Dendrochronology Lab

Name _____

Lab Partner _____

Date _____

Please complete the web based investigations and questions before you begin the laboratory portion of this lesson. Web links for this investigation can be found at http://www.tvja.org/science/plants.htm.

1. Click on A Year in the Life of a Tree. (http://www.domtar.com/arbre/English/une_annee_dans_la_vie_dun_arbre/index.asp) Locate and select the section on Annual Rings. Read the text and study the illustrations. Click on more about annual rings. Continue clicking on the link at the bottom of each page until you have read the entire lesson. When you get to the bottom of the part titled "Read Between the Rings" please complete the two games ("Read Between the Rings" and "From Bark to Pith") to test your knowledge. Print each page after checking your answers and staple them to this paper.

2. See Talking Trees: A living diary of climate. (http://whyfiles.org/021climate/ringers.html) Who predicted that annual growth rings might become a barometer for measuring future climate?

   Information locked within tree rings has become a standard scientific gauge used to measure what five things?

   Define Dendrochronology:

   What is the process in which patterns from different trees are matched to pinpoint the year a tree produced a particular ring?

   What tree is the longest living organism on earth?
   How long can they live?

   "The advantage of using trees to study climate is that they are living records of past climate and weather. Those records are available in parts of the world where there are few _____ and where consistent … records … rarely go back more than _____."

3. Select A Guide to Dendrochronology. (http://tree.ltrr.arizona.edu/lorim/lori.html) Find and click on Crossdating – The Basic Principle of Dendrochronology. What is accomplished by matching patterns of wide and narrow rings between core samples?

   What three steps where taken during a process called *chronology building* of a Puebloan ruin?

   What is the *principle of sensitivity*?

4. View the slide show and read the text titled: Tree Rings: Ancient Chronicles of Environmental Change (http://www.ngdc.noaa.gov/paleo/slides/slideset/index18.htm) What are the two main types of ring producing trees?

What is an intra-annual or false ring?

What causes a locally absent or missing ring to occur?

What hand-held instrument is used by dendrochronologists to collect tree-ring samples?

Because dendrochronologists do not want to destroy living trees, where might they obtain a full cross section?

Skeleton plots are used to develop a pattern of characteristic rings and to detect _____ and other dating errors, thus ensuring accurate dating.

What is dendroclimatology?

Tree-ring reconstruction of annual rainfall for western New Mexico shows variations in precipitation for the last _____ years.

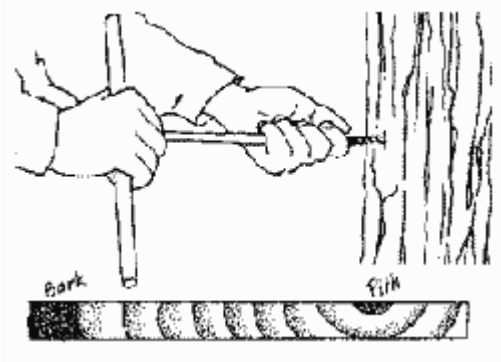
5. Visit Tree Bore Study of Kettle Pond (http://www.madison.k12.wi.us/stugeon/biomasskettle.html) What problem were the 7th grade students of Spring Harbor Middle School trying to solve?

Based on their data, what was their conclusion?

6. Study the Increment Boring Procedure that follows. Pay attention, because you and your lab partner are going to be using an increment borer during this lab. You will need to demonstrate your knowledge of how to use an Increment Borer to your teacher before collecting your core sample.

