Conditions of Water in the Headwaters of the Yuba River in Which Algae and Fish can Survive

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Introduction

- Water quality is important for survival of plants and animals.
- We were interested in which conditions fish and algae could survive.
- California is currently in a drought, which is affecting the life in the rivers.

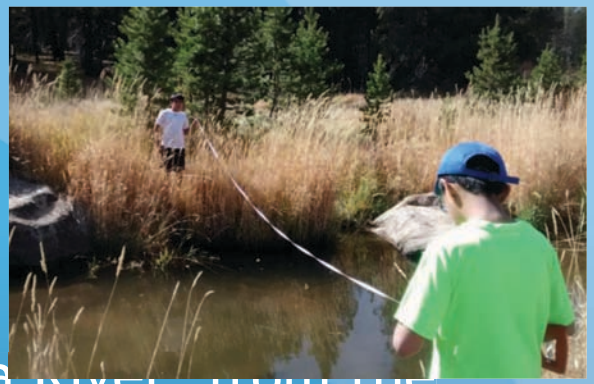
Focus

- The headwaters of the Yuba River and the Van Norden meadow, in Soda Springs, have been experiencing a drought for 3-4 years.
- The river is not connected, but consists of various-sized pools in the river bed, which leads into the Van Norden lake.
- We researched how qualities of water affected the fish and algae in the pools, and if the populations of both organisms were connected.

Hypotheses

- Hypothesis: We will find more algae in ponds with acidic pH, shallower pools, less dissolved solids, less chlorine, more hardness, and moderate alkalinity.
- Hypothesis: We will find more fish in ponds which have a neutral pH, colder temperature, deeper pools, less dissolved solids, less chlorine, low hardness, and moderate alkalinity.
- Hypothesis: In pools with more algae, there will be less fish, and vice versa.

Methods



- We hiked along a section of the Yuba River, from the bridge in the upper part of a meadow, to the lower part of Lake Van Norden, approximately 2 miles.
- We assessed 9 ponds which each had different conditions.
- In each pond we studied the water by measuring pH, hardness, chlorine, alkalinity, number of fish, % of algae, temperature, depth, and total dissolved solids.

