Dissolved Oxygen and Biodiversity

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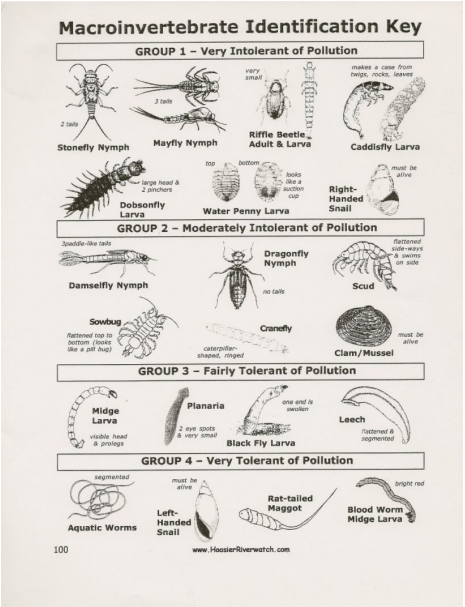
Introduction

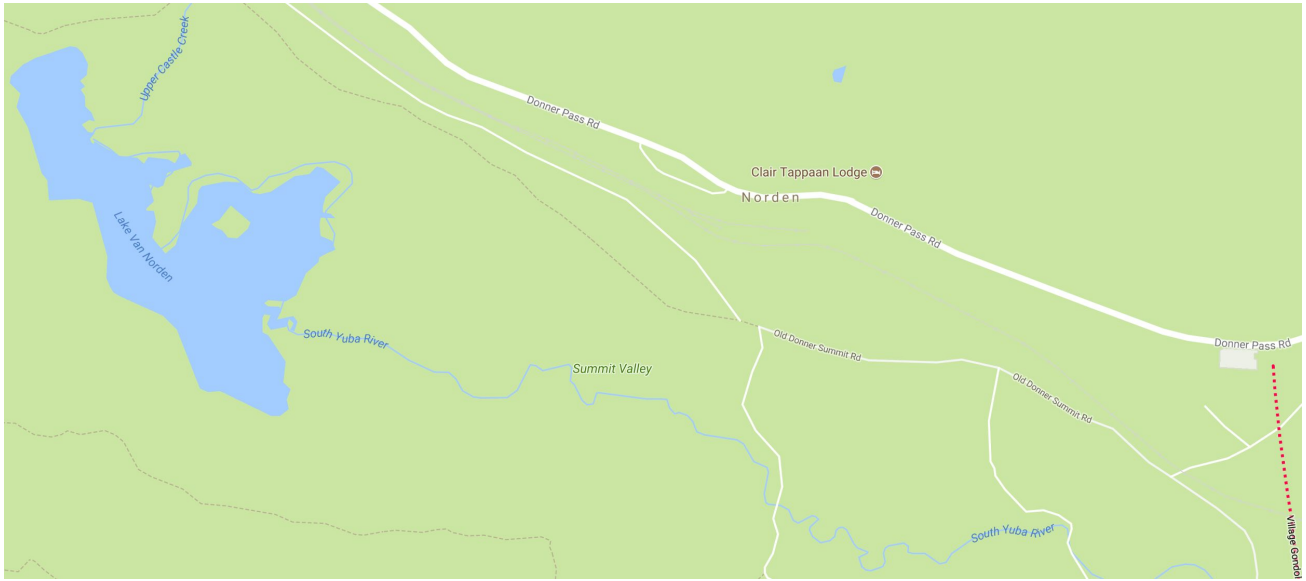
How does dissolved oxygen affect biodiversity of macroinvertebrates?

- Biodiversity of macroinvertebrate indicator species
- Dissolved oxygen - oxygen in the water
  - Nutrients: nitrite, phosphate, ammonia
- Other factors measured: pH, turbidity, temperature, salinity
- Why?
  - Macroinvertebrate indicator species = water quality
  - High water quality = healthier ecosystem = better air quality



Time & Location

- When: Fall, from 9:00 am to 2:00 pm
- Where: along the South Yuba River and Lake Van Norden



Hypothesis:

If there is more dissolved oxygen then there will be more biodiversity in macroinvertebrates.

