water pennies	<input type="checkbox"/> Damselflies <input type="checkbox"/> <u>Sowbugs</u>	<input type="checkbox"/> Lunged snails
<input type="checkbox"/> Gilled snails	<input type="checkbox"/> Net spinning <u>Caddisflies</u>	
<input type="checkbox"/> Total # of X's	<input type="checkbox"/> Total # of X's	<input type="checkbox"/> Total # of X's
Total * 3 = _____	Total * 2 = _____	Total * 1 = _____

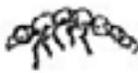
Add the three numbers together. Total Index Value = _____

Water Quality (circle the correct answer)

Excellent (more than 22) Good (17-22) Fair (11-16) Poor (less than 11)

Aquatic Macroinvertebrates

Dichotomous Key

1 A. The organism has segmented legs
BOX 2  

B. The organism does NOT have segmented legsBOX 13

2 A. The organism has **6** segmented legs
BOX 3

B. The organism has more than 6 segmented legsBOX 12

3 A. Body is longer than it is wide (elongate)
BOX 4

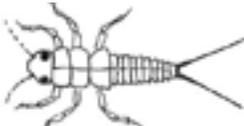
B. Body oval or roundedWATER PENNY 

4 A. The organism has **2 or 3** tails or filaments
BOX 5   

B. The organism has no tail or a single filament.....BOX 7

5 A. 2 or 3 hairlike tails (most often 3) and has gills along the side of the abdomen.
MAYFLY NYMPH 

B. 2 or 3 hairlike tails with NO gills along the side of the abdomen.....BOX 6

6 A. 2 or 3 hairlike tails (most often 2), 2 claws at the end of each leg, and NO gills alongside abdomenSTONEFLY NYMPH 

B. 3 broad leaf like tails and NO gills along the side of the abdomen
DAMSELFY NYMPH 

7 A. Hardened abdomen (covered by plates or hard)BOX 8

B. Soft flexible abdomen.....BOX 9

*This key will help to identify most but not all of the macroinvertebrates found in cold water streams in the upstate of South Carolina.

8 A. Wide abdomen, large eyes, and no tail
.....DRAGONFLY NYMPH 

B. Entire body hardened and stiff.....BEETLE LARVA

9 A. Fleshy extensions or thin filaments extending from **sides** of abdomen.....BOX 10

B. No filaments extending from sides of abdomen.....BOX 11

10 A. Fluffy or branched gill tufts under abdomen, large mouthparts short forked tail with hooksDOBSONFLY LARVA (HELLGRAMMITES) 

B. No gill tufts **under** abdomen, thin filaments extending from sides of abdomen, one tailBOX 11

11 A. 2 small hooks on forked back end. Abdomen may have gills
.....CADDISFLY LARVA 

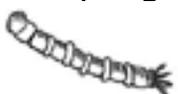
B. Abdomen that ends in a long tail or filament
.....ALDERFLY LARVA 

12 A. 10 segmented legs, large claws, body is lobster like
.....CRAYFISH 

B. Body shrimp-like, no clawsSCUD (or Freshwater shrimp) 

13 A. Fleshy body with no shellBOX 14

B. Fleshy body with a shell.....BOX 15

14 A. Fleshy caterpillar like body with fleshy finger-like extensions from one end
.....CRANE FLY LARVA 

B. Fleshy caterpillar like body that tapers to points on both ends
.....FLY LARVA (horse and deer flies) 

15 A. Has a single spiral shell.....BOX 16

B. 2 shells that open on a hingeFRESHWATER CLAM

16 A. When point of shell is up and opening is facing you, opening of shell is on right
.....GILLED SNAIL 

B. When point of shell is up and opening is facing you, opening of shell is on left
.....LUNGED SNAIL 

Identifying Birds

Start with **SHAPE**

Look at the body of the bird.

- a. How big is it?
- b. Is it plump or skinny?

Look at the bill of the bird

- a. Is it short or long?
- b. Is it pointed or rounded?
- c. Is it straight or curved?

Look at the bird's wings.

- a. Are the wings pointed or curved?
- b. Are the wings long or short?

Look at the bird's tail.

- a. Is the tail long or short?
- b. Is the tail one part or forked into two parts?
- c. What shape is the tail?

Tips

Size can be tricky to determine in the field, since few birds will sit still and let you measure them. Compare the birds you don't know to common birds that you do know.