Graphs and Data Tables

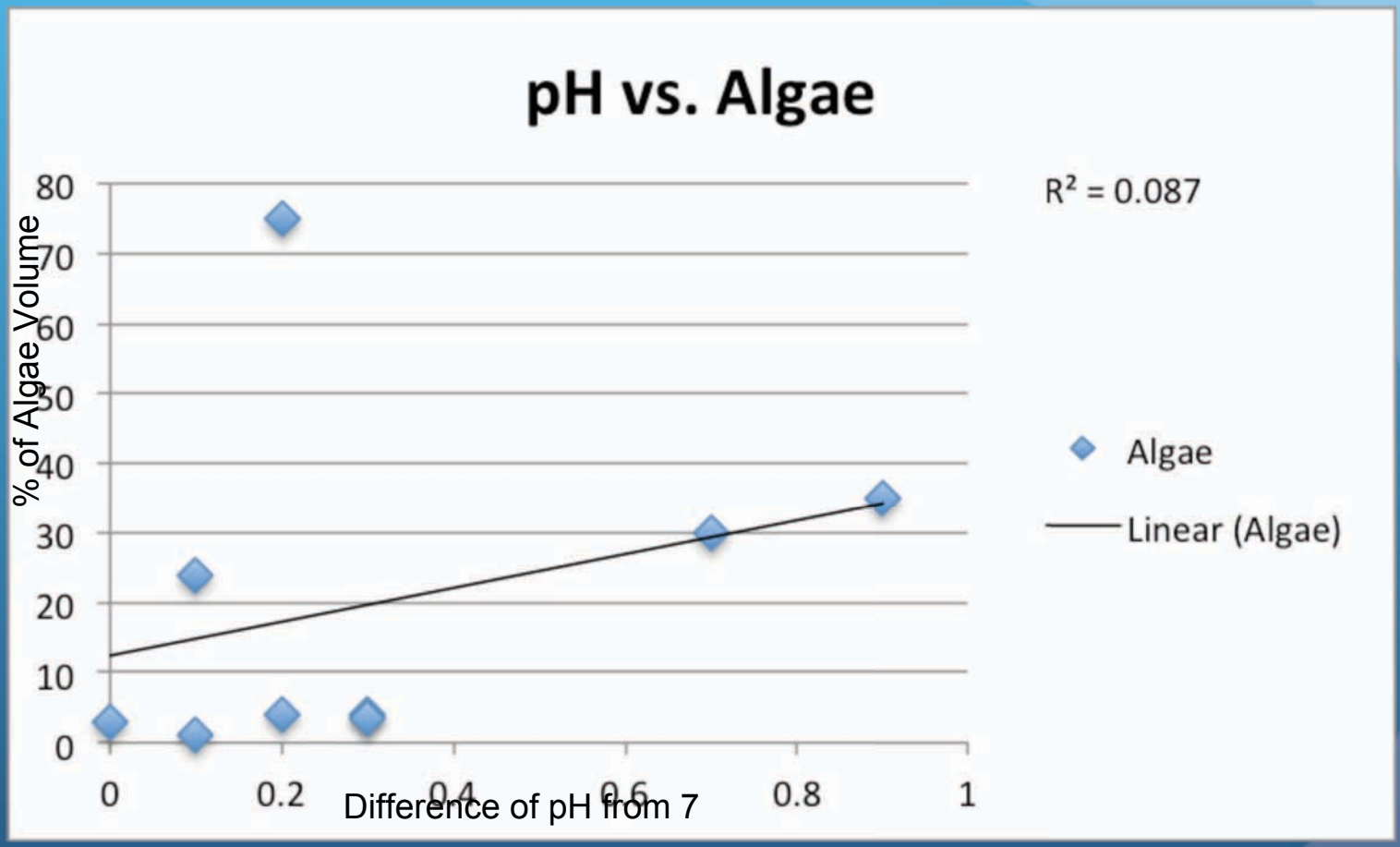
Data Table Part 1

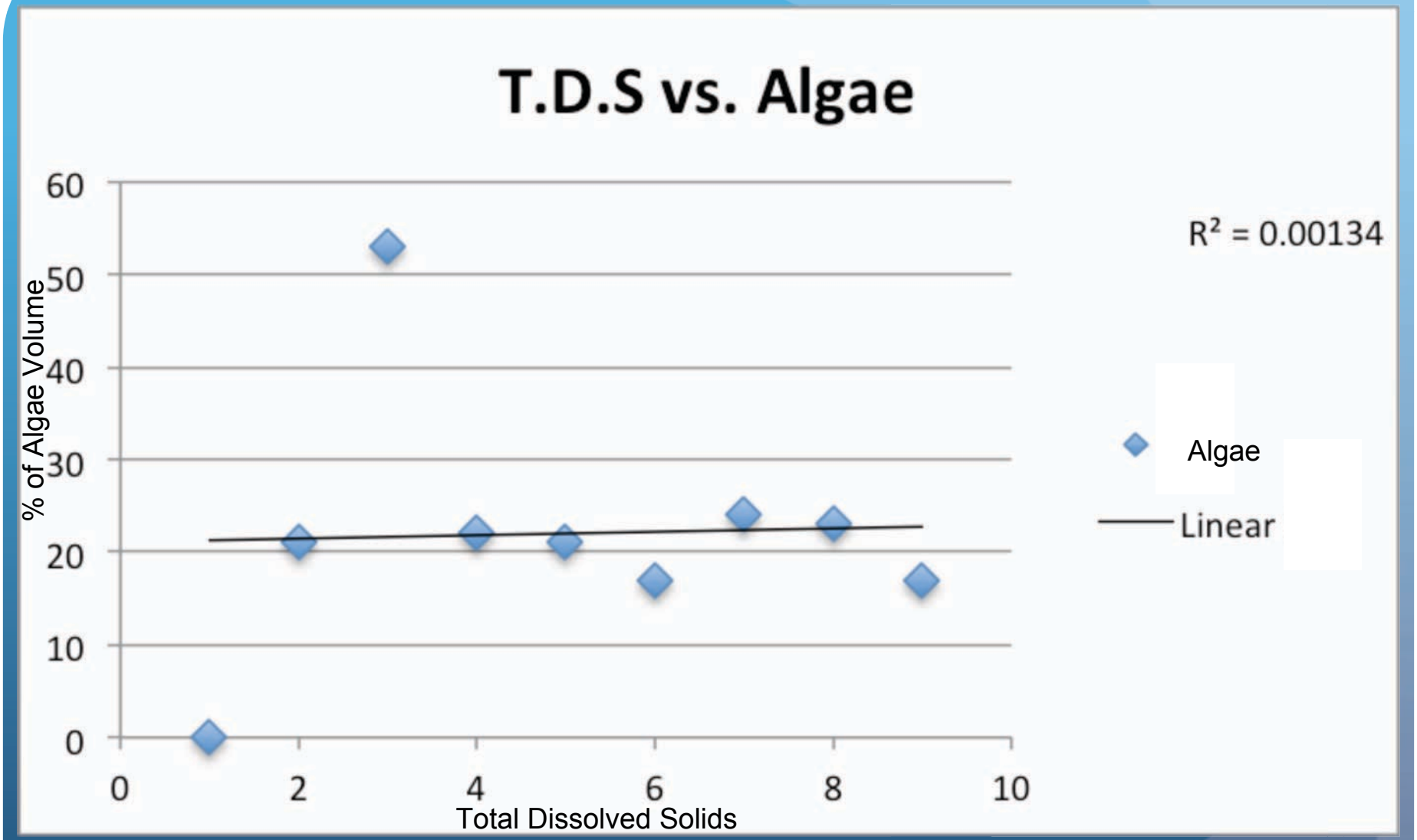
	Nitrates (ppm)	Nitrites (ppm)	Hardness (ppm)	Chlorine(ppm)	Alkalinity (ppm)	Electronic PH
Pool 1	0	0	25	1	120	7.1
Pool 2	0	0	75	0.5	40	7.3
Pool 3	0	0	75	0	60	6.3
Pool 4	0	0	75	0.5	20	6.7
Pool 5	0	0	25	1	40	7.1
Pool 6	0	0	75	2	40	7
Pool 7	0	0	50	1	40	6.8
Pool 8	0	3	75	2	40	7.2
Edge of Lake	0	0	300	0.5	20	7.9

