



The Mushroom Journey

Does Higher pH Affect Mushroom Growth?

Introduction

- In January, our class began a unit on Biology. We went to Catalina State Park for an exploratory field trip and part of the trip was to look for signs of decomposers. We connected with Desert Pearl Mushrooms to get twelve mushroom grow blocks so we could visualize our thoughts into an experiment.
- Two weeks later we began our research on mushrooms, pH, and the effects of pH on plants and humans. We discovered that too basic of pH could make humans sick (or worse) and that too acidic of pH for plants can cause plants to not grow as well (differently and less productively). Our research led us to believe that pH that is too far from neutral (in either direction) would not be good for humans or plants. We determined we would test this using mushrooms.



Research Question:

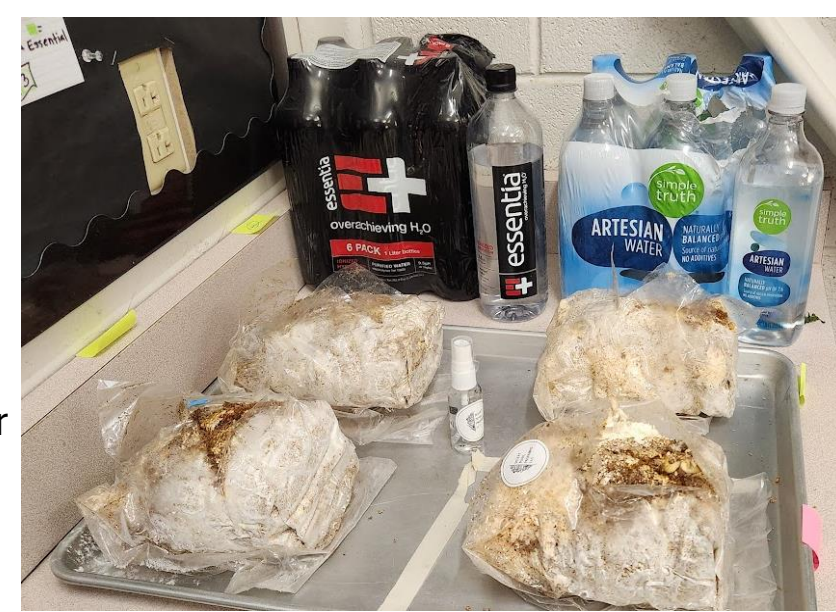
Will higher pH water affect mushroom growth?

Hypothesis:

We hypothesis that neutral pH water (7.6 pH) will produce a taller and wider (as measured by cap size) mushrooms than higher pH water (9.5+).

Procedures

1. Contact Desert Pearl Mushrooms and order our Home Grow Kits.
2. Schedule for an expert from Desert Pearl come speak to our class about mushrooms, their growing environments, and to help us start our experiment/sterilize our equipment.
3. Follow Grow Kit Instructions (Our lab notebook shows the full set of instructions.)
4. We collected and tested (with pH strips) 4 types of water in preparation for the experiment (Artisian 7.6 pH, Essentia 9.5 pH, Tucson tap water 8 pH, and well water from the Tucson Mts 8.5 pH).
5. We color coded our blocks for each level of pH water. Blocks T1, T2, T3 (Orange/Tap Water) Blocks W1, W2, W3 (Yellow, Well Water) Blocks A1, A2, A3 (Pink, Artesian Water) Blocks E1, E2, E3 (Green, Essentia)
6. Set up our logbook for the watering schedule.
7. Filled and labeled our spray bottles.
8. Using Nitrile Gloves we harvested, measured, and weighed (using a kitchen digital scale) our mushrooms from each block and then recorded our data.



