What's the Story with this Forest? – Part 1

Materials: pruning clippers, journals, pencils, hand lenses, *How to be a Tree Detective* handout

Extension activity materials: cups, water, sugar, a place with some light

Share this quote with the students and ask them if they know who said it.

"I see no more than you, but I have trained myself to notice what I see." Sherlock Holmes

Tell students they will be learning a new language. We will apply this language to reading the story of a landscape. Reading the landscape is a process similar to solving mysteries. We must not only learn and practice the language, but familiarize ourselves with the clues we are looking for and decipher what they might mean. Over the next few weeks, we will work on fine-tuning our observation skills and learning the language of plant identification in order to start piecing together the story of the forest near Marshall Pond.

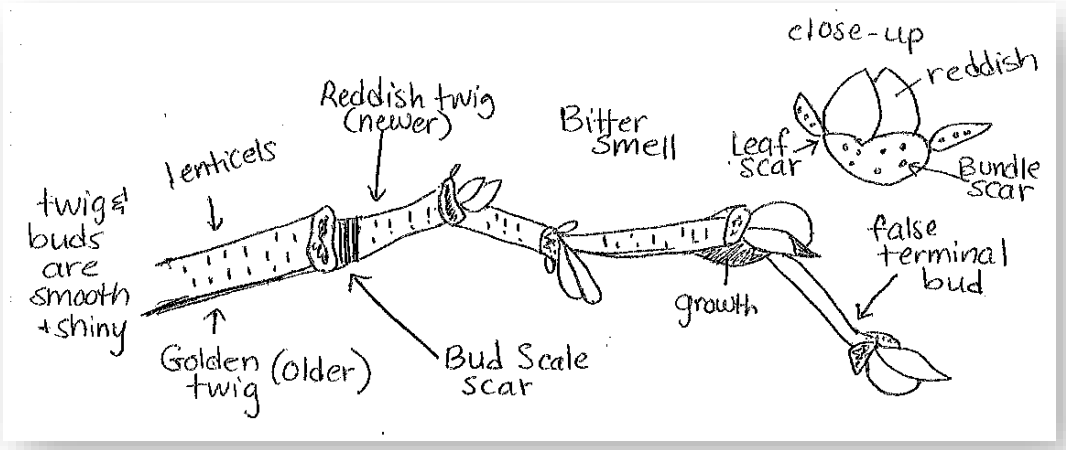
TWIG COLLECTION (20 min)

Tell students they will start with observing a tree in the school yard. Once they pick a tree, they need to gather some information: Draw the general shape of the tree and height in the forest related to other trees (i.e. tallest, medium height, short). Record the color of the bark, the texture, branch scars, lenticels on the trunk, any other obvious patterns or trends. If you see any fruit hanging from the tree, draw it and record where it is located.

Clip a twig about 8-10 inches long from each tree to bring inside for closer observation. Each student should have a twig to observe.

TWIG DETECTIVES (30 min)

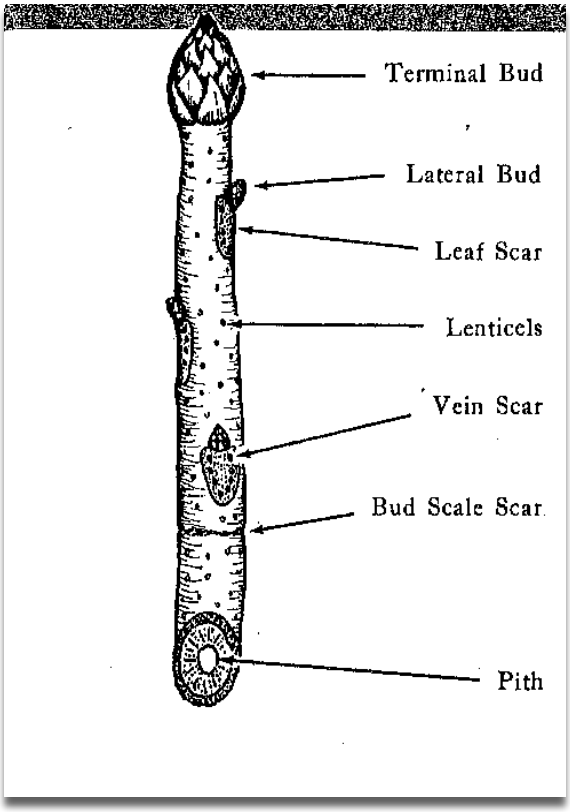
Ask students to make a careful drawing of their twig. Include every bump and mark on it as accurately as possible. Use the magnifying lens to examine the designs and patterns on the twig and draw them.



