

A. Background: Highlight as you read.

1. **Stems** hold a plants **leaves to the sun for photosynthesis**. Stem & root **cells** form tubes, or **tissues**, for transportation of materials. The tubes work together as the **vascular system** of a the plant. **Our vascular system** is also made of tubes and is our b_____ or _____ system.

Xylem /'zīlēm/ **tubes** carry **water u**_____ to the leaves.

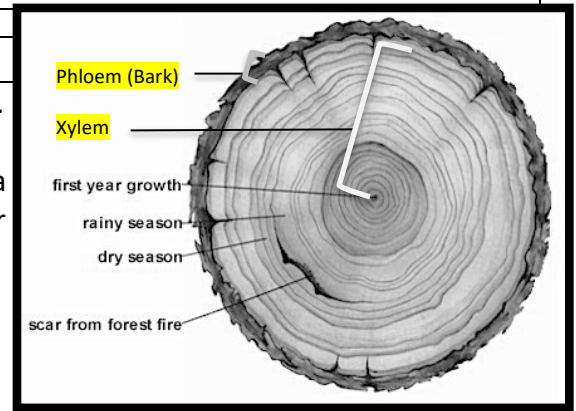
Phloem /'flō,em/ **tubes** carry **food d**_____ to the roots.

2. **HERBACEUS STEMS** die in winter and have to start new from the root or a seed in the spring (tulips, celery, beans and wheat). Their **xylem & phloem** tubes are in small groups called **vascular bundles**.

3. **WOODY STEMS** (trees & shrubs) live many years. Here, they rest during the winter and grow again in spring. Times of growth and rest result in **growth rings**. Some trees live hundreds of years.

4. Each growing season, or year, new growth is added on the outside of the stem. During spring large **xylem** cells are added around the outside of the stem, forming a ring. Large cells (tubes) appear light in color. In the heat of summer and the cool of fall, growth is slow and small cells (tubes) are added. Small cells look dark. Together these cells (tubes) are a **growth ring** (light & dark) in cross-section. Each growth ring's width is determined by the growing conditions at the time. Besides the age of a single tree, growth rings (tree rings) can be used to determine the history of an area, including a)growing _____, b) weather, c) insect damage, d) injury, e) crowding and f) fire damage.

5. Outside the **xylem**, smaller **phloem** cells are added. **Phloem** carries _____ to the roots and in later years, become protective **bark**. **Bark** rings are usually too small to see and split and/or falls off as the tree grows. The **bark**, or p_____ rings are not accurate to count. **Have Checked**



B. Growth Rings of Woody Stems Lab:

6. **Woody Stems** add a **growth ring of vascular tissue** each **y**_____ (or growth season). Large cells of spring look light Small cells look dark. Together they = 1 year. For age, count dark or light, not both.

- ___a) Observe growth rings of a cross-section of a tree stem (trunk or branch).
- ___b) Find evidence an event, fire damage or a new branch. (A black marker mark = "fake fire" damage.)
- ___c) Determine the age of at least 10 different type of tree stems, 5+ with "fake fire" and 5+ with other events.
- ___d) Record Data. Include ID number. You may ask for another sheet to do more.

Trial	ID #:	Name of Tree:	Age in Years:	Event: "fire", new branch or ?	Age at Event:	If cut this year, year of event:
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

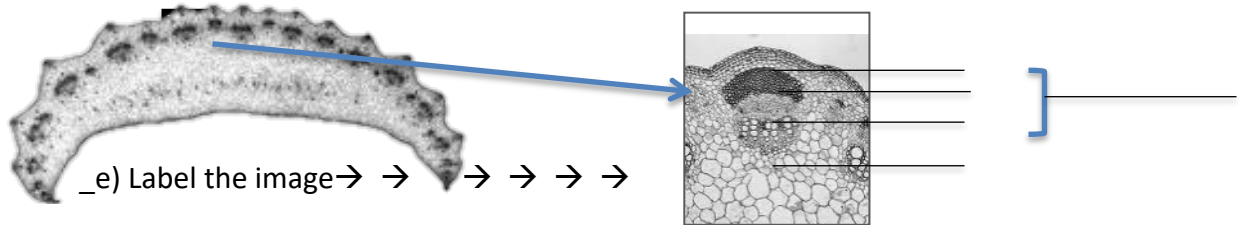
Have Checked

C. Vascular Bundles of a Herbaceous Stem Lab

7. Herbaceous Stems have vascular tissue (tubes) in small groups called **Vascular Bundles**.

Observe the **VASCULAR BUNDLES** in a stem that has been in colored water. (The photo is of celery)

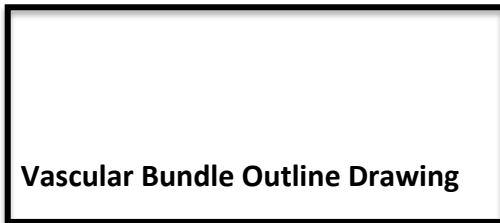
- _a) The **X** _____ **TUBES** carry water _____ (up or down?) so are colored _____ .
- _b) The **P** _____ **TUBES** carry food down, so are still green or colorless.
- _c) **CAMBIUM** cells make new cells and is between the xylem and phloem.
- _d) The surrounding large cells are **CORTEX** cells and are for food and water storage



_e) Label the image → → → → →

8. Ask for one herbaceous stem cross-section (sample) of a celery or other herbaceous stem.

- _a) **Locate one vascular bundle.** Ask for and use the USB microscope to view close-up.
- _b) Focus on **ONE vascular bundle.** Take a photo. Ask for help to “Click” as you focus.
- _c) Draw a **OUTLINE scientific drawing** of the cross-section of your **one** vascular bundle.
- _d) Label **xylem, phloem & cambium**
- _e) Remove only the **xylum** from a slice of celery (or other stem) **& tape it below:**



Have Checked

C. Growth Rings of Animals:

9. Animal Growth Rings show up in various organisms and ways.

- _a) **View actual examples.** Choose one to draw.
- _b) Draw an outline scientific drawing of one example. Label.



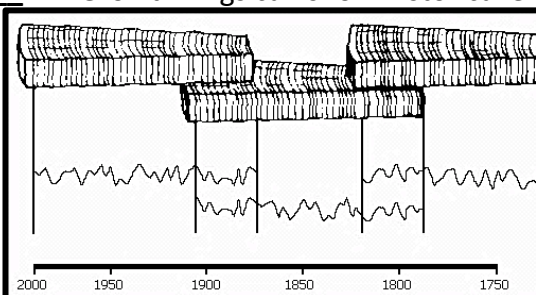
10. The image is of an example of growth rings of a Desert Tortoise.

- _a) **Use a pencil and mark one set of the growth rings.** →
- _b) This tortoise shows _____ rings of growth (growth cycles).



D. Using Growth Rings to Determine Historical Events.

11. Growth rings can show historical events back farther than the age of any one tree.



← At left is an example.

- _a) The oldest tree is on the _____ (left, right, middle).
- _b) It was cut in about the year _____ .
- _c) Find 3 good years in a row. Estimate the year(s).

Have Checked