Photos of Procedures



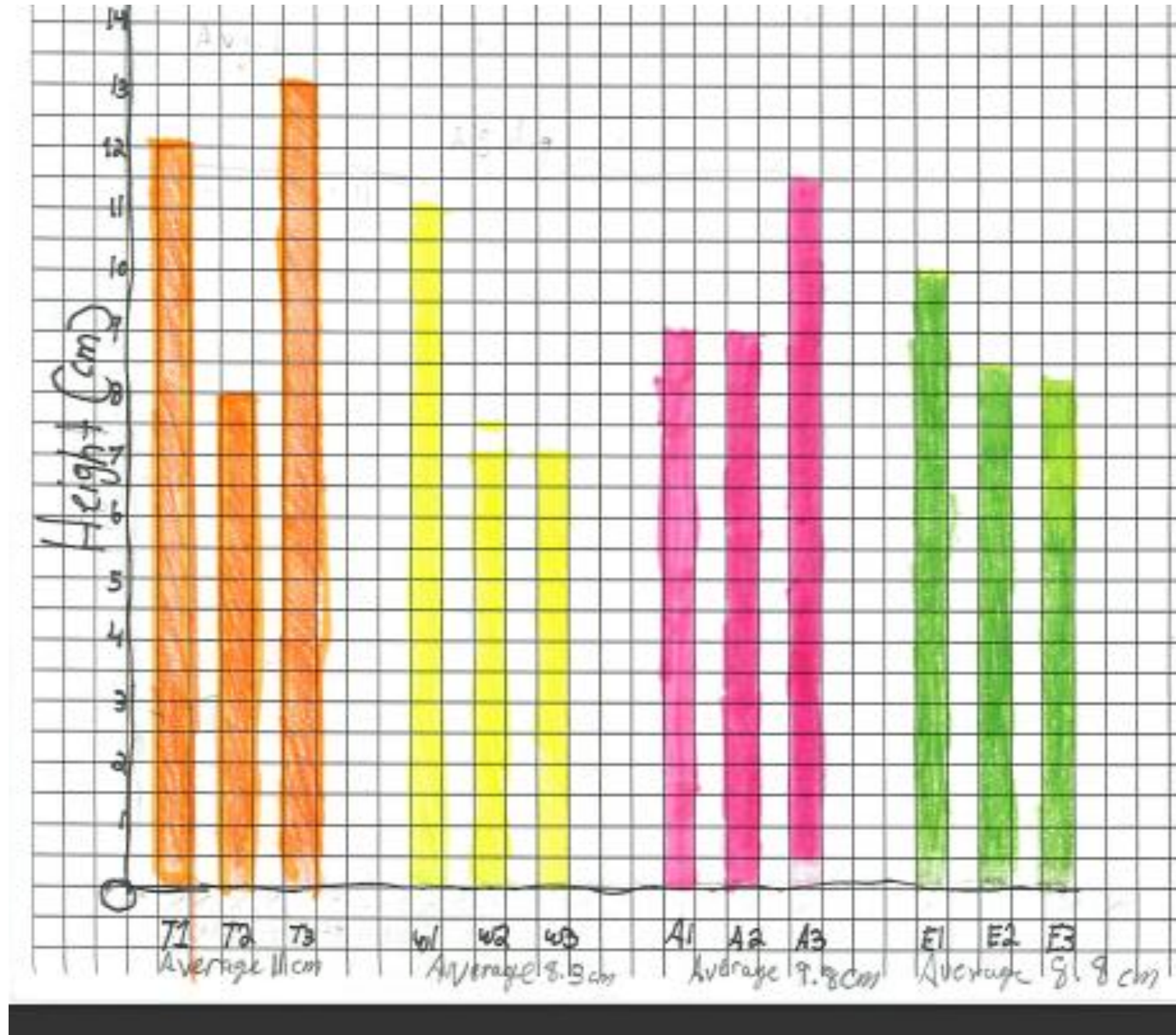
Sample of Watering Schedule Logbook



2/6	5	Sprites each		4 PM	AL T.P OR
2/6	5	" "		6 PM	AP
2/7	5	" "		7 AM	AP
2/7	5	" "	" "	11 AM	T.P OR
2/7	5	" "	" "	11 AM	AL
2/7	5	" "	" "	1:45	EW, T.P A.W
2/7	5	" "	" "	2:15	AL T.P
2/7	5	" "	" "	6:00	AP
2/8	5	" "	" "	8:55	T.P OR
2/8	5	" "	" "	11:55	AL
2/8	5	" "	" "	10:00	Close P.J.N
2/8	5	" "	" "	10:30	E.G.I
2/8	5	Sprites	" "	10:30	E.W
2/8	5	" "	" "	10:30	K.M
2/8	5	" "	" "	12:30	T.P J.N
2/8	5	" "	" "	12:30	E.G.I
2/8	5	Sprites each		12:30	E.W
2/8	5	" "	" "	3:30	J.N, A.W
2/8	5	" "	" "	12:30	K.M
2/8	5	(AID)		5:00	K.M
2/9	5	" "	" "	8:20	OR
2/9	5	" "	" "	8:20	J.N
2/9	5	" "	" "	10:30	J.N, AL
2/9	5	Sprites each		10:30	E.W
2/9	5	" "	" "	12:30	T.N.