Tell students that to identify a tree from a twig, they have to know what clues to look for and the language scientists use when talking about them. Students will read *How to be a Twig Detective*. Then, they will use the vocabulary in the text to label their twig drawings. Ask students to estimate the age of their twigs and label them on their drawings.

They may use *Some Clues for Twig Detectives* (on the back of the handout) and the leaf scar shapes to narrow down what tree species the twig represents. They should record any new information in their journals.

Extension: Any time after February or so, you can force twigs to open up by bringing them inside and putting them in a cup of water that has a small amount of dissolved sugar in it. Set the cup in a place it will receive sunlight. Record what happens to the twig over the next several weeks. If possible, determine which buds are for leaves and which are for flowers. They can add this information to their drawings.



Content Information (from *Winter Tree Finder* pg 1)

Terminal Bud – From this bud the twig will grow longer in spring. It is often much larger than the lateral buds, but is absent from the twigs of some trees.

Lateral Bud – from this bud, a side branch will grow – shorter than the growth from the terminal bud.

Leaf Scar – A leaf was attached here last summer. Leaf scars represent the sealing off of the tree's plumbing system that supplied food and water to the leaf while it was still in place. Different species have different shaped leaf scars.

Lenticels – These cork-filled pores permit the green, living inner bark to breathe.

Vein or Bundle Scar – These dots on the leaf scars are the broken-off, cork-filled ends of the tubes that supplied water to the leaf.

Bud Scale Scar – From this scar the scales of last winter's terminal bud fell last spring. From the tip of the twig to the first bud scale scar is one year's growth. From the tip back to the second scar is two year's growth, and so on. The scale scars encircle the twig.

Pith – This is the soft, inner core of the twig.

These parts are also defined in *How to be a Twig Detective* that the students will read.

Next week, we will learn how to use tools for plant identification and do our best to identify the tree our twigs came from.

What's the Story with this Forest? – Part 2

Materials: White board, markers, twigs, journals with twig drawings, pencils, Winter Tree Keys, Tree Guides (for extra information)

Review learnings from part 1. Remind students that we are learning the language of plant identification in order to read the forest and figure out its story. This week, we will be learning about classification and tools used to identify trees.

CLASSIFICATION (BOOT KEY) (25 min)

Turn and Talk

1. Why do you think humans categorize living things?
2. How do humans categorize living things?

Ask students to sit in a circle. Tell each student to take one shoe off their foot and put it in the middle of the circle. Tell them we are going to categorize these shoes, but first we need to define what a shoe is and make sure all these items should be lumped together. Record the definition of a shoe where everyone can see it.

Group Share

1. What are some of the most obvious differences?
2. How might we separate these shoes into two groups?

Have the group agree on two categories. Appoint someone to write down the categories as they are devised. The categories should move from most obvious to least obvious. Continue to create and record categories until each shoe is left on its own. Name the shoe for the person it belongs to.

Example record of classification using shoes:
Label the first two groups 1A and 1B. For example, 1A: It is a boot. 1B: It is a sneaker. Have the students pick out other characteristics (color, shape, size, etc.) of group 1A that can be used to further subdivide the group. These will be labeled 2A and 2B. (Example: 2A: It is brown. 2B: It is not brown.) Continue this process until all of group 1A and all of group 1B are identified as individual items.
Each division should tell the key reader what the next step is to be or what the item is.
1A: It is a boot. . . . go to 2
1B: It is a sneaker . . . . (go to the next number after keying group 1A out fully)

2A: It is brown . . . . Tommy's boot
2B: It is not brown. . . .go to 3

Once the key is completed it should be tested. Have a student select a random shoe and take it through the key to find out how easy (or difficult) it is to use. If they discover any problems, they should fix them as they go.

