

A photograph of a dense forest of Engelmann spruce trees. The trees are tall and thin, with dark green needles. The ground is covered in a thick layer of brown pine needles and some green moss. Several trees have red ribbons or markers tied around their trunks, indicating they are part of a study. The lighting is bright, suggesting a sunny day.

A study of Engelmann Spruce, their proximity to Wheeler Lake, and the amount of transpiration.

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Introduction

Engelmann Spruce (*picea engelmannii*)

- Engelmann spruce trees are primarily found in Colorado's high-elevation forests, specifically on the western slopes of the Rocky Mountains, from around 9,000 to 11,500 feet in elevation.
- This research aims to find how factors such as proximity to water, age, and circumference affect the rate of transpiration



Background

During our backcountry trip, we did a science experiment on tree transpiration. Each group chose a spot with different conditions some were in direct sunlight, others in shade, some near water, and others farther away. We placed plastic bags over the tree branches and secured them with twist ties to collect moisture released from the needles. After a few hours, we came back to collect the bags and measure the amount of water inside. Our team ended up with the most water in our bags, which made us curious. We wanted to figure out why that happened was it because we were closer to the pond, in more sun, or something else?

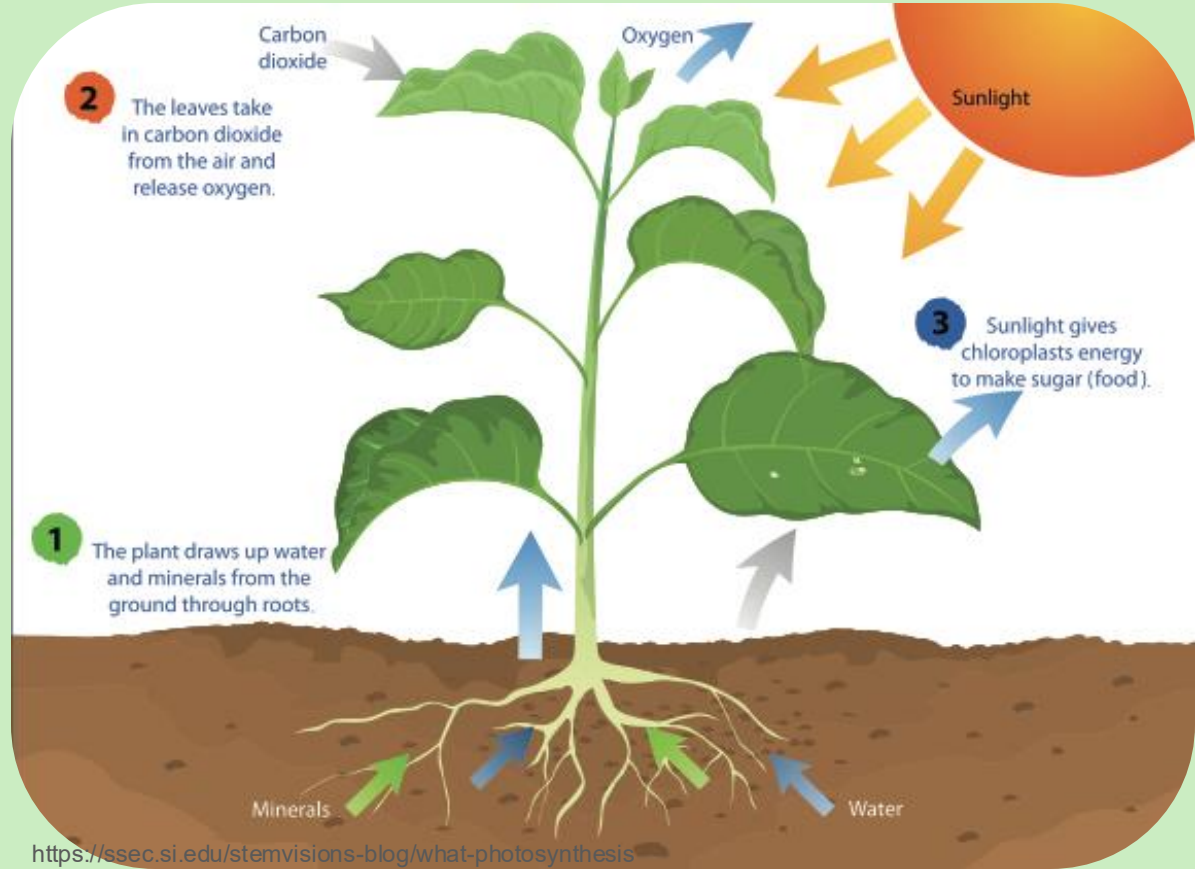
Photosynthesis and other Factors that affect transpiration rate