Reasoning: More dissolved oxygen means that there is more oxygen available for organisms in the water.

Other hypotheses: If there is less turbidity-

- Less phosphorus - high plant productivity
- Less nitrogen - higher plant productivity
- Lower temperature - lack of sediment
- More neutral or acidic - organic decay

Method

- Take a water sample from the body of water by putting water into small plastic water bottles
- Measure turbidity with a Secchi tube and meter stick
- Measure pH with AZ8681 Waterproof pHmeter
- Measure temperature with IKEA Cooking Thermometer
- Measure salinity with TDS-3 Salinity Sensor

Method (cont.)

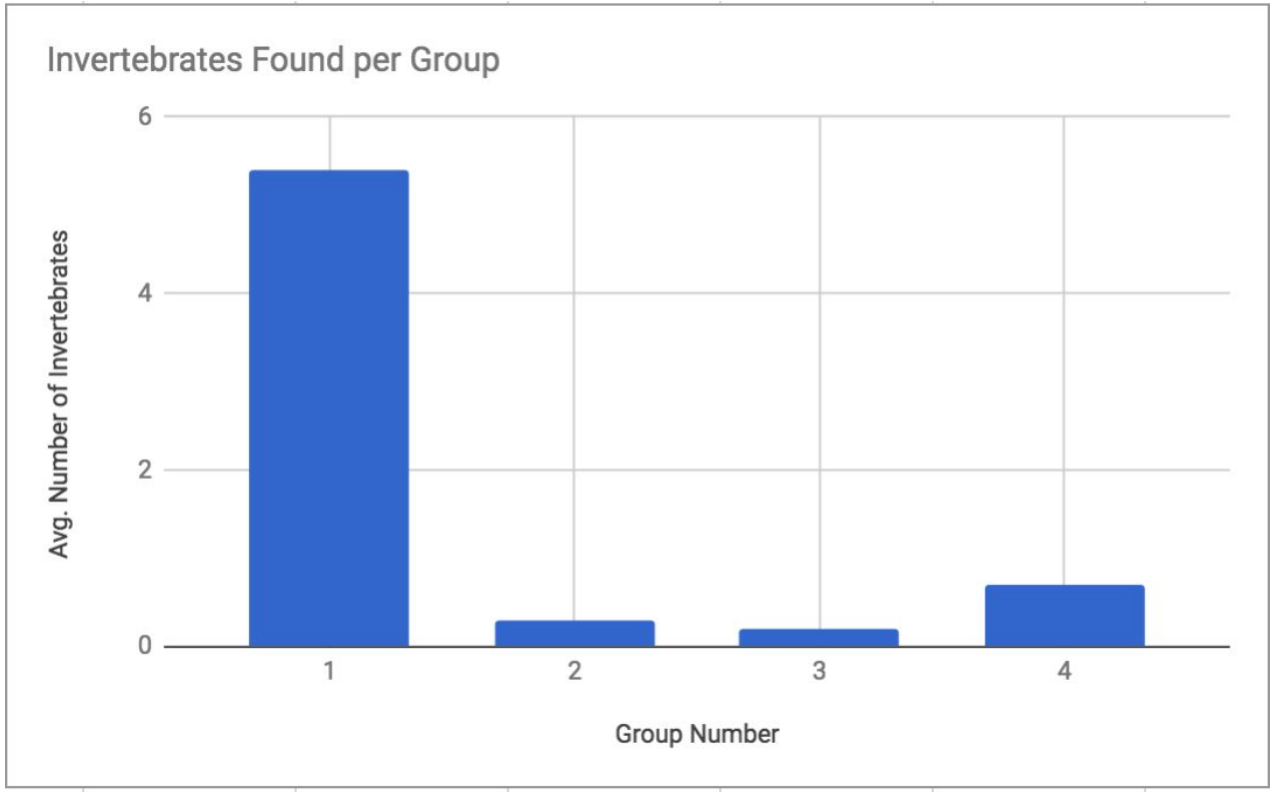
- Measure dissolved oxygen with Milwaukee MW 600 Dissolved Oxygen Smart DO meter
- Used net to catch a sample of macroinvertebrates (by raking nearby vegetation or turning over rocks and stirring up the sediment)
- Put sample of macroinvertebrates in tub of water and identified them
    - Standardize time
- Measure phosphate, nitrite, and ammonia in water samples with API Pondcare Pond Master Test Kit
- Used bioassessment formula to calculate biodiversity
    - (Group 1 x 4) + (Group 2 x 3) + (Group 3 x 2) + (Group 4 x 1) = bioassessment score

