

The Tree Diaries:

An up-close and personal investigation into the innermost secrets of a tree of your choice

I like trees because they seem more resigned to the way they have to live than other things do.
~Willa Cather, O Pioneers! 1913

Overview

Goals: Trees – we can't live without them. Yet we often take them for granted, or ignore them completely unless we're looking for shade on a hot day. It's time for all that to change! During this semester you will:

- identify at least one *species* of tree.
- learn the *structures* of a tree and their *functions*.
- observe the *biological cycles* of a tree over 5 months.
- investigate the *ecological* place of trees in our *community*.

You will also learn what all those words mean if you're not already familiar with them.

Format:

- You will need a spiral notebook that will become your *Tree Diary*.
- Please put your **name** in LARGE letters on the cover of your book as soon as you get it. You may decorate your diary if you like, as long as we can still read your name and section. This diary will be kept in your EL&L binder, and will be subject to random checks and grading. •Bring your *Tree Diary* to every class!!
- Leave three blank pages (both sides) at the beginning of the diary for your **Table of Contents**. Make 4 columns on each page and label them:

Assignment #	Assignment Name	Date	Page #
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- You will be given a new tree assignment weekly. Assignments will include directed observations (we tell you what to look for) and/or collection of samples from your tree. All will be added to your book. The observation assignments will require you to make sketches and/or give verbal descriptions of what you see. You are welcome to draw or write more than is required. Inspiration and creativity are encouraged. (i.e. Poems, stories, use of color, etc. are *good* things.)
- Keep this overview sheet in a safe place, preferably your Earth Labs and Lit binder, for the duration

The Tree Diaries Assignment #1

The tree which moves some to tears of joy is in the eyes of others only a green thing which stands in their way.

~William Blake, The Letters 1799

Choose a tree for this project.

The tree of your choice must meet the following five criteria:

- It must be in a place where you will be sure to see it several times a week - (near your home or near school.)
- The circumference of the trunk must be *at least* 30 centimeters.
- The tree must be deciduous. It's leaves must be broad and flat (even if tiny) and *not* be needle-shaped. Your tree must lose its leaves and become dormant during the winter months.
- You must be able to touch the lower branches of the tree so that you can observe them easily.
- You must get permission from the owners of the tree to take periodic branch samples during the year. There will be no more than four of these, and no sample will be longer than 15 centimeters. The samples will be taken from a place that won't disrupt the silhouette of the tree.

Estimate the height and circumference of your tree, as practiced in class today.

3) Describe the location of your tree.

Include features of the environment that might affect the growth of your tree, such as:

- restrictions on water flow (e.g. pavement)
- physical barriers
- objects that might block sunlight
- competition from other plants
- etc.

4) Sketch a map showing how your tree is situated in relation to the features you discussed in your description. Include compass directions on your map.

5) It's nice to have a name for a friend whose intimate secrets you are going to share. If you want to (i.e. this is optional) name your tree.

Good luck and HAVE FUN!!!

The Tree Diaries Assignment #2

**NOTE: This assignment is done over the course of several days.
Begin immediately!**

1) Collect a sample twig from your tree. Follow these directions carefully!!

- You must get permission from the owners of the tree to take branch samples.
- Use a pruning shears, knife or sharp scissors to CUT your sample. *Do not break pieces off your tree!!*
- Cut a twig about 15 cm. long that has at least 2 leaves attached.

NOTE: Collect your sample from a place people won't see easily. (Keep the tree looking good.)

2) Make a detailed sketch of your twig and its leaves.

- Include any bumps or features on the wood of the twig.
- Show the shape of the twig accurately.
- Pay attention to the shape of the leaf and its (veins) and edges.

NOTE: If you have them, colored pencils are a good medium in which to do your sketch. Regular graphite pencils are the next best tools. A whole leaf or leaf-edge rubbing is a nice addition to your sketch.

3) Press the twig sample and glue it to a page of your Tree Diary.