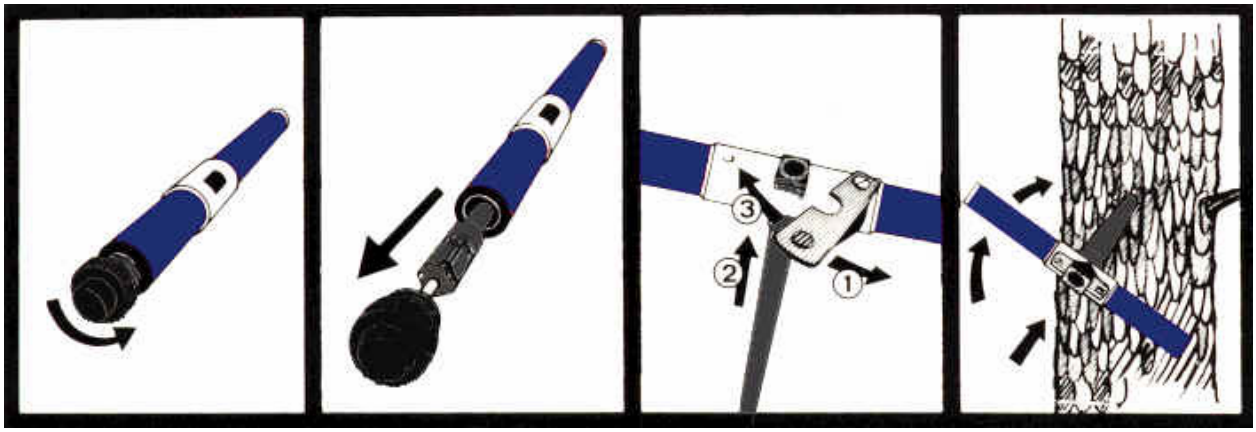
Materials

- Increment Borer
- Bee's Wax
- WD-40
- Tree Tar
- Plastic Soda Straw
- Zip-lock Bag
- Tape
- Sand Paper
- Hand Lens or Dissection Microscope
- Camera or Pencil & Drawing Paper
- Plant Press
- Chemicals & Glassware for Staining core samples from certain trees (see your teacher for help)



Increment Boring Procedure

1. Remove the borer bit and extractor from inside the handle and assemble the handle and bit by pushing the locking latch away from the handle and inserting the square end of the borer bit into the handle. Return the locking latch completely around the bit and tighten the locking latch screw.

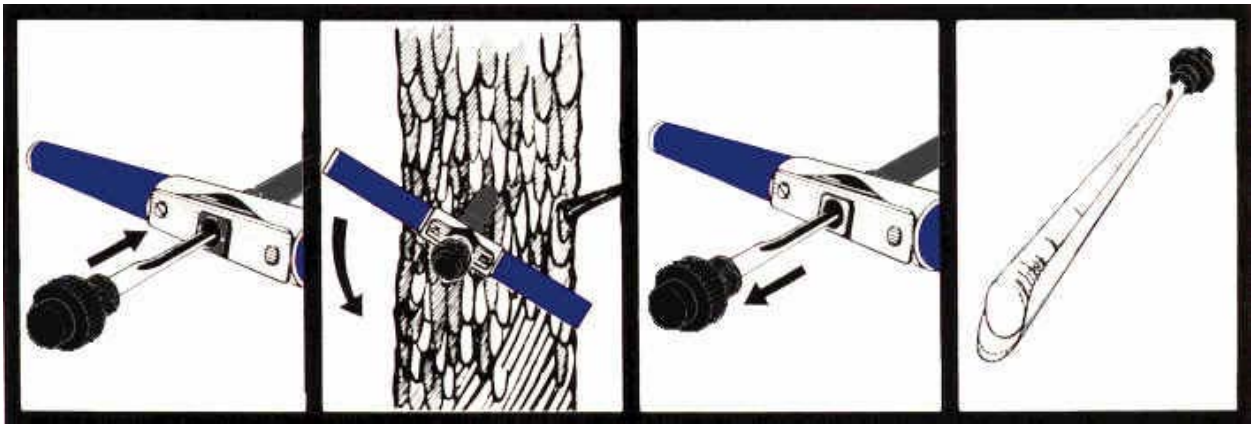


2. Apply beeswax to the threads and shank, completely covering the outer surface.

3. Align the borer bit and handle so that the bit will penetrate through or towards the center of the tree. Place the bit threads against the tree, at chest height, preferably in a bark fissure where the bark is thinnest. Hold the threaded end steady with one hand while pushing forward on the handle and turning to the right. Turn until the threads penetrate the wood enough to hold the bit firmly in place.

4. Place both hands, palms open, on the ends of the handle and turn clockwise until the bit reaches the desired depth, attempting to drive through the absolute center of the tree.

5. Insert the full length of the extractor, concave side up. Then turn the handle one-half turn counterclockwise to break the core from the tree and also to turn the extractor.