Photosynthesis

Photosynthesis is the process by which green plants use sunlight to make their own food.

Transpiration

Transpiration is the loss of water vapor from plant leaves through small openings called stomata.

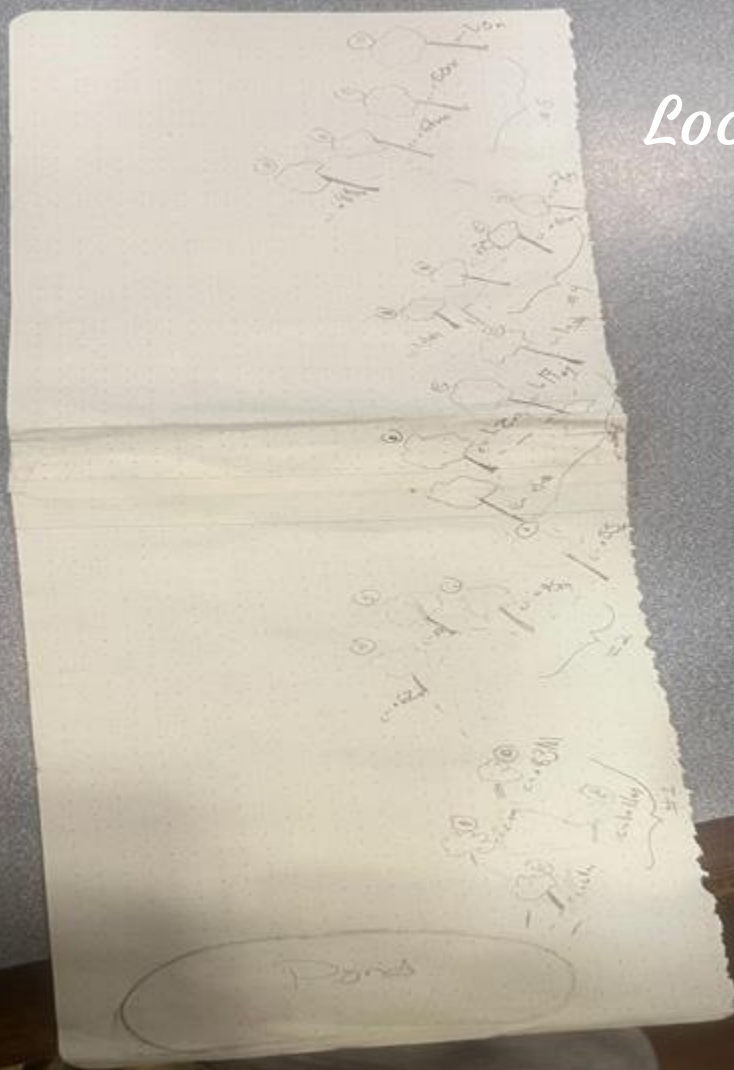


Hypothesis

We think that proximity to Wheeler Lake affect how much water an Engelmann Spruce tree can hold in its needles



Location



Methods

1. Transects

We first planned to study trees closest to the pond, but realized Engelmann Spruce trees didn't grow in an approximate straight line from the pond. So we chose a new area with more Engelmann Spruce and created 5 transects, each with 4 trees, to study both proximity and sunlight exposure.



Methods

2. Proximity

We used Tree D in Transect 1's distance from the pond (33.3 meters) as our starting point. To save time, we didn't go back to the pond for each tree instead, we added the distance from one tree to the next, building on Tree D's measurement as we moved through all five transects.