Data Table Part 2

Width of Pool (cm)	Temperature °C	Depth(cm)	Total Dissolved Solids	Number of Fish	% of Water Volume Algae	% Substrate Algae
350	8.8	60.3	23	4		
320	9.3	127	21	3		70
202	10.8	14.8	21	0	25	97
206	10.7	15.1	22	2		80
625	7	78	17	5	20	80
150	14.4	14.4	24	5		60
270	12.5	12.5	17	3	70	95
200	11.9	11.9	24	3		80
1560	18.2	52	53	0	30	95

Algae Graphs and Discussion


pH vs. Algae
% of Algae Volume
80
70
60
50
40
30
20
10
0
0
0.2
0.4
0.6
0.8
1
Difference of pH from 7
R² = 0.087
Algae
Linear (Algae)


T.D.S vs. Algae
% of Algae Volume
60
50
40
30
20
10
0
0
2
4
6
8
10
Total Dissolved Solids
R² = 0.00134
Algae
Linear

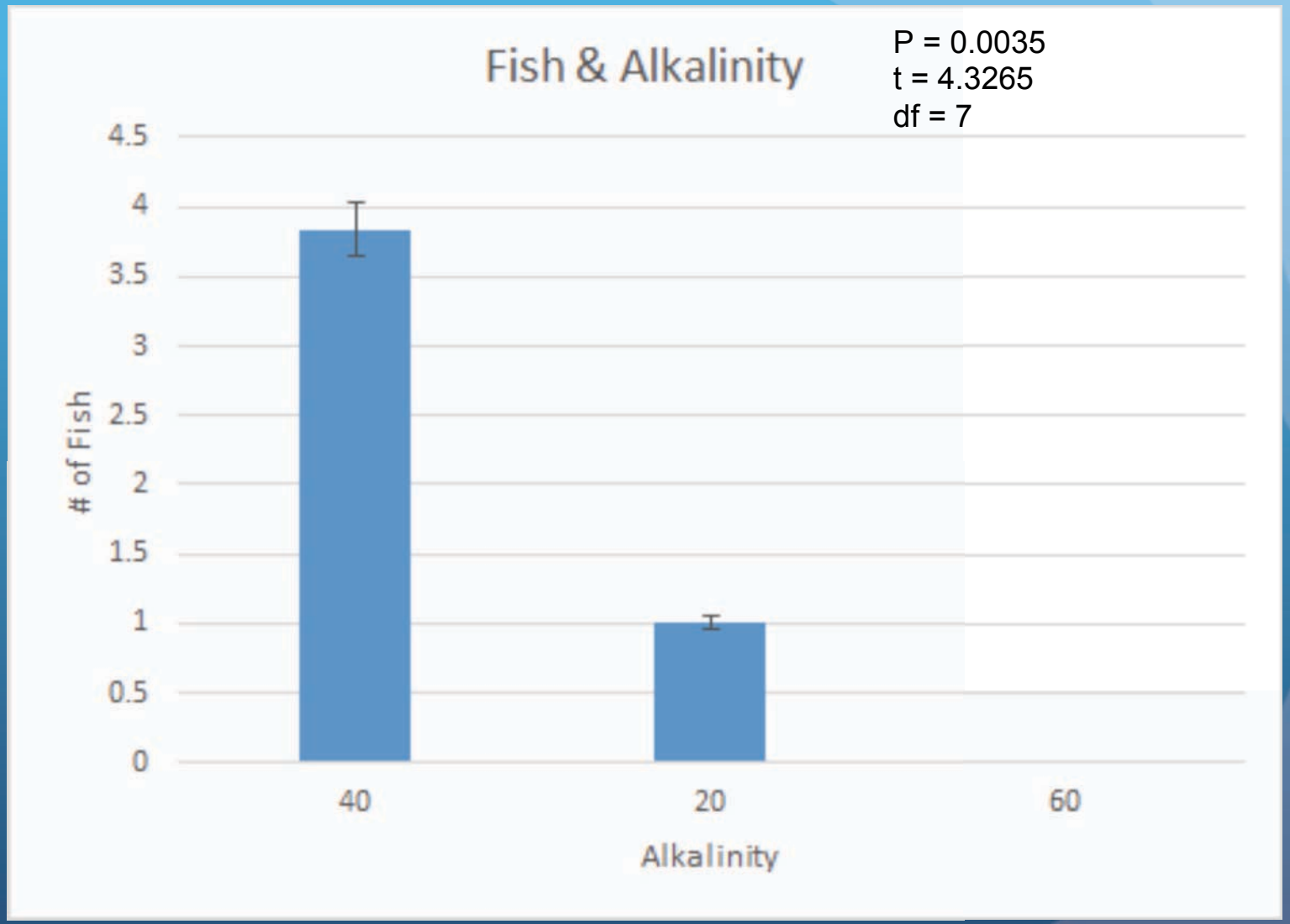
Algae Discussion

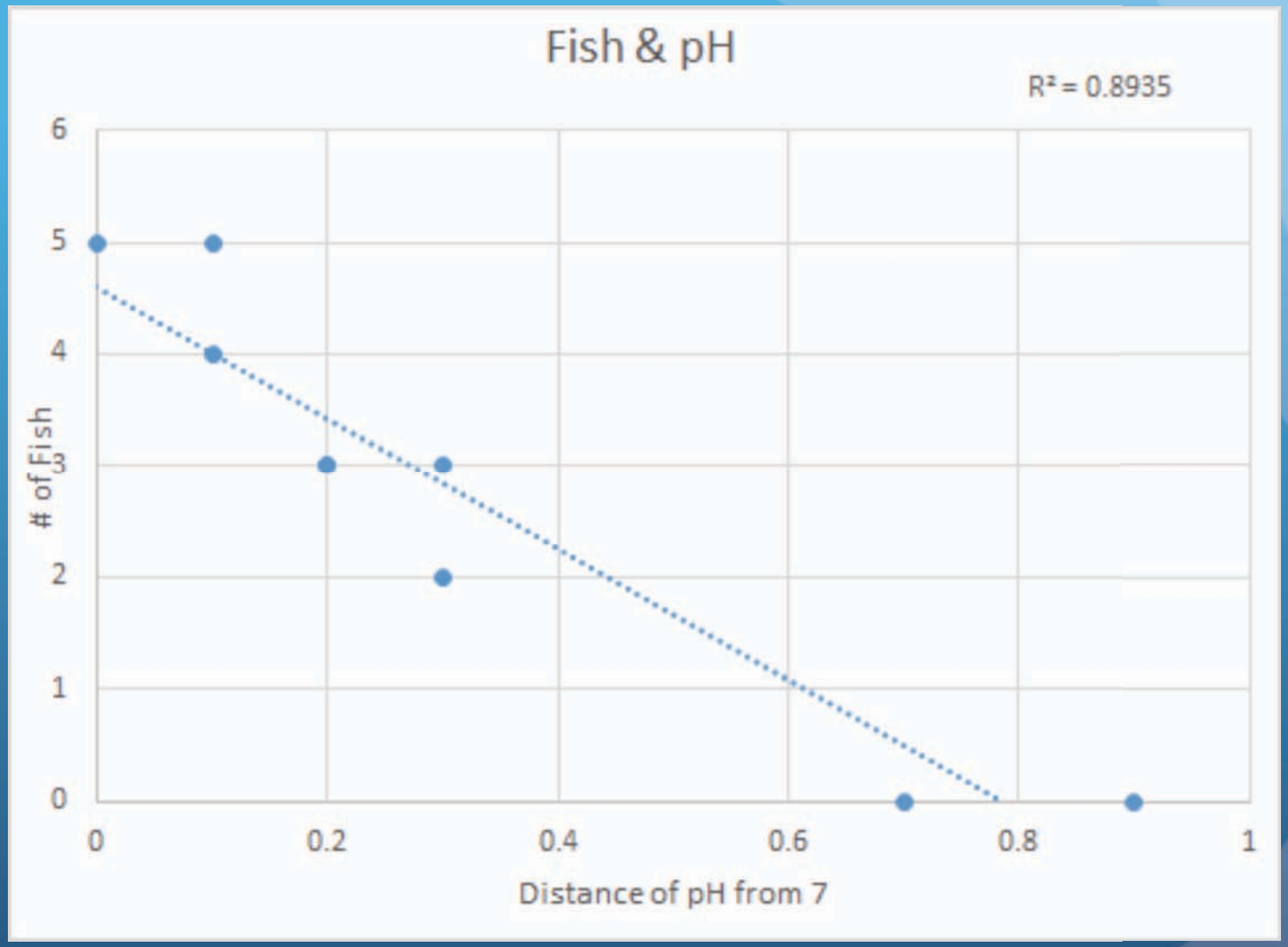
- Our results show that there is no correlation between pond conditions and the algae amounts.
- We conclude that algae can tolerate many a wider range of water conditions in the meadow.