6. Pull the extractor from the borer bit. The core will be resting in the concave side of the extractor, held in place by the toothed edges at the tip. Remove the borer bit from the tree before examining the core sample. Leaving the borer bit too long in the tree may cause it to become stuck as tree sap moves in around it. If unsatisfactory results are obtained (broken core, unclear core, or incorrect placement), repeat the proceeding procedure on another nearby section of the tree. If the core becomes stuck inside the bit please ask your teacher for help.

7. Paint the wound with tree wound paint / tar, covering the open hole.

8. Slide the core sample into a plastic soda straw and label accordingly. Several straws may be taped together end-to-end if the core sample is long. Place each sample in a labeled resealable plastic bag. Store the cores in a refrigerator to discourage mold growth or freeze them until examination takes place.

9. At the end of lab, the borer and extractor should be sprayed with WD-40™. This will remove resinous deposits and prevent acid-etching of the borer by residual sap. Sprayed surfaces should then be wiped with a clean cloth. The inside of the bit should also be lubricated.

10. Photograph or draw a picture of your tree. If you choose to draw your tree, please use proper drawing paper and pencil(s). Take the time necessary to make an accurate illustration. If you choose to photograph your tree you may borrow the digital camera from your teacher.

11. Collect and press a leaf or needles from your tree. Be sure to label your leaf in the plant press to avoid potential loss.

12. Identify your tree using one of the identification web sites such as Trees of the Pacific Northwest (http://oregonstate.edu/trees/) or one of the identification books available in the classroom. Please list both the common and Latin name.

Core Sample Preparation

13. Use sandpaper to smooth out your core sample along its entire length. Start with medium grit, then fin, and end with extra fine. Work carefully if your core is fragile. If you can clearly see the rings you may want to skip this step to avoid crumbling the core on some species.

14. Carefully examine your core sample using a hand lens or dissection microscope. Can you distinguish the annual growth rings? _____ If yes, go on to Core Sample Analysis. If the rings are indistinguishable you will need to stain your core sample to make this job easier. Please read the following directions before asking your teacher for assistance:

Use of Phloroglucinol Stain

Annual rings may be difficult to distinguish in a sample core due to species-specific characteristics such as in diffusely porous species. Irregularities within the tree due to climatic or site influences may also create difficulty in ring evaluation. In these instances, sample cores may be stained with phloroglucinol solution, which stains the lignin of the wood red and leaves the cellulose unstained, therefore making the growth rings more distinct. Two solutions are required: a solution of 1% phloroglucinol in 95% ethyl alcohol and a solution of 50% aqueous hydrochloric acid.

Procedure:

1. Soak sample cores in phloroglucinol solution for one minute.
2. Place cores in hydrochloric acid solution.
3. Remove the cores from the acid solution when they begin to turn red (approximately one minute), then rinse carefully in tap water.
4. Allow the cores to dry.
5. Examine under fluorescent light. Growth rings will become more distinct as the core sample dries.

Core Sample Analysis

Carefully observe your core sample using a hand lens or dissection microscope to answer the following questions.

1. Where can you find the oldest growth rings on your core sample? Near the pith or the bark end?

2. What year does the last growth ring on you core sample represent?

3. According to your core sample how old is your tree? What year did your tree begin growing?

4. When was the wettest year? _____When was the driest year? _____

5. Was this tree alive when you were born? _____ What year were you born? _____ According to your core sample, was your birth year a dry or wet year? _____ How do you know?

6. Crossdate your core with that of another lab team. Which core is oldest? _____ What year did the older tree begin growing? _____ What species is represented by the other group's core sample? _____ How well do the rings match up? Describe your observations.

7. Please tape your core sample, the pressed leaf from your tree, and photograph/drawing of your tree in the appropriate spaces below. If either of these is too large for the space provided affix it to a separate sheet of paper and staple it to this paper.

Reflection Questions

1. Why must you apply tree tar on the wound after extracting the corer bit from the tree?

2. How can you study climate and weather patterns using tree core samples?

3. If you came across a fallen tree in the forest how could you find out how long it had been dead?

Photograph / Drawing	Leaf
Core Sample	