

Dissolved Oxygen on the Elwha

By: Martin Waldrip and Justice Quent



Presentation Outline

- Introduction: Our Preliminary research that lead to our hypothesis
- Methods: The materials we used and how we sent up our experiment
- Results: The data table, graph, and statistical analysis
- Discussion: Why we got these results

Library Research

- Dissolved oxygen can get in the water by aeration, Diffusion from the surrounding air, and as a waste product of photosynthesis
- Optimal D.O. level is 9 milligrams per liter
- Levels less than 3 mg/L are fatal to fish
- Levels between 3mg/L and 5mg/L put life under stress
- Levels shouldn't exceed 110%

Benefits of Research

Our research will benefit the scientific world by showing if the water above the dams is safe for the salmon.



Research Question

Is the dissolved oxygen level higher at the Mouth of the Elwha or at Lake Mills?



Hypothesis

We predict that the D.O. level is higher at the Mouth of the Elwha. We made this prediction because the water at the Mouth is much more aerated. The manipulated variable is the location, the controlled variables are the equipment, the method, and the time of test, and the responding variable are the D.O. levels.

Null Hypothesis

Our null hypothesis is that there will be no difference in dissolved oxygen levels at the Mouth of the Elwha an Lake Mills.



Materials

- One Dissolved Oxygen Kit
- One Towel
- At least one pair of goggles
- At least one pair of rubber gloves
- One waste container
- One data table, pencil

Methods

1. Assemble materials.
2. Choose test sites.
3. Fill glass vial to brim with water from test site; **make sure there are no air bubbles.**
4. Add one oxygen one packet to water; shake vigorously.
5. Add one packet of oxygen two to solution; shake vigorously.
6. Let solution sit until orange particles settle below line.

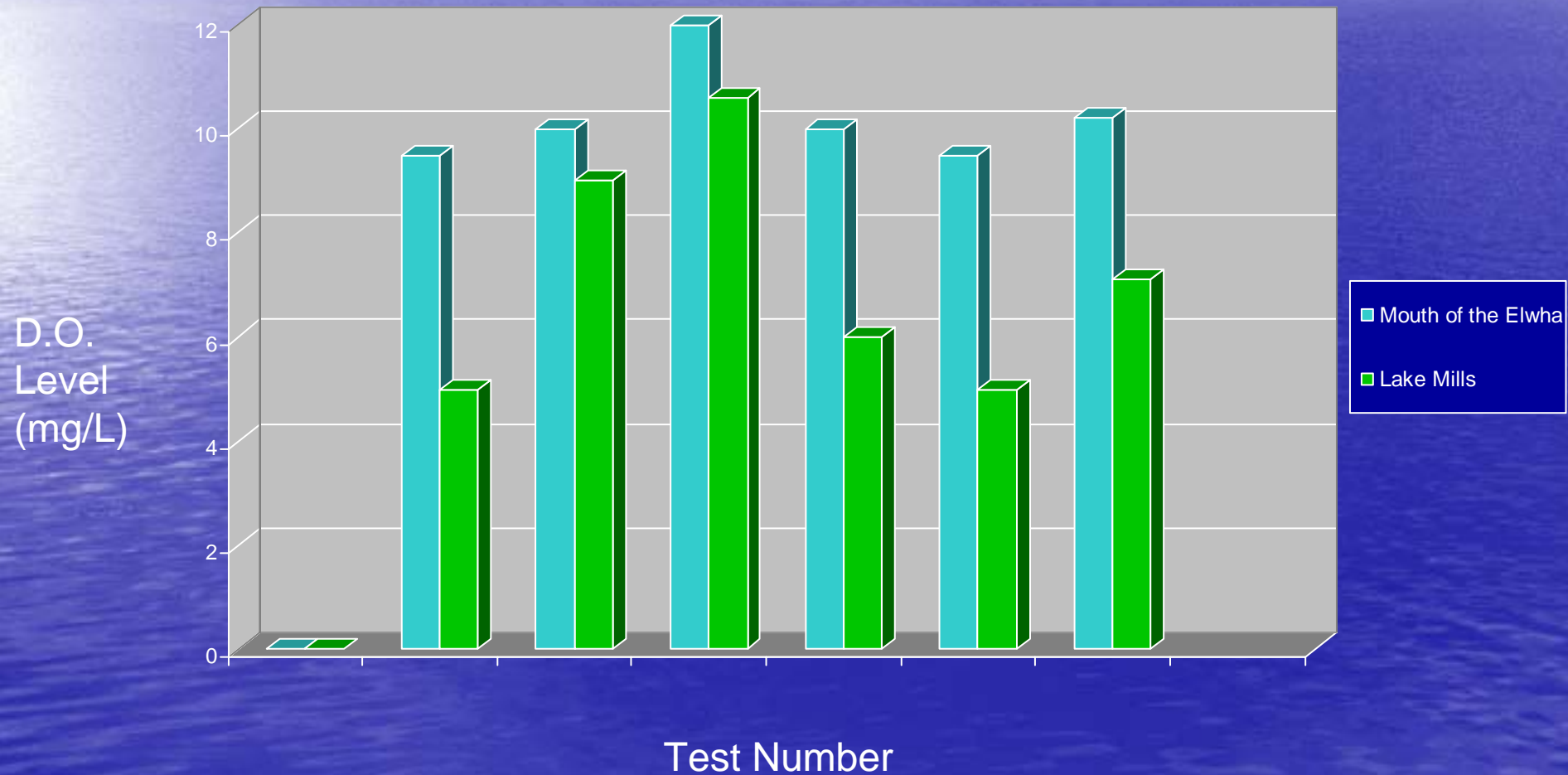
Methods (Continued)