Use the bird as a ruler.

To determine if a bird has a short beak or a long beak, compare the beak length to the length of the bird's head. Is the beak smaller than the head, the same length, or longer?

Next, determine **COLORS**

- 1) What is the main color of the bird?
- 2) Are there any other colors on the bird?
 - a. Where are the other colors?
- 3) Does the bird have any distinctive markings?
 - a. Does the bird have wing bars?
 - b. Does the bird have patches of color on the wings or tail?
 - c. Does the bird have eye markings?
- 4) What color are the bird's legs?

Finally, **WHERE** are you and **WHAT** is the bird doing?

Where is the bird: Where you see the bird is important because birds have specific ranges and prefer certain habitats. As an example, let's say you have a bird that you are trying to identify and you have narrowed your choice to two birds. You check the RANGE in your bird book and determine that one lives on the East Coast of the United States and the other lives only in California. Which bird do you think you have found?

If you are in the mountains or in the forest, you may see different birds than you would in a park. If you are at the lake or the ocean, you may see different birds than you would in your backyard.

What is the bird doing: Some birds prefer to eat specific types of food. Others have special mating behaviors or build their nests from specific types of material. Is the bird swimming, wading, eating at a bird feeder, hopping around on the ground, climbing a tree, hovering in mid-air, or catching a small animal for dinner? Behavior can tell us a lot about birds and help to identify the bird.

*If you are able to tell what sound the bird is making, that may also help. Many birds have a few distinct calls. Be careful though, the song you hear may be coming from a bird that you don't see!

.....

Photo Scavenger Hunt: Birds

- | | |
|---|--|
| <input type="checkbox"/> A bird eating | <input type="checkbox"/> A bird flying |
| <input type="checkbox"/> A male bird with bright plumage | <input type="checkbox"/> A bird feather |
| <input type="checkbox"/> A female bird with cryptic plumage | <input type="checkbox"/> A bird's nest |
| <input type="checkbox"/> A migratory bird | <input type="checkbox"/> A bird that swims |

Draw a picture of one place that you see a bird during your field expedition below:

Amphibians and Reptiles

Scientists that study reptiles and amphibians are called Herpetologists.

Reptiles and Amphibians share some characteristics:

- Lay eggs (except some snakes)
- “Cold-blooded” or Ectothermic– cannot regulate their body temperature but must depend on the sun to become warm. This is why so many reptiles and amphibians can be found “basking” on rocks, logs, and roads when it is cool out, and why many retreat into water or burrows when it is hot out.

Amphibians

*Frogs, Toads, Salamanders, Newts

- Most adults live on land but must lay their eggs in water.
- Eggs are soft, without a shell
- Young amphibians live in water and breathe through gills. Most amphibians eventually go through a set of changes called metamorphosis where they grow legs and lose their gills, though there are some species that have gills as adults and stay in water their entire lives (Mudpuppy Salamanders).
- Most amphibians have soft porous skin which allows them to absorb water directly through the skin. This is a characteristic that makes amphibians great indicators of environmental pollution. Since they absorb water through the skin, they are more likely than other animals to be affected by pollutants.
- The largest known amphibian is the Japanese Giant Salamander which grows up to 6 feet long and 140 pounds.
- The state amphibian of South Carolina is the Spotted Salamander

Reptiles

*Snakes, Turtles, Lizards, Alligators

- Eggs are soft and leathery and are usually laid on land rather than in water.
- Skin is scaly and does not absorb water.
- When snakes and lizards stick their tongues out they are “smelling” the air by collecting scent particles and running them across a special sensory organ called the Jacobson’s organ.
- The state reptile of South Carolina is the Loggerhead Turtle

Observing Reptiles and Amphibians:

- Many reptiles and amphibians are shy and secretive and may be hard to find. Patience is important.
- Look under logs or rocks in wooded and slightly damp areas for lizards, salamanders, and snakes. Be careful: check with your eyes first before turning the log or rock over, turn the log or rock over carefully with a stick, and turn it so that the opening is away from your body.
- Some frogs, snakes, and lizards are arboreal, meaning that they live in trees. Don’t forget to look up!