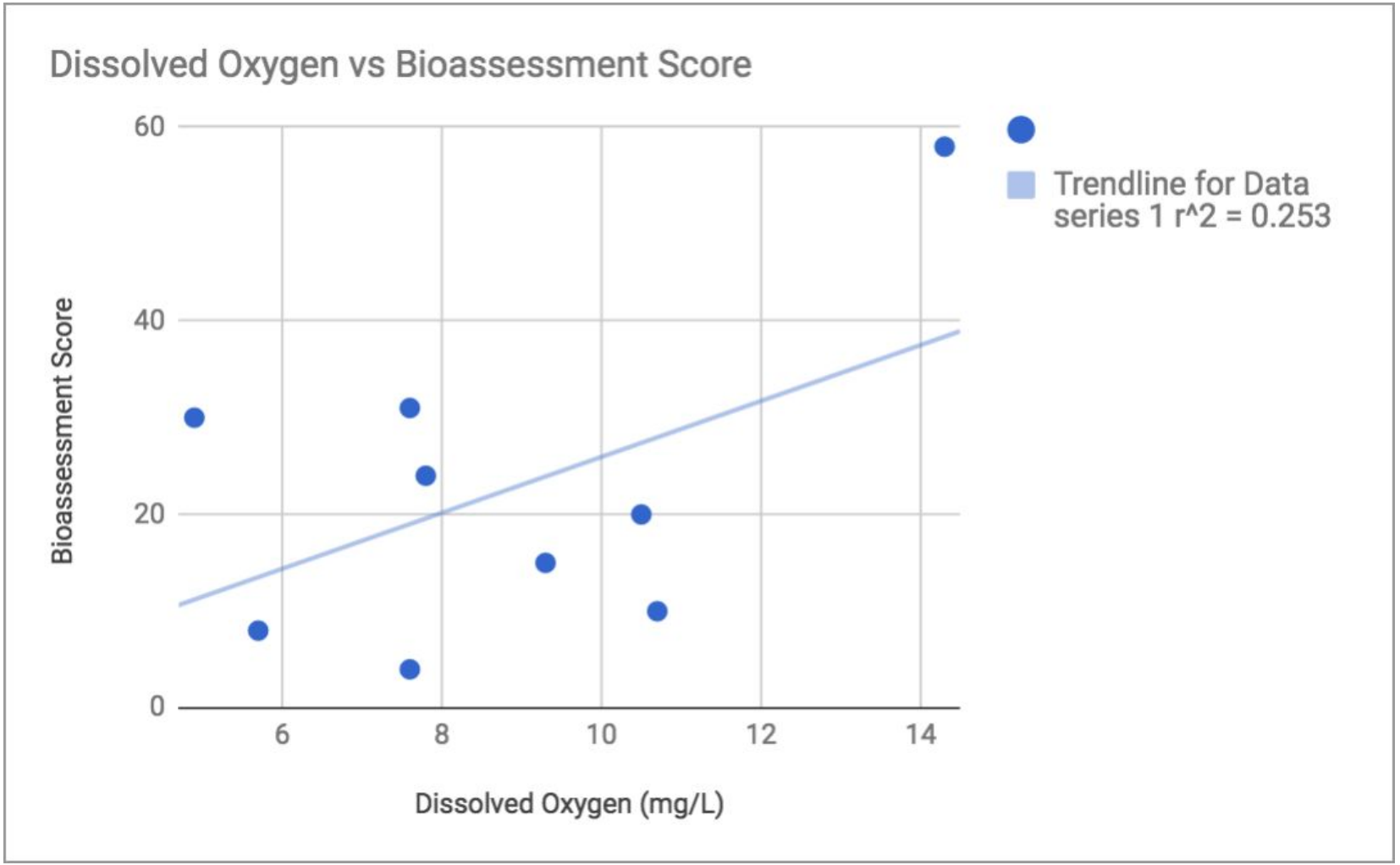
We found:

- No nitrite or phosphate
- Some ammonia (0-0.5 ppm mg/L)
- pH levels were fairly consistent (~7-8)
- Generally less turbid (1200 mm)
- Salinity varied between the meadow and lake

Results

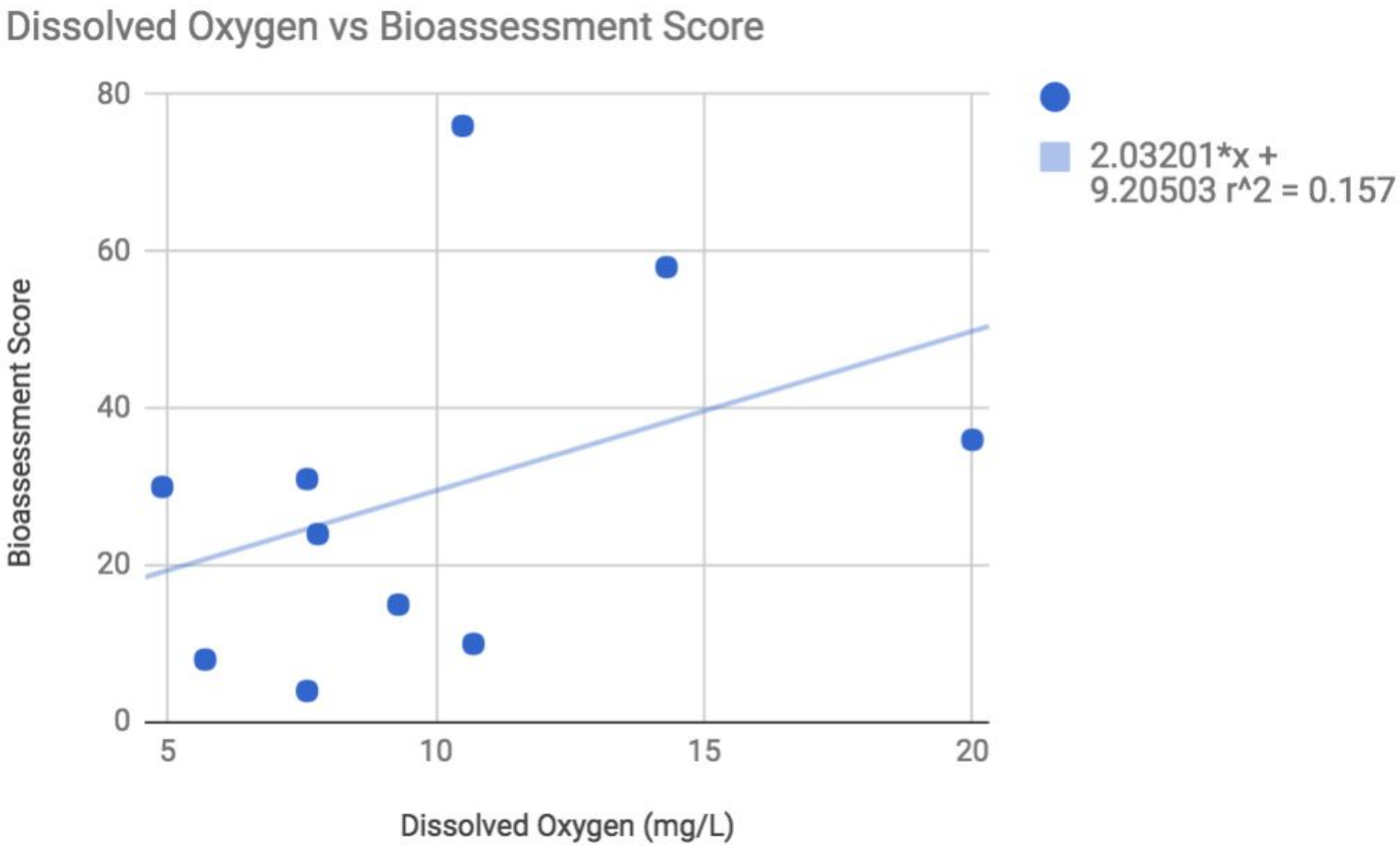
Group #	Group #	P-value
1	2	0.0004
1	3	0.0003
1	4	0.0021
2	3	0.6958
2	4	0.5362
3	4	0.4246