7. Add one packet of oxygen three to solution; shake vigorously.
8. Pour solution into measure tube until brim
9. Place solution from first vial into waste container.
10. Place solution from measure tube into the third vial.
11. Add oxygen four drops until solution is clear; count drops!
12. Repeat steps 2-10 four more times; record measurements.

Results

Test Number	Level at Mouth of Elwha (mg/L)	Level at Lake Mills (mg/L)
1	9.5	5
2	10	9
3	12	10.6
4	10	6
5	9.5	5
Average	10.2	7.12
Range	2.5	5.5

Graph



Statistical Data

- P - Value = 0.81

There is a 81% chance of seeing data like this if the null hypothesis is true.



Discussion

- The dissolved oxygen level is higher at the Mouth of the Elwha
- The water at the Mouth was much more aerated than Lake Mills
- More open to fish

Next Step

If I had the chance to do this test again, I would take a ton more tests, and use an electronic dissolved oxygen meter to measure with.



DISSOLVED OXYGEN

Introductory

A good D.O. level, or dissolved oxygen level, is water is essential for aquatic life. Oxygen can get into water by diffusion from the surrounding air, by aeration, which means rapid movement, and as a waste product of photosynthesis. The dissolved oxygen concentration in water should not reach over 110%, the salmon may suffer from a rare but deadly disease called, you guessed it, "gas bubble disease." Bubbles in the fish's blood stream block the flow of blood through the blood vessels, causing death. The optimal D.O. level for salmon is nine milligrams per liter of water. A level that is seven to eight milligrams per liter is acceptable, while a level under five milligrams per liter is under stress. A level below three and a half is fatal. What I want to know is if the D.O. level is higher at the mouth of the Elwha River, or at Lake Mills. This will tell me if the dissolved oxygen level is high enough, even in a lake, for the salmon.

Materials

- 1 Dissolved Oxygen Kit
- 1 Towel
- At Least 1 Pair of Goggles
- At Least 1 Pair of Gloves
- 1 Waste Container
- 1 Data Table, Table