- Remember that amphibians **MUST** lay their eggs in water, so it makes sense to look for adult amphibians near water. Check wetlands, floodplains, and streams for amphibians and remember to wear rubber boots or old shoes that can get muddy.
- Many amphibians and reptiles are nocturnal, so taking a trip in the evening or night time is a good idea. Bring a flashlight, a plastic container or small bucket, and your camera and wear rubber boots. **ALWAYS** have an adult with you when you go on a night expedition.
- Use a small net to carefully catch small frogs, lizards, and salamanders for observation. Place them gently in a clear container to observe, take pictures, and record field notes and then release them where you found them.

Common Types of Reptiles and Amphibians in Greenville, SC

Frogs	Toads	Skinks	Lizards
Turtles	Salamanders	Snakes	

“Collecting” Reptiles and Amphibians

In order to keep a record of any reptiles and amphibians you may encounter, photographs are the best option. If you cannot take a picture, make a quick sketch and record detailed information regarding color, shape, and habitat in your field notebook. For frogs and toads, recordings of their calls are also a good way to help identify the animal.

Photo Scavenger Hunt: Reptiles and Amphibians

- | | |
|---|---|
| <input type="checkbox"/> A frog | <input type="checkbox"/> A tadpole |
| <input type="checkbox"/> A skink | <input type="checkbox"/> A turtle |
| <input type="checkbox"/> A lizard | <input type="checkbox"/> An adult amphibian near water |
| <input type="checkbox"/> A reptile basking in the sun | <input type="checkbox"/> An egg from a reptile or amphibian |

Draw a picture of a reptile or amphibian that you have found during a field expedition:

Common Invasive Plant Species in Greenville, SC

<p>Chinaberry <i>Melia azedarach</i></p> <p>ID: up to 50 ft tall with alternate leaves 2 or 3 times compound. Leaflets are 1-3in long with serrated margins. Flowers in Spring. Fruit are yellow or yellow-green.</p>	 <p><small>Emily Farp, FloridaNature.org, Bugwood.org</small></p>	<p><u>Tree</u> Severe Threat </p> <p>Native to Asia, Chinaberry was first introduced to the US in Charleston, SC in the 18th century. The fruit is poisonous to humans.</p>
<p>Tree of Heaven <i>Ailanthus altissima</i></p> <p>ID: up to 80 ft tall with very large alternate compound leaves each 1-4ft long with 10-41 leaflets. Each leaflet has two or three small toothed lobes at the base. When crushed, the leaves smell nutty.</p>		<p><u>Tree</u> Severe Threat </p> <p>Very common in urban, disturbed areas, Tree of Heaven produces chemicals that prevent other plants from growing nearby.</p> <p>Tell it apart from native Sumac by looking for Sumac's fully serrated leaflet margin as opposed to the 2 or 3 lobed "boot" shape at the base of Tree of Heaven's leaf.</p>
<p>Princess Tree Royal Paulownia <i>Paulownia tomentosa</i></p> <p>ID: up to 60 ft tall with bark that alternates between smooth and rough. Large, heart shaped, opposite leaves that are shallowly lobed. Leaves are hairy on the bottom. Large clusters of violet flowers.</p>		<p><u>Tree</u> Severe Threat </p> <p>Introduced in the 1840's, Princess Tree grows very fast and takes over disturbed areas. It spreads by seed and by resprouting from the roots. One plant produces an estimated 20 million seeds.</p>

Common Invasive Plant Species in Greenville, SC

<p>Mimosa <i>Albizia julibrissin</i></p> <p>ID: small tree 20-40ft tall with doubly pinnately compound leaves with very small leaflets. Bark is almost smooth. Flowers are white to pink and look like “feathered pom-poms.”</p>		<p><u>Tree</u> Significant Threat </p> <p>Common in disturbed and urban areas, Mimosa is especially a problem alongside rivers. Introduced in 1745, Mimosa is still a popular landscape plant because of its attractive leaves and flowers</p>
<p>Chinese Parasol Tree <i>Firmiana simplex</i></p> <p>ID: small tree 30-40ft tall with large simple 3-5 lobed leaves arranged alternately. Bark is green-ish with white stripes and smooth.</p>	 <p><small>James H. Miller, USDA Forest Service, Bigwood 954 21924</small></p>	<p><u>Tree</u> Significant Threat </p> <p>Chinese Parasol Tree is a landscape plant in the chocolate family that grows very quickly.</p>
<p>White Mulberry <i>Morus alba</i></p> <p>ID: small tree 30-50ft tall. Leaves glossy green, alternate and simple with very variable shape (lobed, mitten-like, ovate) often on the same plant. Blackberry like clusters of fruit.</p>	 <p><small>Robert Vitek, Dorcasum, KY, pugaweb.org</small></p>	<p><u>Tree</u> Significant Threat </p> <p>Originally introduced in an attempt to develop a silk worm industry in Colonial times.</p> <p>Tell it apart from the native Red Mulberry: the top is glossy and the underside of the White Mulberry leaf is smooth while the Red is fuzzy.</p>