Height of Mushrooms

- Blocks T1, T2, T3 (Orange/Tap Water, pH 8)
- Blocks W1, W2, W3 (Yellow, Well Water, pH 8.5)
- Blocks A1, A2, A3 (Pink, Artesian Water, pH 7.6)
- Blocks E1, E2, E3 (Green, Essentia, pH 9.5)





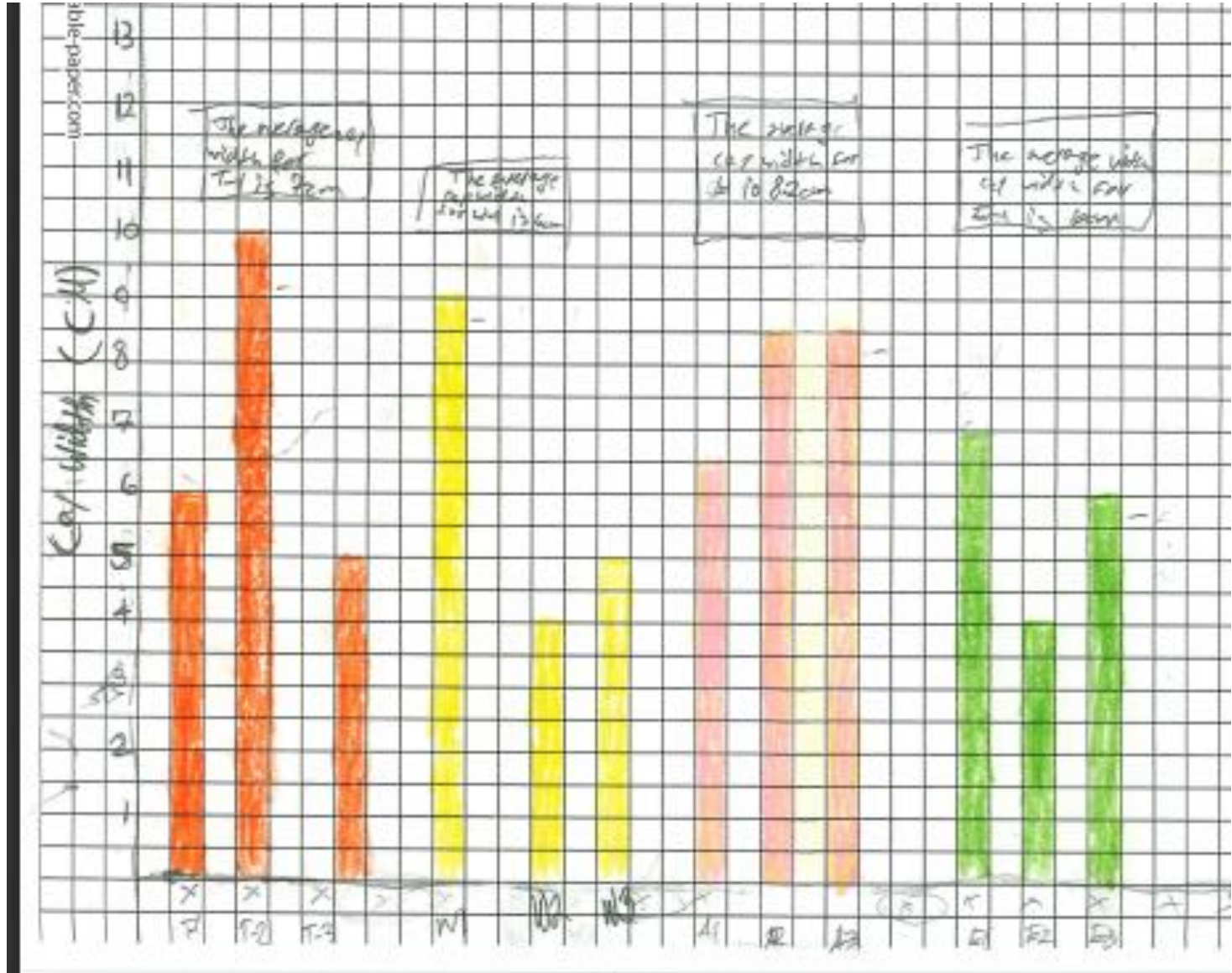
Cap Width of Mushrooms

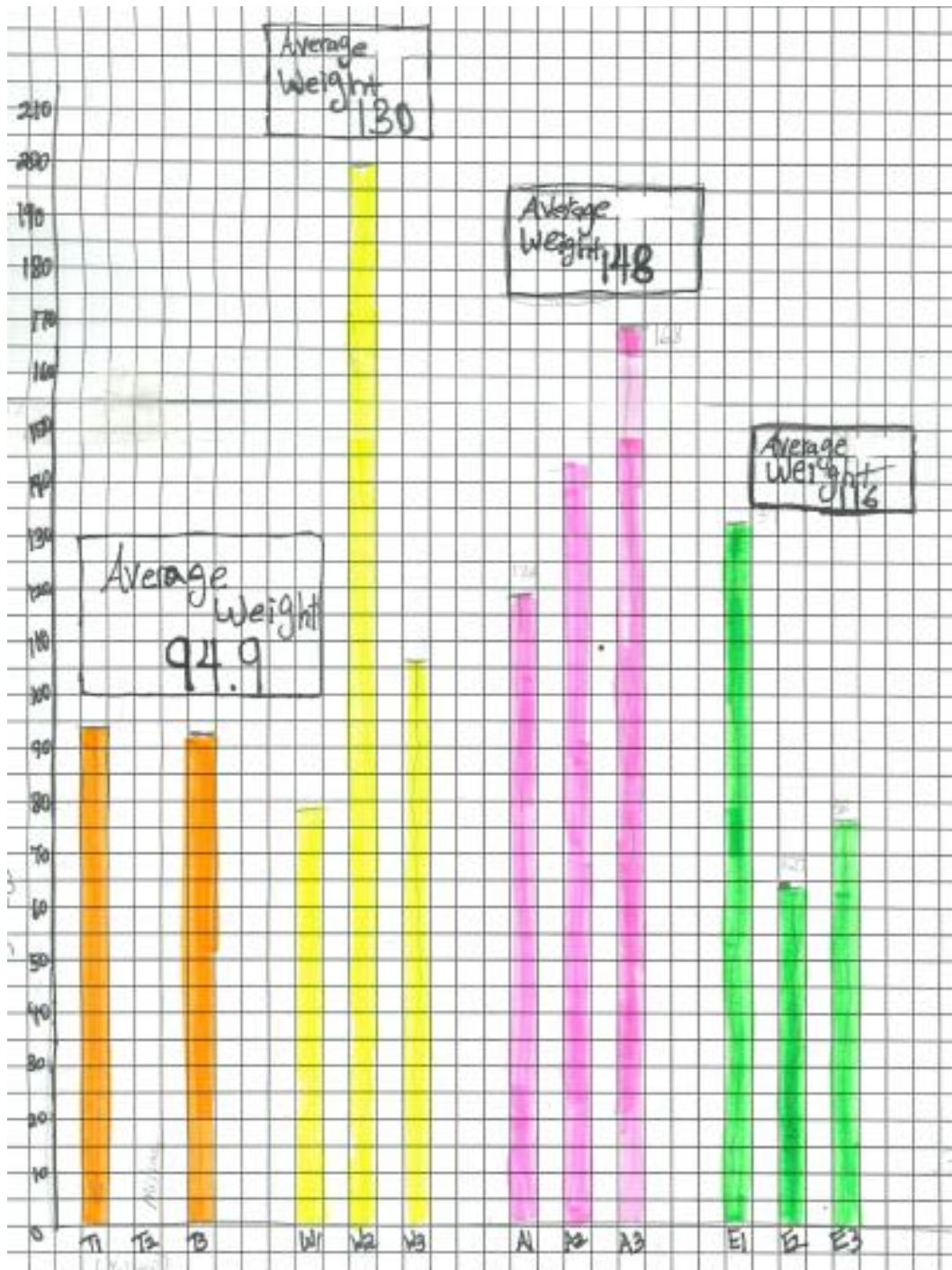
Blocks T1, T2, T3 (Orange/Tap Water, pH 8)