- Lay a paper towel or paper napkin in your open diary.
- Place your twig sample on top of the paper. Press one leaf top side up and one leaf upside down., making the specimen *as flat as possible*.
- Cover the specimen with another paper towel or paper napkin. You now have a twig and towel sandwich.
- Carefully close the diary and place it under some heavy books. Leave it there for several days until the leaves are thoroughly dry.
- When your twig / leaf sample is flat and dry, prepare a small amount (2-4 ml) of a 50% / 50% mixture of white glue and water.
- Use a cotton swab or small paintbrush to coat one side of the specimen thoroughly with glue.
- Press the specimen, glue-side down onto a clean page of your tree diary, carefully smoothing all wrinkles and using small weighted objects to hold the twigs down until the glue dries (overnight).
- Label the specimen with the date it was collected and the date added to your Tree Diary.

NOTE: If your sample is too large to fit on one page, draw a *detailed* sketch of what the entire twig sample looks like. Cut it neatly (using the pruning shears again) and glue the pieces to successive pages. Label each page in some way so that it is clear how each segment corresponds to the original drawing.

The Tree Diaries Assignment #3

- 1) Take a very close look at your tree, at the bark, the branches, and up into the canopy (where all the leaves are). Spend at least ten minutes making these observations.

Do you see any animals or evidence that animals have been there? What is the evidence? What does it tell you about the animal(s) that are/were there?

Remember that not all animals are big and furry. Some have feathers. Some are insects or other small creepy crawly critters.

Write down what you observe. Draw sketches if you find something interesting

QUIET SIT

There is always Music amongst the trees in the Garden, but our hearts must be very quiet to hear it.

~Minnie Aumonier

- 2) Sit under your tree for ten full minutes and LISTEN quietly. When you are all finished, write down what you sense. How does sitting quietly make you feel? Write or sketch your thoughts about sitting quietly and really observing another living thing. This part of the assignment should be at least a page. You may be creative!

The Tree Diaries **Assignment #4: Leaf Poster**

- 1) The purpose of this assignment is to investigate your environment and notice things you never noticed before. It will also help you learn and recognize some features of tree leaves. These features will help you identify your special tree. Use the handout provided. You are encouraged to use other resources for clarification of terms and descriptions of characteristics. The Internet is useful, as are field guides. Be sure to include *all sources*, properly referenced. Your bibliography should be attached to the back of your paper, with your name on it!
- Make a collection of leaves that includes one example of each of the leaf shapes below.
 - Be sure to collect the *whole leaf*. Don't forget the petiole!
 - Some leaves might have more than one of these characteristics. You *may* use one leaf for more than one category.
 - Press leaves flat for one to two days.
 - Arrange the pressed leaves on a poster board or other display medium e.g. construction paper, cardboard, etc.). Try to make an attractive arrangement.
 - Mix some white glue half and half with water. Use a paint brush or Q-tip to glue the leaves to the poster board.
 - Carefully label each leaf as to which characteristics it displays.
 - Make sure your name and block are visible on your project!!

A simple leaf with no lobes.

A pinnately lobed simple leaf.

A pinnately compound leaf.

A palmately veined leaf.

A leaf that was arranged opposite on the branch.

A leaf that was arranged alternate on the branch.

A leaf with smooth margins.

A leaf with toothed or serrate margins.

A palmately lobed simple leaf.

A palmately compound leaf.

A pinnately veined leaf.

A needle shaped leaf.

An elliptical leaf.

A ginkgo leaf.

A leaf with wavy margins.

A lanceolate (lance shaped) leaf.

NOTE: You are welcome to exhibit creativity and imagination in your presentation as long as the science is evident!

Grading Rubric:

Two points for each attribute correctly collected and identified. (32)

Two points for following directions accurately. (2)

Six points for neatness, including spelling, legibility, leaf attachment, and design creativity. (6)

TOTAL POSSIBLE POINTS: 40

The Tree Diaries Assignment #5

- 1) Use the dichotomous tree key you got in class to identify your tree. Check your identification against pictures and descriptions in a field guide or on line. If the latter, verify your identification with at least three unrelated websites.
- 2) Copy into your tree diary the steps (i.e. dichotomous characteristic choices) that led you successfully to the identification of your tree species. This will give you a list of features that are used in differentiating your kind of tree from all the other species in the area.

Example: (Note: the number of steps you follow may be considerably greater than the 4 in this example.)

Practice Key

1. simple leaf go to 3
3. Leaf margin is toothed, or if lobed, the lobes are pointed go to 5
5. Leaf is toothed, but not lobed go to 7
7. Leaf is about twice as long as it is wide; margin of leaf is asymmetrical at its lower edge ELM

The Tree Diaries Assignment #6

Us sing and dance, make faces and give flower bouquets, trying to be loved. You ever notice that trees do everything to git attention we do, except walk?