Common Invasive Plant Species in Greenville, SC

<p>White Poplar <i>Populus alba</i></p> <p>ID: large tree 60-100ft tall with alternate simple leaves that vary in shape from oval to 5 lobed. Leaves have undulate and toothed margins, and the underside is covered in thick white hairs. The petiole is also covered in hairs.</p>		<p><u>Tree</u> Significant Threat ★</p> <p>White Poplar is native to Europe and Asia and was introduced for landscaping. It reproduces mainly through sprouts from the roots.</p>
<p>Paper Mulberry <i>Broussonetia papyrifera</i></p> <p>ID: short tree 30-40 ft tall. Leaves are very variable: opposite, alternate or whorled on the stem, very hairy underneath heart and mitten shaped with sharply toothed margins and pink to orange fruit.</p>		<p><u>Tree</u> Significant Threat ★</p> <p>Planted in the Southeast as early as 1900, the inner bark of the Paper Mulberry has been used since ancient times to make paper. Tell it from native mulberry: not actually in the mulberry genus, Paper Mulberry has rounded ball shaped fruit and dull leaves on long petioles. Red Mulberry has shiny leaves and red to black hanging fruit.</p>
<p>Bradford Pear <i>Pyrus calleryana</i></p> <p>ID: tree up to 60 ft tall. Leaves are simple and alternate on the stem. Ovate in shape. Clusters of white flowers appear before leaves in early Spring.</p>		<p><u>Tree</u> Emerging Threat ★</p> <p>Introduced from China, the Bradford Pear is widely used in landscaping.</p> <p>The flowers of Bradford Pear are very fragrant, in a bad way. It has been said that they smell "like fish."</p>

Common Invasive Plant Species in Greenville, SC

Russian Olive

Elaeagnus angustifolia

ID: Small tree or shrub up to 30 ft tall with thorny stems and leaves alternate and longer than wide, tapering to a rounded point with smooth edges. Yellow flowers, silvery fruits.



Tree
Alert

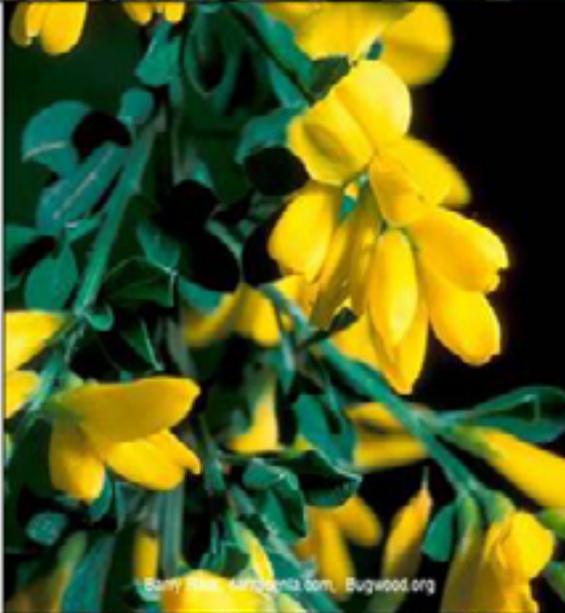


Mainly present in the Western and Central states, Russian Olive is invasive in North Carolina, and is on the alert list for South Carolina.

Scotch Broom

Cytisus scoparius

ID: Shrub up to 12 ft tall with slender green stems and compound leaves with 3 leaflets alternate on the branch. Leaflets less than 1 in long, dark green on top and pale and hairy beneath. Bright Yellow Flowers late Spring to Early Summer.



Shrub
Severe Threat



Scotch Broom forms dense thickets. It was introduced from Europe and sold as an ornamental.

Thorny Olive

Elaeagnus pungens

ID: Shrub 3 – 25 feet tall with elliptical alternate leaves that are covered in small silvery scales. Branches are dark brown and have lots of thorns.