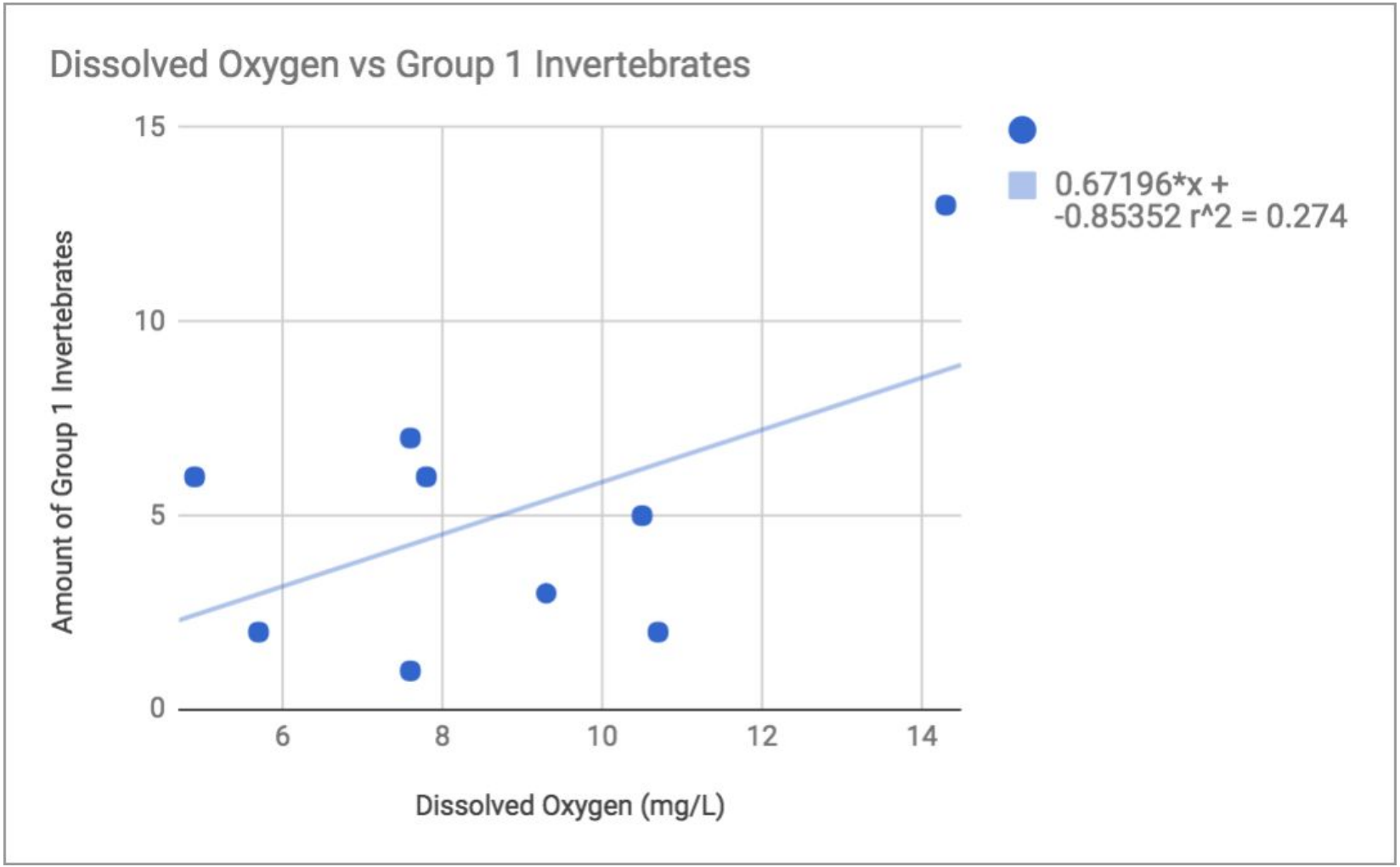




*Outlier of Group 4 is not included

*Outlier in Group 4 is included



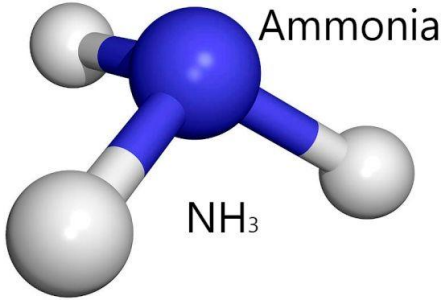

Dissolved Oxygen vs Group 1 Invertebrates
15
10
5
0
Amount of Group 1 Invertebrates
6
8
10
12
14
Dissolved Oxygen (mg/L)
0.67196*x +
-0.85352 r^2 = 0.274

Discussion

- Our results were inconclusive.
- We found many Group 1 invertebrates, which indicates that water quality was good since Group 1 invertebrates are very intolerant of pollution.

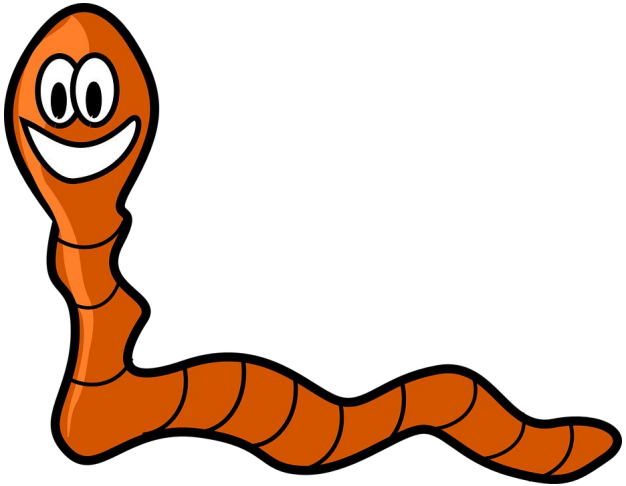
Discussion

- Data = inconclusive → did not support nor reject our hypothesis
- Unable to find strong correlations between dissolved oxygen and biodiversity of invertebrates
- Only nutrient found in the water samples was ammonia, not nitrite or phosphate → amount of nitrite and phosphate was immeasurable/our kit was not sensitive enough to measure it
- Presence of ammonia = animal (bird/fish) waste
- Nitrogen cycle is present
- Found good water quality = healthy ecosystem here



Improvements and Questions

- Gather more data in a more diverse selection of locations - more variety in turbidity and other factors
- Use more sensitive nutrient test kit
- Have standardized time for identifying invertebrates
- Take pictures of data & location
- Why was there an abundance of worms in an isolated, turbid pool of water?
- Why are there increased salinity levels in the lake, and how does that affect the biodiversity in the lake?

Acknowledgments

- Max, Patrick, and Roxie for providing dissolved oxygen measurements
- Rochelle and Spencer for guiding us through this process (and the meadow)