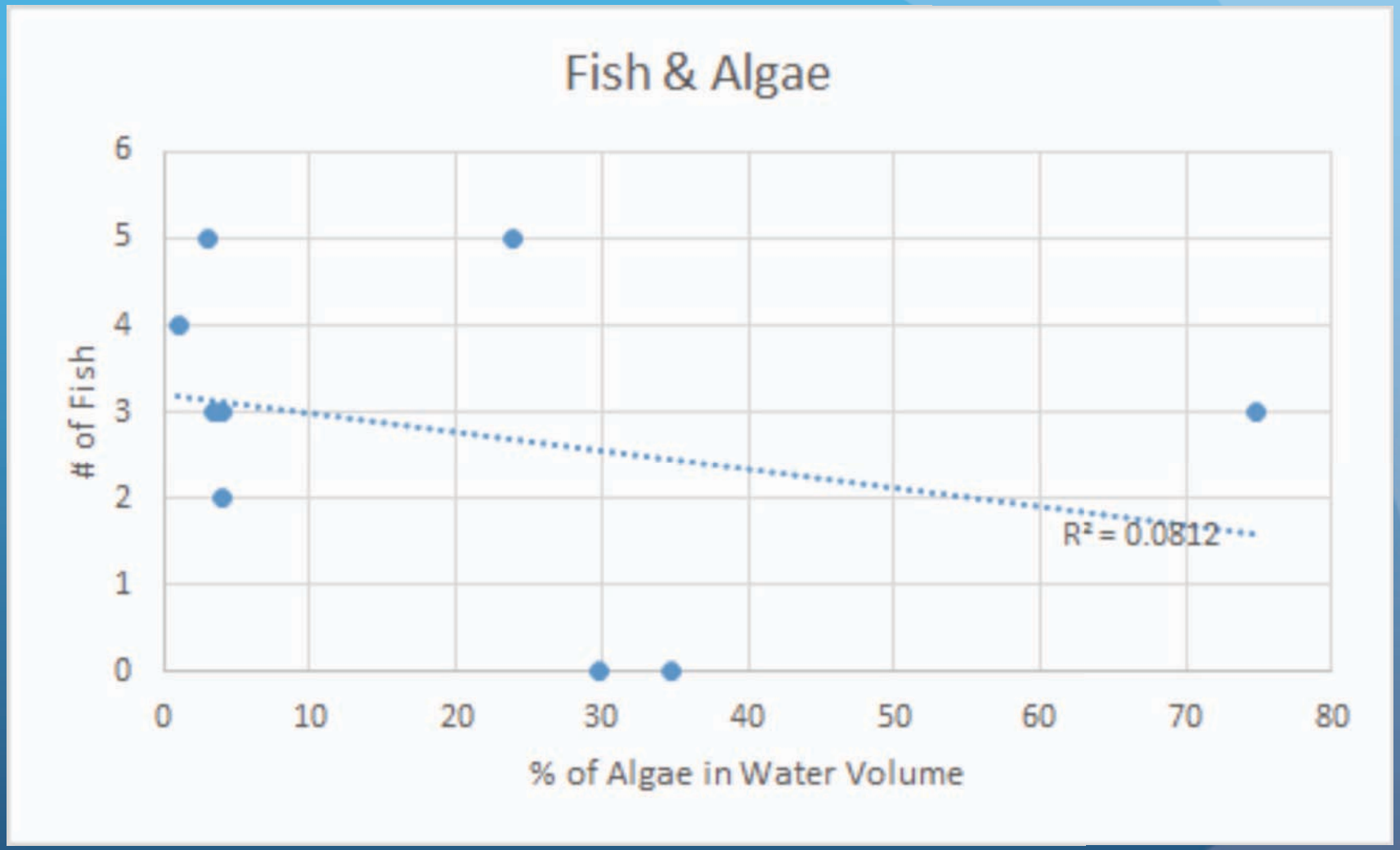
Algae Discussion

- Our hypothesis stated that we will find more algae in ponds with acidic pH, shallower pools, less dissolved solids, less chlorine, more hardness, and moderate alkalinity.
- However, the data in our data tables show there is no direct correlation between the water conditions that the algae lives in and the number of algae, rejecting our hypothesis.

Fish Graphs and Discussion


Fish & Alkalinity
P = 0.0035
t = 4.3265
df = 7
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
# of Fish
40
20
60
Alkalinity


Fish & pH
R² = 0.8935
# of Fish
Distance of pH from 7
0
1
2
3
4
5
6
0
0.2
0.4
0.6
0.8
1


Fish & Algae
# of Fish
% of Algae in Water Volume
0
1
2
3
4
5
6
0
10
20
30
40
50
60
70
80
R² = 0.0812

Fish Discussion

- A question we had was: What was the ideal PH for fish? According to our data, the fish seem to like a neutral PH. The pools with PH measurements closer to 7 had more fish.
- Another observation we made was if alkalinity affected the number of fish in the pools. The graphs show that the pools that have an alkalinity of 40 have at least 3 fish.
- Our final observation was that there was no significant correlation between the number of fish and algae in a given pool.

Fish Discussion

- Hypothesis: We will find more fish in ponds which have a neutral pH, colder temperature, deeper pools, less dissolved solids, less chlorine, low hardness, and moderate alkalinity.
- Our hypothesis was correct for pH, because it was neutral.
- We observed that alkalinity in the pools with more fish were low.
- There was no correlation for the other factors.

Improvements for Next Time

1. More samples
2. Increase area of study
3. Test more properties: Dissolved Oxygen
4. Different biomes: Forest
5. Survey how macroinvertebrates affect the fish and algae
6. Identify types of fish/algae
7. Survey continuous rivers
8. Survey non-drought affected rivers

Thanks for Watching