Shrub
Severe Threat



Thorny olive also looks like Russian Olive and Autumn Olive, both also invasive species for South Carolina.

Common Invasive Plant Species in Greenville, SC

Autumn Olive

Elaeagnus umbellata

ID: Shrub 3 – 20 ft tall. Leaves are alternate and elliptical with a silvery underside. Branches are a greenish brown in color and have many thorns. Fruit - many red berries in Fall.



Shrub

Severe Threat



Autumn Olive was introduced to the US in 1830 from China and Japan and was planted for wildlife habitat. It has since been shown that native plants are better than exotics for wildlife.

Two Color Bush Clover

Lespedeza bicolor

ID: shrub 3 – 10 feet tall. Leaves are alternate and compound with 3 elliptical leaflets. Has small "Pea-like" purple to whitish flowers. Seeds are in pods, with a single seed to a pod



Shrub

Severe Threat



Introduced from Japan as an ornamental and planted widely as food for wildlife such as quail.

Privet

Ligustrum japonicum
Ligustrum sinense
Ligustrum lucidum
Ligustrum vulgare

ID: Shrubs up to 30 ft tall. Leaves are thick and leathery, opposite and simple with the tips coming to a point. Clusters of dark purple-black berries in late Summer to early Fall.



Shrub

Severe Threat



Widely planted as hedges, privet has become a major problem in natural areas in the South East. It takes over, preventing native plants from growing.

Common Invasive Plant Species in Greenville, SC

Japanese Knotweed

Polygonum cuspidatum

ID: Shrub with reddish brown reed-like stems, leaves arranged alternately leaves are thick and spade shaped with a sharp slope to the pointed tip.



Shrub

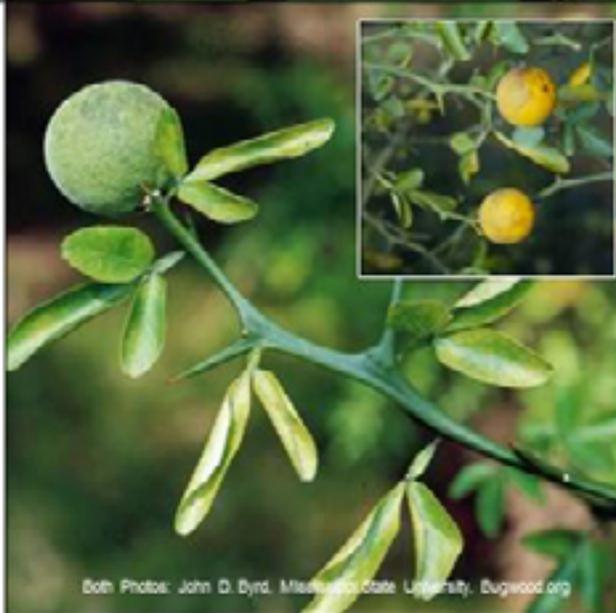
Significant Threat

Some people confuse Japanese knotweed with bamboo because it has reed-like stems that don't always die back in winter.

Trifoliate Orange

Poncirus trifoliata

ID: Shrub 8-30 ft tall with alternate compound leaves with 3 leaflets with "winged" petioles. Twigs are green with large thorns. Flowers white with 5 petals. Fruit yellow – orange and up to 2 in diameter



Both Photos: John D. Byrd, Mississippi State University, Bugwood.org

Shrub

Significant Threat



Many invasive plants have fewer natural enemies and herbivores in a new habitat than native plants. Due in part to its thorns, deer do not eat Trifoliate Orange but do eat native plants growing in similar habitats, giving Trifoliate Orange an advantage.

Multiflora Rose

Rosa multiflora

ID: Shrub up to 15 ft tall. Leaves are pinnately compound with an odd number of leaflets, alternate on the stem. Thorns are stiff, wide at the base, and curve backwards. Small white flowers in clusters.



James H. Miller, USDA Forest Service, Bugwood.org

Shrub

Significant Threat



Tell it apart from native roses: the base of the petiole of the Multiflora Rose has hairy, fringed stipules. Also, native roses tend towards pink flowers.

Common Invasive Plant Species in Greenville, SC

January Jasmine,

Sweet Breath of Spring
*Lonicera
fragrantissima*

ID: Shrub up to 10 ft tall with many branching hollow stems. Leaves dark green and opposite. Flowers are tubes with flared petals at the end: yellow, pink, and white.