~Alice Walker, The Color Purple, 1982

1) Check your tree at least every other day. As soon as your tree shows any sign of changing color, notice and write down:

- What part of the tree is changing first?
- What color or colors is it?
- What is the pattern of the spread of color?

Your tree diary should ultimately include a record of when and in what manner your tree changed from its summer growing state to its dormant winter state this year.

2) Do some research and find out what is responsible for the color change. What are the different pigments involved? Where do they come from? What is the advantage to the tree of changing its colors and losing its leaves?

The Tree Diaries Assignment #7

Every creature is better alive than dead, men and moose and pine trees, and he who understands it aright will rather preserve its life than destroy it.

~Henry David Thoreau, "Chesuncook," The Maine Woods, 1848

A food is a set of interactions between different species in an ecosystem. In assignment #3 you observed evidence of animals that interact with your tree. In this assignment #7 you will integrate those observations with the concepts of ecology that you have learned in the classroom. Reread your TD #3 assignment. With those observations fresh in your mind, record the following in your Tree Diary.

A. Your Tree is Part of a Food Web.

As some of you were able to see from nibble marks and tunnels in your tree's leaves, your tree is part of a food web. It is a producer, absorbing solar light energy, and taking in CO₂ from the air as well as water and various nutrients from the soil. Through the process of photosynthesis, these raw materials are converted into high energy molecules (such as glucose) which provide biologically useful energy to your tree and other organisms.

- With your tree as the producer at the base of your food web, identify
 - 3 primary consumers that might use your tree as a food source
 - 2 secondary consumers that might eat the primary consumers
 - 1 tertiary consumer that might eat one or more of the secondary consumers.

You may never have actually seen some of these organisms, but with careful observation, evidence of their existence in your food web should be possible to find.

NOTE: Your tree is part of a temperate deciduous biome. Restrict your food web to those organisms that actually inhabit the area in which you and your tree currently live.

In high winds, some of your trees may have lost branches, and many are losing leaves as part of their normal seasonal cycle. Over time, these discarded tree parts will seem to disappear. We know, however, that they are being recycled and the nutrients they contain returned to the soil.

- list at least 5 decomposers that may use the "dead" tree material for energy while returning nutrients to the soil.

B. Build the Food Web

Using the list you created in Part A above, build a food web with your tree at the center. Start with your tree and link each living thing in turn. Draw the arrows in the direction of energy flow (from the *eaten* TO the *eater*). Are humans parts of your web? If so, where do they fit in?

C. A Hole in the Web

Imagine that your tree was cut down. What would happen to your food web? What would happen to the organisms in the web? How would the removal of your tree affect the ecosystem in which it now exists?

D. Your Tree in Time

We have also discussed the concept of *succession* in class. Chances are your tree is less than 100 years old. What do you think the ecosystem was like before your tree was there? Think about what plants and animals might have been inhabiting the space. Where did they go if they are no longer there? What do you think will happen in your tree's environment in another 100 years?

The Tree Diaries Assignment #8

PART I

- 2) **Continue to check your tree at least every other day for changes in leaf color and leaf loss.**
- 3) In your tree diary, **record observations** that answer the following questions:
 - What color or colors is your tree turning?
 - What is the pattern of the spread of color?
 - When did your tree start losing its leaves?
 - Which leaves are coming off your tree first?
- 4) When do you think your tree will finally lose all of its leaves? **Record your prediction.**

When your tree has lost ALL of its leaves, make note of the date (was your prediction accurate?) and you are finished with this assignment. You now have a Tree Diary break until after the New Year, but give your tree an occasional glance anyway, just to stay in touch.

PART II

*And this, our life, exempt from public haunt, finds tongues in trees, books in the running brooks,
sermons in stones, and good in everything
~William Shakespeare, As You Like It 1623*

- 1) Imagine what it would be like to be your tree. Think about what you (the tree) would have experienced since September when you (the student) started your observations.

Write an autobiography in the voice of your tree. It should be two typed (12 point font, double spaced, one inch margins) pages. You may be as fanciful as you wish, but you must include some biology! Keep in mind the following questions:

- What role or roles do you play in your ecosystem?
- What niche do you occupy?
- With what other organisms do you interact? (e.g. What happened to all of those leaves you dropped? What were you seen with back in assignment number 3?)
- What abiotic factors influence your growth?
- What parts of your lifecycle have you been living through lately?
- What do you anticipate for the rest of the winter and the spring ahead?