Methods

3. Circumference

We measured the circumference of each tree trunk in meters to compare size and analyze its effect on water retention.



Methods

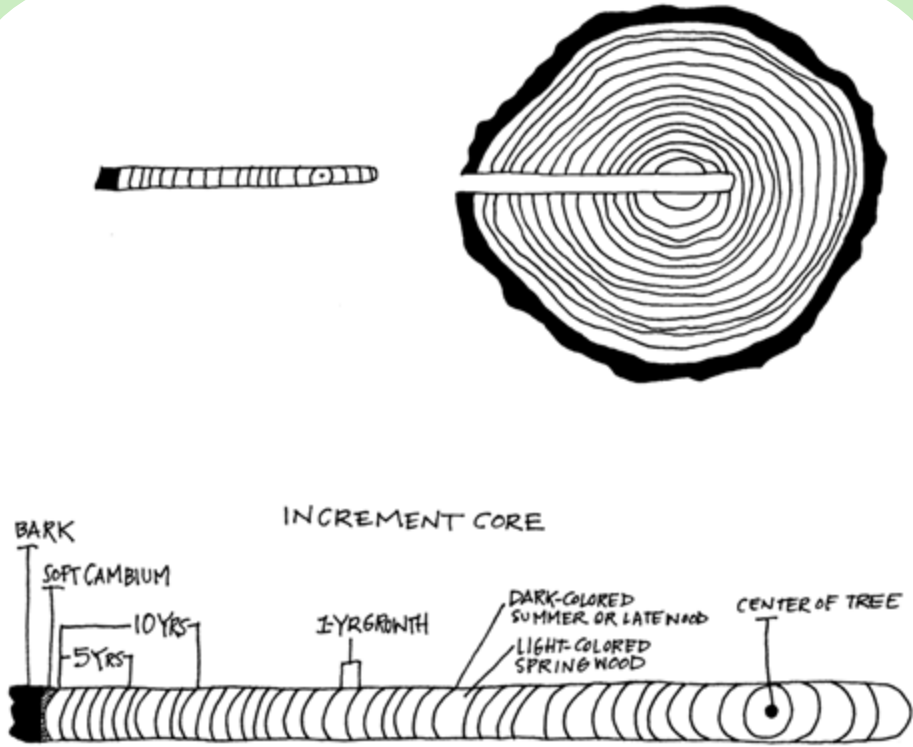
4. Transpiration

We placed a plastic bag over 5 clusters of needles on each tree and sealed it with a twist tie to collect moisture and then about 3 hours later we measured the volume (ml) of the plastic bags and plotted the data on our notebooks.

- Start temp: 53°F at 8:25 AM to 58°F at 9:02 AM
- End temp: 63°F at 12:20 PM to 12:33 PM



Methods: Tree cores



Data - Transect 1

Tree	Proximity (m)	Circumference (m)	Transpiration (ml)	Sunlight	Age (years)
A	30.3	0.61	0.2	0	-
B	31.7	2.4	0.4	1	128
C	31.8	1.11	0	2	-
D	33.3	0.83	0.3	1	117
Averages	31.8		0.2		

Data - Transect 2

Tree	Proximity (m)	Circumference (m)	Transpiration (mL)	Sunlight	Age (years)
A	50.3	0.62	0.1	2	165
B	50.6	0.9	0	1	90
C	50.7	0.95	0.05	3	
D	53.6	0.55	0	1	
Averages	51.3		0.04		

Data - Transect 3

Tree	Proximity (m)	Circumference (m)	Transpiration (mL)	Sunlight	Age (years)
A	60.5	0.5	0	1	
B	62.1	1.2	0.05	3	101
C	64.0	1.17	0.4	3.5	
D	64.7	1.3	0.5	3	179
Averages	62.8		0.2		