Shrub

Emerging Threat



Sweet Breath of Spring is a shrub that closely resembles the vining invasive Japanese Honeysuckle.

Macartney Rose

Rosa bracteata

ID: Shrub up to 10 ft tall. Leaves are pinnately compound with 7 to 9 leaflets, alternate on the stem with serrate margins. Thorns curve backwards. Small white flowers with five petals in clusters.



Shrub

Emerging Threat



Introduced as an ornamental, and is very similar in appearance to the Multiflora Rose, another invasive plant.

Meadowsweet

Spiraea japonica

ID: Shrub 4 to 6 ft tall with alternate leaves up to 3 inches long and oval in shape with toothed margins. Flowers light to dark pink in clusters up to a foot wide. Flowers form on the tips of the stems.



Shrub

Emerging Threat



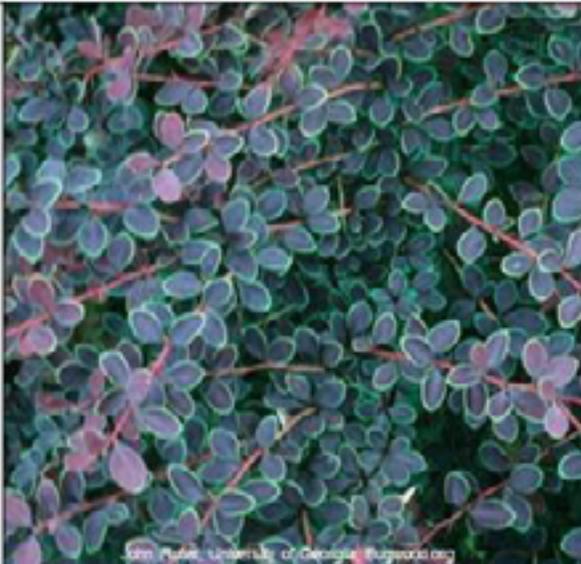
Like many invasive plants, Meadowsweet is able to reproduce and spread quickly. One Meadowsweet plant can produce hundreds of seeds in a single growing season.

Common Invasive Plant Species in Greenville, SC

Japanese Barberry

Berberis thunbergii

ID: 2-8 feet high with thick zig-zag stems and small oval leaves green-blue to purple in color with smooth margins arranged in alternate clusters along the stem. Thorns. Bright red berries.



Shrub
Alert



Tell it apart from the native barberry: Japanese Barberry has smooth leaf margins while our native barberry has toothed leaves.

Nandina, Sacred Bamboo

Nandina domestica

ID: Shrub up to 8 ft tall. Leaves are large doubly compound arranged alternately and whorled on the stem. Stem is brown with overlapping sheaths, resembling bamboo. Bright red berries in clusters during winter.



Shrub
Alert



Introduced from Asia and used as an ornamental landscape plant, Nandina is now escaping into forests.

Wineberry, Wine Raspberry

Rubus phoenicolasius

ID: Shrub, stem up to 9 ft tall with purple hairs, appearing reddish. Compound leaves with 3 finely toothed and lobed leaflets. Leaves are hairy and silvery on the bottom. The fruit looks like a raspberry and is edible.



Shrub
Alert



Wineberry is considered invasive in North Carolina and is on the Alert list for South Carolina.



Common Invasive Plant Species in Greenville, SC

<p>English Ivy <i>Hedera helix</i></p> <p>ID: Evergreen woody vine up to 90 feet long. Leaves alternate with variable shape, typically with 3 or 5 lobes, smooth margin, and white veins. Vine forms thick mats on the ground or around trees.</p>	 <p><small>James H. Miller, USDA Forest Service, Bugwood.org</small></p>	<p><u>Vine</u> Severe Threat ★</p> <p>Tell it apart from native grapevines: native grapes have leaves that are similar in shape but not as thick and often hairy, while English ivy leaves are smooth.</p>
<p>Japanese Climbing Fern <i>Lygodium japonicum</i></p> <p>ID: Vining fern up to 90 ft long with a very slender but strong stem. Leaves opposite on the vine, compound and highly variable in shape, and a lots of small lobes in the margin of the leaflets.</p>	 <p><small>Chris Egan, River to River CWMA, Bugwood.org</small></p>	<p><u>Vine</u> Severe Threat ★</p> <p>The Japanese Climbing Fern produces spores that can be seen in two rows along the underside of the margins of smaller leaflets. These seeds are dispersed to new areas by the wind.</p>
<p>Japanese Honeysuckle <i>Lonicera japonica</i></p> <p>ID: Trailing or climbing vine up to 80 ft long with oval leaves opposite in pairs along the stem. Flowers are long tubes: yellow, white, or cream in color. Stems are reddish brown and hollow. Fruit is blue-black berries.</p>		<p><u>Vine</u> Severe Threat ★</p> <p>Tell it apart from native honeysuckles because young Japanese Honeysuckle vines are hairy while natives are smooth. Also, Japanese Honeysuckle grows very densely in thick, smothering mats, while natives do not.</p>

