

Student Guide

Waterlogged Wood Activity

Introduction:

Many wooden artifacts are recovered from underwater conditions, like shipwrecks. When an object is waterlogged (fully saturated with water), oxygen is excluded, thus preventing or slowing many typical reactions that lead to complete decay. Over time, water enters the wood cells and eventually degrades the cellulose and lignin, thus undermining the structural integrity of the cellular structure. If excavators or conservators allow the waterlogged artifact to dry out, the weakened cells can collapse and cause the artifact to shrink, crack, and warp. To prevent this collapse, conservators replace the water with another material, such as polyethylene glycol, which will support the weakened cell walls.

Objectives:

- To understand the effects of waterlogging at the cellular level and its impact on artifacts

Supplies:

Bass wood strips or pieces
Ruler
Distilled water
Beaker (100 mL)
Beaker (25 mL) or weights
Single-edge razor or X-acto knife
Microscope slides (4)
Coverslips
Tweezers
Compound microscope
Food dye

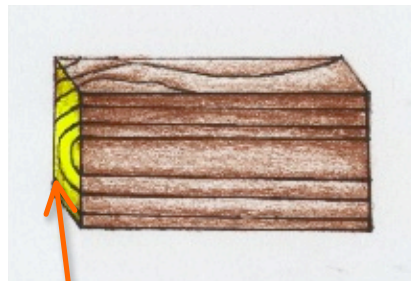
Safety: Razor blades should be handled carefully.

Procedure:

1. Place a small piece of dry balsa wood into a beaker and cover with water. Allow it to soak while continuing with steps below.
2. Remove one piece of wood from the stock dye bath. Pat it dry with a paper towel.
3. Using a fresh single-edge razor blade or X-acto knife, cut a thin slice from the transverse plane of the dyed wood (See diagram below.). Take extra care to cut perpendicular to the grain direction so that the cells are clearly visible. Make sure your fingers are away from the cutting edge. The slice should be almost paper thin to allow the microscope light to pass through. Cutting thin slices requires practice and a very sharp blade.

4. To prepare a wet-mount slide, place a drop of distilled water in the middle of a glass slide. Using tweezers, place the wood slice in the drop of water. Coverslip and label the slide.
5. Remove the piece of wood from the beaker you filled with water. Pat it dry.
6. Using a razor blade, cut a thin slice from the transverse plane of the wet wood.
7. To prepare a wet-mount slide, place a drop of distilled water in the middle of a glass slide. Using tweezers, place the wood slice in the drop of water. Coverslip and label the slide.
8. Examine the two slides under the microscope at 10x power and at 40x. Draw the cells on the worksheet. Observe differences between the wet wood and the dyed (waterlogged) wood.
9. Allow the dyed (waterlogged) wood sample to dry out. The sample may dry at room conditions, but could require several days. To encourage drying, carefully remove the cover slip. Sample slides may be placed on a warming plate or in a warm oven for several hours or overnight. Replace cover slip and handle carefully to prevent dry samples from blowing off slides.
10. Examine the *dried* (dyed, waterlogged) wood under the microscope at 10x and 40x. Draw the cells on the worksheet. Observe the differences between the dried-out waterlogged wood and the dry wood.

Clean up: Return all supplies. Water and dye baths can be poured down the sink.



Transverse Section

Student Name _____

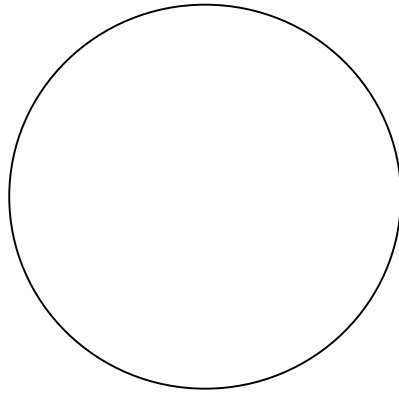
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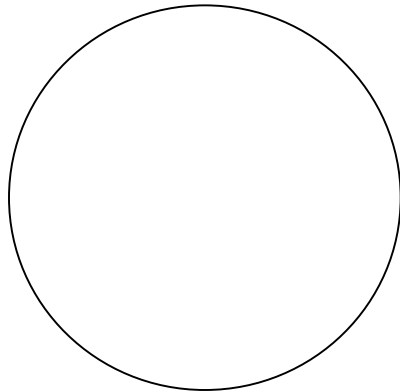
**Waterlogged Wood
Answer Sheet**

I. Looking closely at a one area of your sample, draw a group of 6+ cells as they appear under magnification.

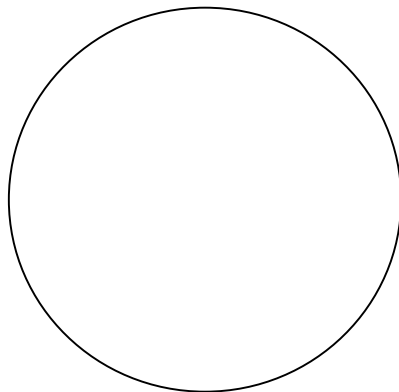
A. Wet Wood



B. Waterlogged Wood



C. Dried Wood



1. Using the names for specific parts of the cellular structure, describe the visible differences between the cells of the wet wood versus the waterlogged wood (samples A & B).

2. Using the names of specific parts of the cellular structure, describe the visible differences between the cells of the waterlogged wood versus the dried wood (samples B & C).

3. The differences you observed among these small samples occurred over a relatively short period of time. What do you imagine will happen to a large object (like a sunken ship) if the waterlogged cells are allowed to dry? Will the wood be strong and structurally stable.