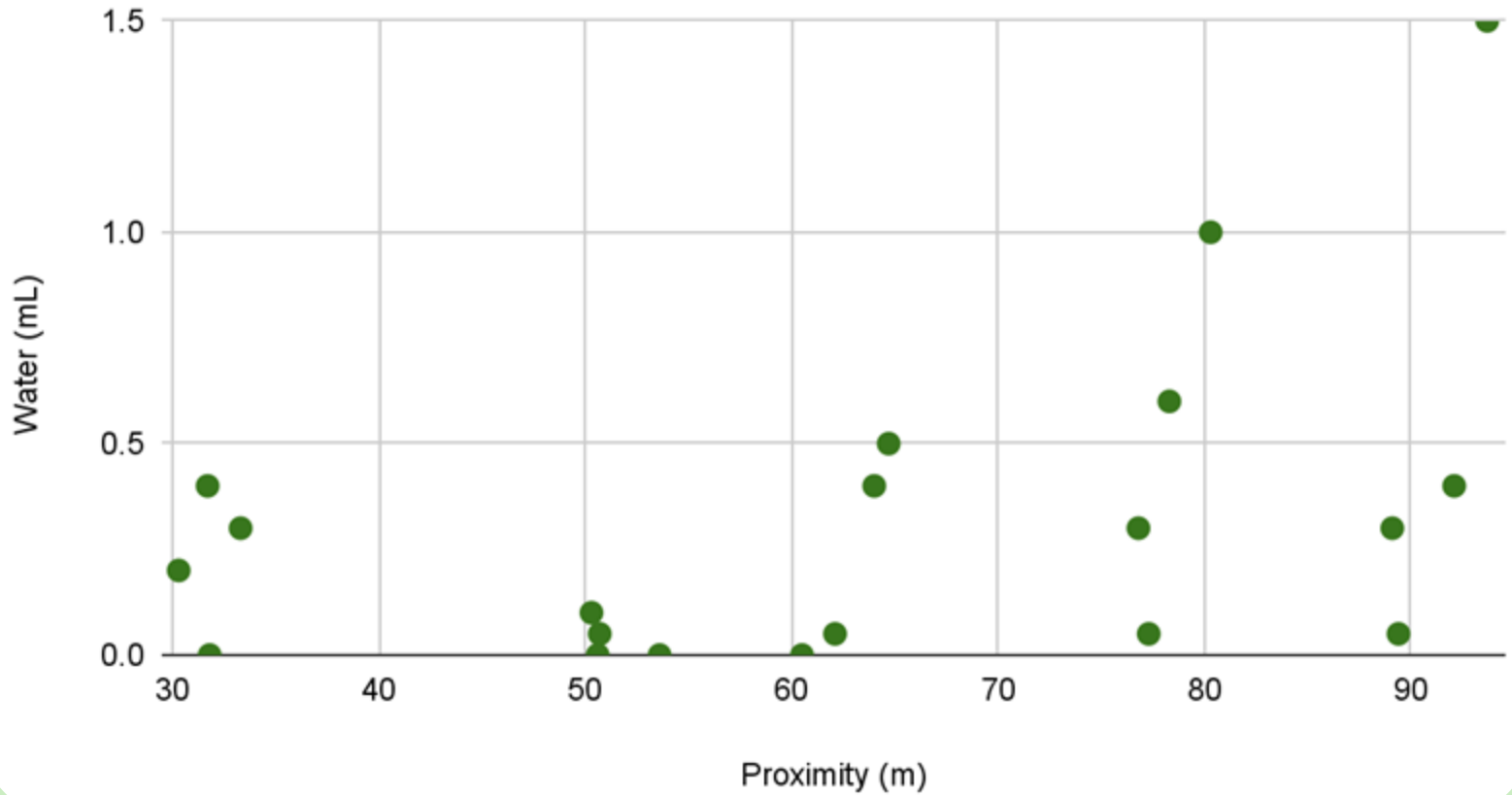
Data - Transect 4

Tree	Proximity (m)	Circumference (m)	Transpiration (mL)	Sunlight	Age (years)
A	76.8	1.1	0.3	2	105
B	77.3	0.7	0.05	4.5	
C	78.3	0.6	0.6	4	
D	80.3	0.7	1.0	3.5	150
Averages	78.2		0.5		