Common Invasive Plant Species in Greenville, SC

Kudzu

Pueraria montana

ID: Woody vine with a thick stem. Leaves are alternate and compound with 3 leaflets. Middle leaflet has two lobes and each side leaflet has a single lobe. Pea-like flowers in clusters: purple in color.



Background photo: James H. Miller, USDA Forest Service, Bugwood.org

Vine

Severe Threat



Introduced for erosion control and feed for cattle, Kudzu is a major problem in South Carolina, forming dense mats along roadsides, fields, stream banks, and forest edges.

Wisteria

Wisteria sinensis

Wisteria floribunda

ID: Thick woody climbing vine up to 75 ft long. Leaves are alternate and compound with 7-19 leaflets with a smooth but wavy margin. Large clusters of pink, white, or purple flowers. Very fragrant.



James R. Allison, Georgia Department of Natural Resources, Bugwood.org

Vine

Severe Threat



Chinese and Japanese Wisteria are difficult to tell apart because they can cross breed. Infestations of Wisteria are common when the vine escapes from a place where it was planted for landscaping.

Periwinkle

Vinca major

Vinca minor

ID: Evergreen vine, growing along the ground up to 3 ft long and 1 ft high. Leaves opposite, glossy with slightly turned under smooth margins. Purple flowers with a central tube and pinwheel like petals.



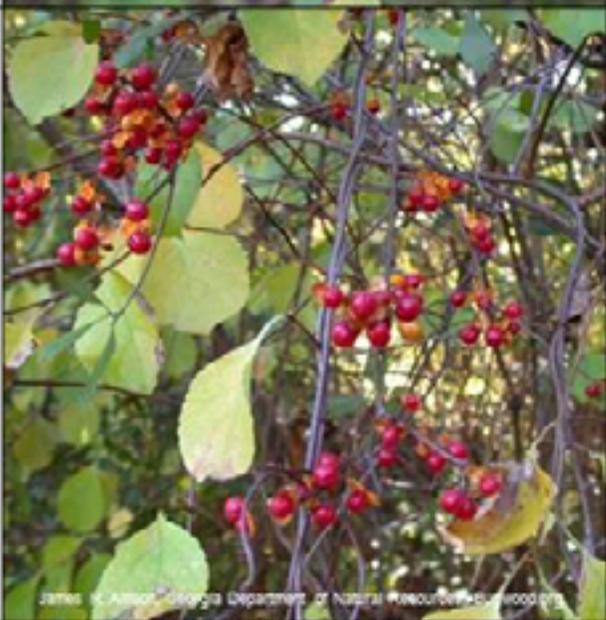
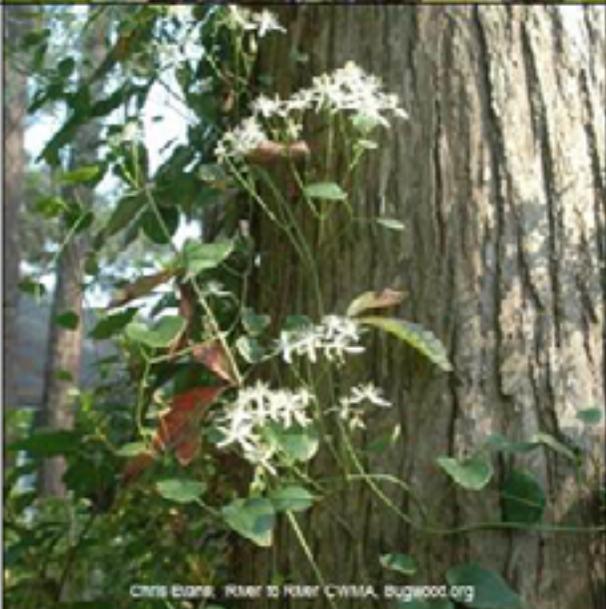
Vine

Severe Threat



Tell it apart from Carolina Jasmine which is trailing and climbing, has reddish stems, widely spaced opposite leaves, and yellow flowers.