NOTE: You may do research if you wish, but it is not required.

The Tree Diaries

Assignment# 9: Winter Twig Lab

Homework

Write down what time sunrise and sunset as well as the maximum and minimum temperatures on the day you did this assignment. (You can get this info in the newspaper or on the web if you do not have a thermometer at home that indicates such information.)

The question is not what you look at, but what you see.
~Henry David Thoreau, *Journal*, 5 August 1851

What I see is mine.
~Henry David Thoreau, *A Week on the Concord and Merrimack Rivers* 1849

- A)** Take a very close look at five of the small branches (twigs) of your tree.
- 1) Do the ends of each twig look the same?
 - 2) Make a *detailed* sketch to scale (actual size) of the last 5 cm. of a twig that seems like most of the twigs you examined.
- B)** Choose a nearby tree that you think is a different kind than your tree.
- 1) Do the ends of each twig look the same?
 - 2) Make a *detailed* sketch to scale (actual size) of the last 5 cm. of a twig that seems like most of the twigs you examined.
 - 3) List 5 ways that the ends of these twigs are different from the ends of the twigs on your tree.
- C)** Select a twig of your tree. Find one that has:
- 1) a bud on the end
 - 2) interesting lumps and bumps and buds that form a pattern along the length of the twig. These lumps and bumps and buds may be a cm. or more apart!
- D)** Make sure you have permission from the tree's owner, and cut (DO NOT BREAK!) a 30 cm twig from your tree. Bring it to school with you on Thursday.

The Tree Diaries

Assignment# 9: Winter Twig Lab

In Class

PART I:

In this lab you will use the dissecting microscope to observe details of a twig sample from your tree. You will record these observations *very carefully and completely* in your tree diary.

A. Look carefully at the diagram on the next page. This is a “typical” twig with all of the features you will look for on your twig. Each of the features on your twig will be a little different than this diagram. **B.** Draw your twig. Be very detailed. Copy as accurately as you can the following features:

- Terminal Bud:
Form a hypothesis as to what you think this is for?

- Lateral Bud:
Form a hypothesis as to what you think this is for?

- Bud scales:
How many on each bud?
What shape?
What color?
What do you think they do?

- Leaf Scar:
Copy the shape carefully.

Draw the scar in relation to a lateral bud.

Think about what your tree looked like a few months ago. What do you think this scar is from?

- Use a metric ruler to measure (in mm. or cm.) the length of the first five internodes. Count the internode between the terminal bud and the first leaf scar as internode #1.

- 1)
- 2)
- 3)
- 4)
- 5)

- Examine relationship of the nodes to each other:
 - Are they on the same side of the twig each time?
 - Opposite sides?
 - Do they spiral around?
 - Are they next to each other?
 - Other description?
 - What might this tell you about how your tree looks with leaves?
- How many vascular bundle scars (little dark dots) are there in each leaf scar?
 - What pattern do they make? Make sure you include them in your diagram.

Think about what you've observed about leaves and hypothesize what these scars are from. (Remember the raw materials that leaves need in order to photosynthesize!)

- Bud scale scar:
 - How long (in mm. or cm.) is your twig between the terminal bud and the first bud scale scar?
 - Think about where you have seen bud scales. Where do you think these scars come from? What might this tell you about how your tree has grown?
- What color is the bark on your twig?
- Is there pith (soft material) in the middle of your twig? Draw what it looks like when viewed under magnification.

Part II:

Distributed around the room are twigs from a number of different kinds of trees. Each twig is labeled with a number. Observe each twig VERY closely.

- 1) Match twigs with other twigs that seem to be from the same kind of tree.
- 2) Record the numbers of each pair of twigs.
- 3) If your twig matches any of the numbered twigs, write that down next to the numbered pair.

The Tree Diaries Assignment #10

It is difficult to realize how great a part of all that is cheerful and delightful in the recollections of our own life is associated with trees.

~Wilson Flagg 1857

OPTION 1: Find out about a tree that is important in your family's cultural heritage.