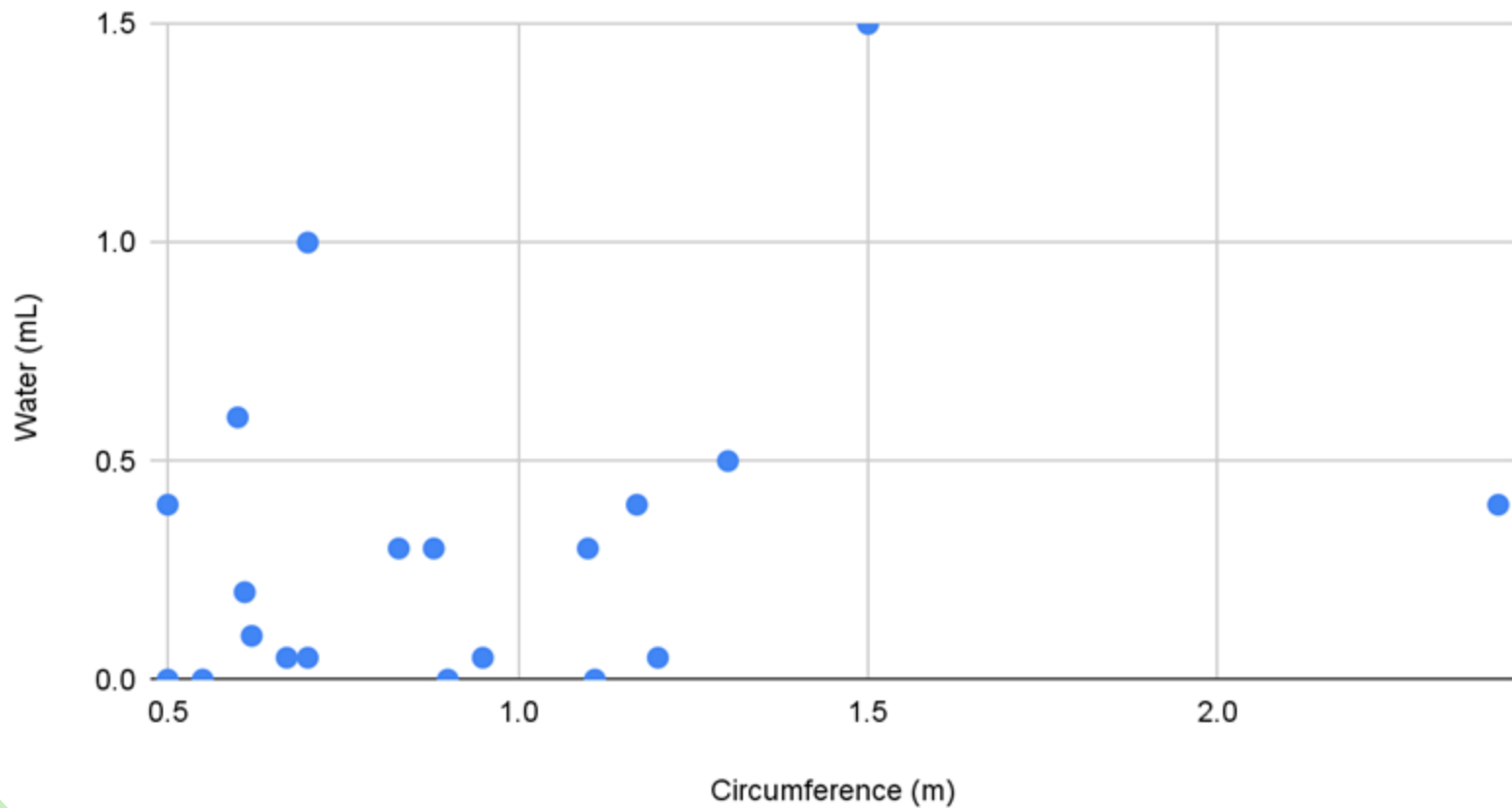
Data - Transect 5

Tree	Proximity (m)	Circumference (m)	Transpiration (mL)	Sunlight	Age (years)
A	89.1	0.88	0.3	5	
B	89.4	0.67	0.05	4	78
C	92.1	0.50	0.4	5	95
D	93.7	1.5	1.5	4.5	
Averages	91.1		0.6		

