Water Absorption in Hardwoods

Jacob Nelson, Megan Hawley, Emily Groves, Clayton Jannusch

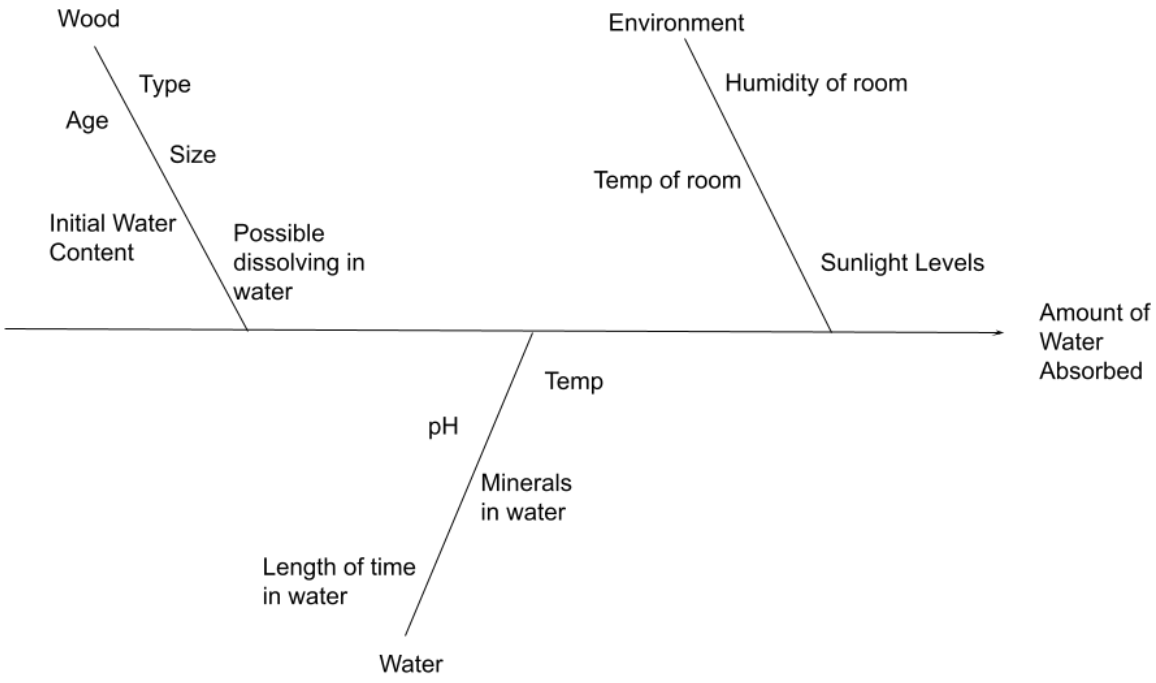
Context and Motivation -

A natural and sustainable building material, softwood has a variety of uses in construction and engineering. In order to advance building practices, we seek variation in moisture content of softwoods after water exposure. Softwood is hygroscopic, meaning it takes on water from its surrounding environment. The moisture content of wood impacts the viability of use in various projects.

Formulation and Variables -

We will measure the absorption capabilities of wood by weighing the wood before and after leaving it submerged in water for a predetermined period of time. Controllable explanatory variables that will affect this outcome include type of wood, density of wood, temperature of the water, and length of time in the water. Uncontrollable explanatory variables that will have an effect on our measurements include the pH of water, dissolved materials in the water, time since the wood was harvested, and possible dissolving of the wood in the water. In the case of the wood dissolving, we are assuming that because the wood will only be submerged for a short amount of time, any dissolving that occurs will be negligible. Other factors can be seen in the

fishbone diagram below.



Response Variable -[1]

We plan to take our measurements using Moisture Content (MC) as the response variable. This metric is the industry standard for determining water content of different wood types.

Moisture Content and Green Wood

Many physical and mechanical properties of wood depend upon the moisture content of wood. Moisture content (MC) is usually expressed as a percentage and can be calculated from

$$MC = \frac{m_{water}}{m_{wood}}(100\%) \qquad (4\text{–}1)$$

where m_{water} is the mass of water in wood and m_{wood} is the mass of the ovendry wood. Operationally, the moisture content of a given piece of wood can be calculated by

$$MC = \frac{m_{wet} - m_{dry}}{m_{dry}}(100\%) \qquad (4\text{–}2)$$

where m_{wet} is the mass of the specimen at a given moisture content and m_{dry} is the mass of the ovendry specimen.

[1] https://www.fpl.fs.fed.us/documnts/fplgtr/fplgtr190/chapter_04.pdf