Blocks W1, W2, W3 (Yellow, Well Water, pH 8.5)

Blocks A1, A2, A3 (Pink, Artesian Water, pH 7.6)

Blocks E1, E2, E3 (Green, Essentia, pH 9.5)





Weight of Mushrooms

- Blocks T1, T2, T3 (Orange/Tap Water, pH 8)
- Blocks W1, W2, W3 (Yellow, Well Water, pH 8.5)
- Blocks A1, A2, A3 (Pink, Artesian Water, pH 7.6)
- Blocks E1, E2, E3 (Green, Essentia, pH 9.5)



Discussion and Conclusion

- We concluded that our hypothesis was half right because even though the Essentia Water (pH 9.5+) did not grow as well (as indicated by the height and cap width) we could not conclude that Artesian Water (pH 7.6) was significantly better than Tap Water (pH 8).
- It was decided that we needed to complete the second trial for more data.
- Our last discovery was that we should have included the weight of the mushrooms (in grams) in our hypothesis because that would have given us more information about the effects of pH and growth of the mushrooms.

Implication & Ideas for Future Research

- Things to know for the next year's scientists:
- We planned ahead to order the blocks; however, we did not leave enough time to consider that the blocks might not grow fast enough at the business and be delivered on time. This did not allow enough time for two trials.
- We also discovered that data collection was harder than we all thought. Communication was challenging between classmates, so we were not successful keeping a close eye on the data because we put it in our individual Science Journals. We really needed a team data sheet for each pH team.
- Next year's team would need to try our experiment again to see if they get similar results and they could also test for more acidic pH levels to compare different effects of pH from both ends of the scale.

Reference (Part 1)

Ecology of Fungi, Dartmouth College, Biology for Majors II. www.lumenlearning.com, Shalli Cater, 1/30/2017

Understanding the Cryptic Role Fungi Play in Ecosystems, Amy Olson, 12/12/2022

Mushroom growing process from spores, Fresh cultivators, <https://www.youtube.com/watch?v=mk9GNEEkQTc>, 12/9/2019

Six Steps to Mushroom Farming, David Megis Beyer, (psu.edu) , 10/2/22

The Dirt on Decomposers, Crash Course Kids, <https://www.youtube.com/watch?v=uB61rfeeAsM>, 2015 April 23

Decomposers, National Geographic, <https://education.nationalgeographic.org/resource/decomposers/>, Date: Oct 19, 2023.

John P. Kmiee , 2022 Annual Water Quality Report Main System, www.tusconaz.gov, 2022

Eric Roy, Problems We Found in Tucson's Drinking Water, www.hydroviv.com ,April,27,2021

PH of drinking water Natural water and beverages, Brian Oram, 2015,archive-water-research.net



Reference (Part 2)

Mushroom (Definition, Characteristics, Species, & Facts), Britannica, updated, January 29, 2024
Grow Mushrooms, www.mushroommag.com, Fungi Farm.

Making Mushroom Grow Kits (DIY), @bmmushroom, [\(2\) Making Mushroom Grow Kits #mushroomgrowing - YouTube](#)

Growing with Hydrogen Peroxide, Future Harvest, 2/20/2024.

How Much Hydrogen Peroxide for Plants Should You Use?, www.gardentipsforall.com, 10/15/2021.

Effects of Acid Rain, www.EPA.gov, 6/1/2023.

Solutions to Soil Problems II. High pH, Loralie Cox and Rich Koenig, December 2010, <https://extension.usu.edu/yardandgarden/research/solutions-to-soil-problems-ii-high-ph>

Alkaline Water: Benefits, Side Effects And Dangers, Sarah Glinkski and Taylor Wallace M.D., <https://www.forbes.com/health/nutrition/alkaline-water/>, **Jan 9, 2024**