- 1) Does it provide food? If so, what food? Bring in a recipe or a sample for all of us to taste.
- 2) Does it provide some other raw material? (e.g. lumber, firewood, fiber, dye, medicine, etc.) If so, what does it provide? Explain in a few sentences how it is harvested and used.
- 3) Are there any myths or legends associated with this tree? If so, please find out what they are and bring in a copy of the story. (Try relatives, the library, or the internet!) Illustrations are entirely appropriate, but not required.

OPTION 2: Think of a tree that has had significance to you in your life. Why was/is it important to you? Write a few paragraphs to describe the nature of the significance.

Did you play in it?

Did it provide shelter?

Was it a landmark for you?

Did you find an interesting bird or animal in its branches?

Did your pet cat climb it and get stuck?

Did it fall down in a hurricane or get struck by lightning?

Did it get hit by a delivery truck?

Did you pick fruit from it?

Did you rake up its leaves and jump in the pile?

Is there something else special about it?

OPTION 3: Write a creative one to two page (typed) story or poem about a special tree such as you would have written about in option #2. Illustrations are entirely appropriate, but not required.

The Tree Diaries FINAL ASSIGNMENT

Your entire Tree Diary will receive a 100 point grade for the term.

1) Make a list of *AT LEAST* ten things you learned through doing the Tree Diaries project this year. Use complete sentences. Illustrations are entirely appropriate, but not required. (20)

2) What else would you like to know about trees (if it required no work for you to find out?)

What I will be looking for when I grade your tree diary for the final time:

- A complete and accurate Table of Contents (15)
 - NOTE: The order of columns is not important
 - Assignment number (really – chronologically)
 - Date of assignment
 - Name or *very* brief description of assignment
 - Page number of assignment

- Dates each assignment was completed written at the top of the page where you wrote the assignment. (10)

- All loose pages either neatly stapled or neatly taped into your book (10)

- Timely responses to all of my comments (15)

- Thoughtful, analytical, attentive written descriptions and answers to assignment questions (15)

- Careful and detailed observations (15)

Only if you have done every assignment are you eligible to receive the maximum score.

Name _____ Block ____

- A complete and accurate Table of Contents (15)
 - NOTE: The order of columns is not important
 - Assignment number (really – chronologically)
 - Date of assignment
 - Name or *very* brief description of assignment
 - Page number of assignment
- Dates each assignment was completed written at the top of the page where you wrote the assignment. (15)
- All loose pages either neatly stapled or neatly taped into your book (10)
- Responses to all of my comments (20)
- Thoughtful, analytical, written descriptions and answers to assignment questions (20)
- Careful and detailed observations (20)

Name _____ Block ____

- A complete and accurate Table of Contents (15)
 - NOTE: The order of columns is not important
 - Assignment number (really – chronologically)
 - Date of assignment
 - Name or *very* brief description of assignment
 - Page number of assignment
- Dates each assignment was completed written at the top of the page where you wrote the assignment. (15)
- All loose pages either neatly stapled or neatly taped into your book (10)
- Responses to all of my comments (20)
- Thoughtful, analytical, written descriptions and answers to assignment questions (20)
- Careful and detailed observations (20)

Rubric for first Tree Diary Assignment

Spiral notebook	1 point	
Name in large letters on cover	1 point	
Block in large letter on cover	1 point	
Three pages for Table of contents	1 point	
First entry listed in ToC	1 point	
Height and circumference of tree	1 point	
Minimum size or larger	1 point	
Appropriate metric units	2 points	
Description of environment	5 points	
Map of tree site with compass points	3 points	
Spelling, neatness, complete sentences	3 points	
TOTAL for assignment		20 points

Rubric for second Tree Diary Assignment

Corrections for previous assignment	half credit	
Assignment listed in ToC	1 point	
Twig cut, not broken	1 point	
Twig at least 15 cm. Long	2 points	
<u>Detailed</u> sketch	5 points	
Sample carefully and neatly pressed	3 points	
Sample pressed with one leaf top-up, one leaf top-down	1 point	
Sample properly mounted	5 points	
Collection date noted with sample	2 points	
TOTAL for assignment		20 points

Rubric for third Tree Diary Assignment

Corrections for previous assignment	half credit	
Description of animal evidence	4 points	
Significance of evidence	5 points	
Thoughtful response to quiet sit	5 points	
Observations made during quiet sit	5 points	
Spelling, neatness, creativity, complete sentences or artistry	1 points	
TOTAL for assignment		20 points