Tell students that this kind of key is called a dichotomous key. Di means 2 and we have created this key by splitting our main group into 2 categories each time. This type of key is very common though there are other types of keys and guides out there.

Turn and Talk

1. What information did you learn from the dichotomous key?
2. What kind of information might you want to know that it doesn't provide?
3. How do you think the Winter Tree Key will compare to this key?

TWIG IDENTIFICATION (25 min)

Tell the students, they will be using the *Winter Tree Key* to identify the twigs they found last week. The dichotomous key starts on page 6 where it says, *BEGIN HERE*. The pages before that are mostly glossary pages and can be very helpful. Just like the boot key, they should always start at the beginning and work their way through the key choosing the characteristic that most closely matches their observations. They should follow the key until they get to a name. Then, compare the information given to their observations and twig. They should add any new learnings that support their identification to their journal pages. If the name doesn't seem to fit, they can check a Tree Guide. If that still doesn't work, they can work through the key again and see where it got tricky. It is possible the tree is not in this guide.

Group Share

1. What characteristics were most helpful in identifying your twig?
2. What other information would you have liked to have known about your tree?
3. Share any questions or wonderings that came up as you were identifying your twig.

What's the Story with this Forest? – Part 3

We have lots of choices here. It depends on what you and your students want to get out of these new skills of reading dichotomous keys and identifying trees in winter. Here are four options I can think of. If you have other ideas, please let me know and we can work together to make it happen. Maybe the students themselves could choose what they want to study, get materials together, and set-up the study itself.

TREE SURVEY

Answers the question, ***What kind of trees are in this forest?*** and It allows students to build winter tree ID skills and collect some baseline data. Everyone can be in the same habitat.

Extension: ***What do the trees tell us about this forest?*** We can use clues from Tom Wessels, *Reading the Forested Landscape* and *Forest Forensics,* to tell the story of the forest. Students would read a chapter out of the book before the Marshall Pond visit. We could make a handout with common land use clues and how to interpret them for the students to use outside or they could use the keys in *Forest Forensics*.

Extension: Resources of this forest – What can the trees and their parts be used for and who uses them? This can be ecological or economic in focus, connecting to natural or cultural history.

HABITAT COMPARISON (use field nearby) or PLOT COMPARISON (can be done in one habitat type)

Comparing tree species of 2 different habitats or plots.

Simple Form:

Answers the question, ***How does the tree species richness in these two habitats or plots compare?*** One plot could be on a flat area and another on a hillside. This data could be shown in a simple venn diagram displaying species richness (number of tree species present) or bar graph.

Extension: Investigate the reason for the differences. What factors are influencing tree diversity? This could lead to researching tree needs and collecting more data on specific factors (e.g. amount of sunlight/shade, air and soil temperature, soil pH, slope, etc).

More Complex Form:

Answers the question, ***How does tree diversity compare between 2 habitats or plots?*** Study plots would need to be set-up, trees identified and counted. It takes into account species richness (number of species) and specie evenness (distribution of species). It can be analyzed by the Simpson Diversity Index, but would need another class period to explain what it is and teach them how to calculate it. I can teach this or give you all the lesson for it.

Extension: Discuss the results and figure out what other factors influence or are connected to tree diversity.

Complex Form:

Answers the question, ***What successional stage is this forest in?*** This would involve setting up a plot. In the plot study, they would not only identify the trees, but count and record how many of each type are in their plot. They could also create size categories that loosely correlate with age (e.g. finger size, fingers on one hand touch around trunk, fingers of both hands touch around trunk, fingers touch with arms around trunk – tree hug, takes two people to reach around trunk, three people, etc) and count how many of each size of each kind of tree in the plot. This could be a great way to incorporate math and graphing into the lesson. And they would be designing their own way to record the information. Students would compare their data about tree distribution in the plots to other data to identify what successional stage the forest is in.

Extension: **Connect land-use history to the successional stages**. Read some of Tom Wessels, *Reading the Forested Landscape* and write down clues to tell the story of the forest or use the keys in *Forest Forensics* also by Tom Wessels to investigate land use history. Go back to Marshall Pond and search for these clues. Record information (could take pictures) and interpret what is found.