



HERBACEOUS STEMS die down in winter and start from the root or a seed in the next growing season (tulips, celery, beans and wheat). Their **xylem and phloem** is in groups or **vascular bundles**.

WOODY STEMS live year round and continue to grow each growing season (trees & shrubs). Trees may live a few years or hundreds of years. Layers of vascular **xylem & phloem** are **growth rings**.

A. Woody Stems add a growth ring of vascular tissue each year (growth season).

- 1) Observe the **GROWTH RINGS** in at least five (5) different type of woody stems (trees). The **GROWTH RINGS** are the **X _____ TUBES** and are called the **WOOD**. The **PH _____ TUBES** are called **BARK**.
- 2) Count the growth rings to determine the age of the tree (or branch) when it was cut. To count growth rings you start at the **c_____** and count either light or **d _____** rings to the **CAMBIUM**, which is the inner edge of the **BARK**.
- 3) Record Data. A black mark represents a "fire". Include ID number.

Trial	ID #:	Name:	Age in Years:	Event: "fire" or new branch	Age at Event:
1		Sycamore			
2		Maple			
3		Apple			
4		Sumac			
5		Oak			
6		Red Fir			
7		Tamarack			
8		Plum			
9		Cactus			
10					

B. Herbaceous Stems have vascular tissue in small groups called **Vascular Bundles**.



- 4) Observe the **VASCULAR BUNDLES** in a stem that has been in colored water.
- 5) The **X _____ TUBES** are colored.
- 6) The **PH _____ TUBES** are still green.
- 7) **CAMBIUM** cells are between the above two.
- 8) Most cells are **CORTEX** cells for storage
- 9) Draw a scientific drawing of **one Vascular Bundle**. Label **xylem, phloem and cambium**.

Extend: ##C. Animal Growth Rings show up in various ways. Observe photos or examples. Record data in chart: Animal, Ring Type, Drawing and Source (Reference).