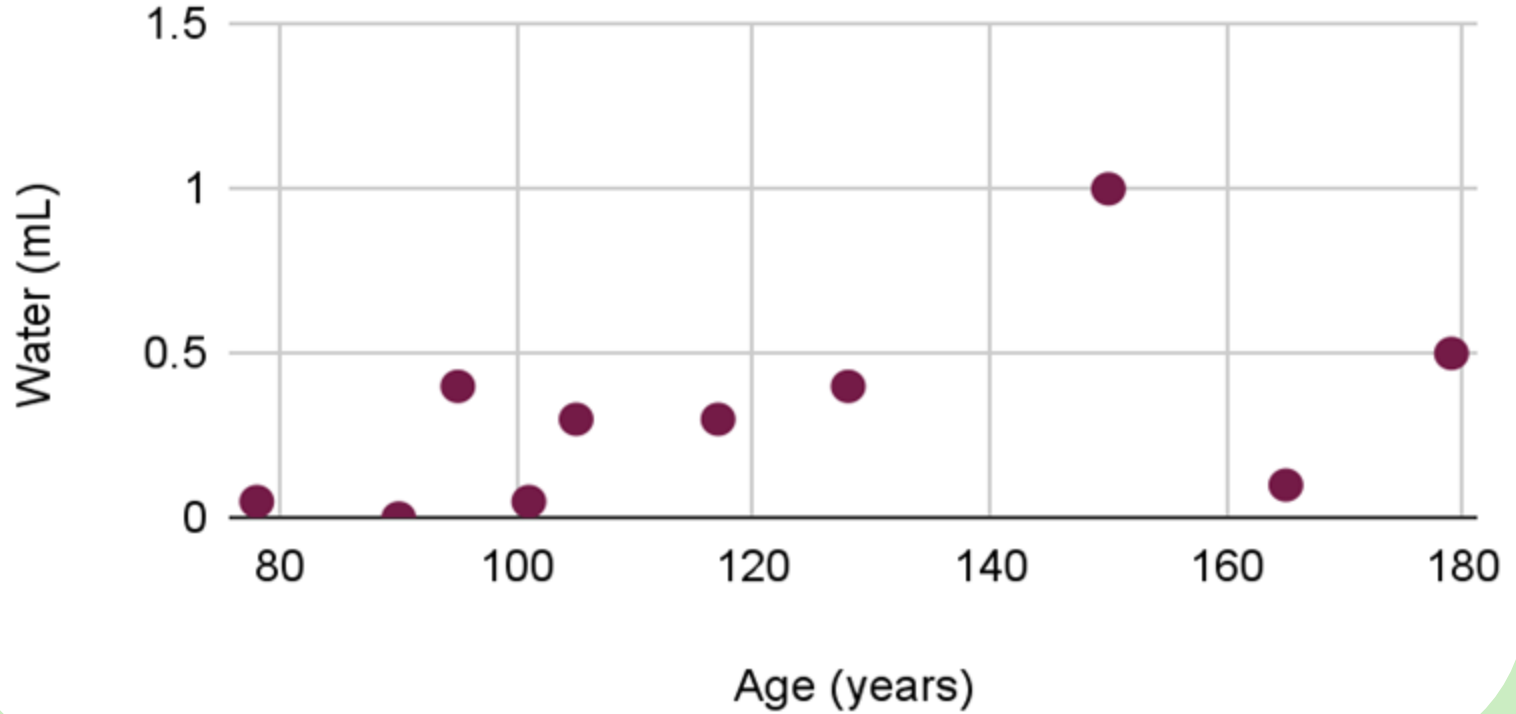
Proximity to Lake (m) vs Water (mL)



Tree Circumference (m) vs Water (mL)



Age vs Water (mL)



Results

- The amount of water produced from transpiration was not directly affected by any of the variables we studied.
- We found that the trees with the most water had the most exposure to sunlight.



Conclusions

- We found that amount of sunlight directly affects the rate of transpiration in Engelmann Spruce trees.
- Future research should focus on south facing trees and sunlight in addition to focusing on proximity to a lake.



Thank you for your time!