Common Invasive Plant Species in Greenville, SC

<p>Chinese Yam, Air Potato <i>Dioscorea polystachya</i></p> <p>ID: Climbing vine up to 65 ft long. Leaves are alternate and heart shaped, tapering to a point with long petioles and smooth margins. Small “potato-like” fruit at base of petioles.</p>	 <p><small>Chris Evans, River to River CWMMA, Bugwood.org</small></p>	<p><u>Vine</u> Significant Threat ★</p> <p>This vine dies back in the Winter but can quickly cover a tree in the Spring. The “Air Yam” fruit drop and grow into new plants, often spread into new areas by water.</p>
<p>Oriental Bittersweet <i>Celastrus orbiculatus</i></p> <p>ID: Climbing and trailing vine up to 60 ft long with leaves alternate on the stem and glossy with finely toothed margins. Tiny greenish flowers. Fruits are yellow capsules with 3 red berries inside.</p>	 <p><small>James H. Adams, Georgia Department of Natural Resources, Bugwood.org</small></p>	<p><u>Vine</u> Significant Threat ★</p> <p>Tell it from American Bittersweet: Oriental Bittersweet produces lots of berries along the stem at the leaf axils while American Bittersweet produces fewer berries in clumps at the end of the stem.</p>
<p>Yam-leaved Clematis <i>Clematis terniflora</i></p> <p>ID: Climbing vine up to 30 ft long leaves compound with 3 to 5 leaflets with smooth margins, opposite on the vine. The stem of the vine sheds in strips. White flowers with four petals.</p>	 <p><small>Chris Evans, River to River CWMMA, Bugwood.org</small></p>	<p><u>Vine</u> Significant Threat ★</p> <p>Tell it apart from native Clematis vines: native Clematis have leaflets with toothed margins while the Yam-leaved Clematis leaflets have smooth margins.</p>

Common Invasive Plant Species in Greenville, SC

<p>Purple Crownvetch <i>Securigera varia</i></p> <p>ID: Vine, grows along the ground up to 9 ft long. Leaves are compound with 9 to 25 leaflets. Long green stalks lead to a cluster of white, pink, or purple flowers.</p>		<p><u>Vine</u> Emerging Threat ★</p> <p>Purple Crownvetch has underground stems called rhizomes that aboveground plants sprout from. A single plant can cover up to 100ft in 4 years.</p>
<p>Japanese Dodder <i>Cuscuta japonica</i></p> <p>ID: Parasitic vine, highly branching with yellow fleshy stems. Leaves are tiny and scale like. Light yellow flowers in late Summer and early Fall.</p>		<p><u>Vine</u> Alert ★</p> <p>Japanese Dodder is a parasite that feeds on the host plant. When enough is present, it kills the host plant.</p>
<p>This is a compilation of Trees, Shrubs, and Vines listed in the South Carolina Exotic Plant Pest Council's 2011 Terrestrial Exotic Invasive Plant Species List for the Piedmont and Mountain Region of South Carolina. Photographs were taken by J. DuRant unless otherwise credited.</p>	<p>Terminology (from SC-EPPC):</p> <p>Severe Threat: known to cause a severe threat to natural areas in SC</p> <p>Significant Threat: an Invasive In SC that does not spread as easily as severe threats</p> <p>Emerging Threat: a plant found in SC or neighboring states that forms infestations and is difficult to manage or is very widespread</p> <p>Alert: a plant known to cause severe damage in neighboring states and is either not in SC yet or is present in a limited amount</p>	<p>Identification and accompanying information is presented using simple terminology for the amateur botanist. For more information, visit SC-EPPC and the websites listed in the reference section.</p> <p>★: has been found in the wild in Greenville county (EDDMaps.org)</p> <p>★: has been found in the wild in a neighboring county (Anderson, Laurens, Pickens, Spartanburg, or Henderson)</p>

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