Methods

1. Assemble materials.
2. Choose site to test at.
3. Fill glass vial to brim with water from test site. **make sure there are no air bubbles.**
4. Add one oxygen one packet to water; shake vigorously.
5. Add one packet of oxygen five to saturation; shake vigorously.
6. Let solution sit until orange particles settle below line.
7. Add oxygen 2 to solution; shake vigorously.
8. Pour solution into measure tube and beim.
9. Place solution from measure tube into 100 mL beaker.
10. Place solution from measure tube into 100 mL beaker.
11. Place solution from measure tube into 100 mL beaker.
12. Place solution from measure tube into 100 mL beaker.
13. Place solution from measure tube into 100 mL beaker.
14. Place solution from measure tube into 100 mL beaker.
15. Place solution from measure tube into 100 mL beaker.
16. Place solution from measure tube into 100 mL beaker.
17. Place solution from measure tube into 100 mL beaker.
18. Place solution from measure tube into 100 mL beaker.
19. Place solution from measure tube into 100 mL beaker.
20. Place solution from measure tube into 100 mL beaker.
21. Place solution from measure tube into 100 mL beaker.
22. Place solution from measure tube into 100 mL beaker.
23. Place solution from measure tube into 100 mL beaker.
24. Place solution from measure tube into 100 mL beaker.
25. Place solution from measure tube into 100 mL beaker.
26. Place solution from measure tube into 100 mL beaker.
27. Place solution from measure tube into 100 mL beaker.
28. Place solution from measure tube into 100 mL beaker.
29. Place solution from measure tube into 100 mL beaker.
30. Place solution from measure tube into 100 mL beaker.
31. Place solution from measure tube into 100 mL beaker.
32. Place solution from measure tube into 100 mL beaker.
33. Place solution from measure tube into 100 mL beaker.
34. Place solution from measure tube into 100 mL beaker.
35. Place solution from measure tube into 100 mL beaker.
36. Place solution from measure tube into 100 mL beaker.
37. Place solution from measure tube into 100 mL beaker.
38. Place solution from measure tube into 100 mL beaker.
39. Place solution from measure tube into 100 mL beaker.
40. Place solution from measure tube into 100 mL beaker.
41. Place solution from measure tube into 100 mL beaker.
42. Place solution from measure tube into 100 mL beaker.
43. Place solution from measure tube into 100 mL beaker.
44. Place solution from measure tube into 100 mL beaker.
45. Place solution from measure tube into 100 mL beaker.
46. Place solution from measure tube into 100 mL beaker.
47. Place solution from measure tube into 100 mL beaker.
48. Place solution from measure tube into 100 mL beaker.
49. Place solution from measure tube into 100 mL beaker.
50. Place solution from measure tube into 100 mL beaker.
51. Place solution from measure tube into 100 mL beaker.
52. Place solution from measure tube into 100 mL beaker.
53. Place solution from measure tube into 100 mL beaker.
54. Place solution from measure tube into 100 mL beaker.
55. Place solution from measure tube into 100 mL beaker.
56. Place solution from measure tube into 100 mL beaker.
57. Place solution from measure tube into 100 mL beaker.
58. Place solution from measure tube into 100 mL beaker.
59. Place solution from measure tube into 100 mL beaker.
60. Place solution from measure tube into 100 mL beaker.
61. Place solution from measure tube into 100 mL beaker.
62. Place solution from measure tube into 100 mL beaker.
63. Place solution from measure tube into 100 mL beaker.
64. Place solution from measure tube into 100 mL beaker.
65. Place solution from measure tube into 100 mL beaker.
66. Place solution from measure tube into 100 mL beaker.
67. Place solution from measure tube into 100 mL beaker.
68. Place solution from measure tube into 100 mL beaker.
69. Place solution from measure tube into 100 mL beaker.
70. Place solution from measure tube into 100 mL beaker.
71. Place solution from measure tube into 100 mL beaker.
72. Place solution from measure tube into 100 mL beaker.
73. Place solution from measure tube into 100 mL beaker.
74. Place solution from measure tube into 100 mL beaker.
75. Place solution from measure tube into 100 mL beaker.
76. Place solution from measure tube into 100 mL beaker.
77. Place solution from measure tube into 100 mL beaker.
78. Place solution from measure tube into 100 mL beaker.
79. Place solution from measure tube into 100 mL beaker.
80. Place solution from measure tube into 100 mL beaker.
81. Place solution from measure tube into 100 mL beaker.
82. Place solution from measure tube into 100 mL beaker.
83. Place solution from measure tube into 100 mL beaker.
84. Place solution from measure tube into 100 mL beaker.
85. Place solution from measure tube into 100 mL beaker.
86. Place solution from measure tube into 100 mL beaker.
87. Place solution from measure tube into 100 mL beaker.
88. Place solution from measure tube into 100 mL beaker.
89. Place solution from measure tube into 100 mL beaker.
90. Place solution from measure tube into 100 mL beaker.
91. Place solution from measure tube into 100 mL beaker.
92. Place solution from measure tube into 100 mL beaker.
93. Place solution from measure tube into 100 mL beaker.
94. Place solution from measure tube into 100 mL beaker.
95. Place solution from measure tube into 100 mL beaker.
96. Place solution from measure tube into 100 mL beaker.
97. Place solution from measure tube into 100 mL beaker.
98. Place solution from measure tube into 100 mL beaker.
99. Place solution from measure tube into 100 mL beaker.
100. Place solution from measure tube into 100 mL beaker.

Data Table

Test #	D.O. Level at Mouth of Elwha (mg/L)	D.O. Level at Lake Mills (mg/L)
1	12	6
2	10	5
3	9.5	5
4	10	10.6
5	9.5	9
Ave.	10.2	7.12

"Is the dissolved oxygen higher at the Mouth of the Elwha or Lake Mills?"

Results

We tested dissolved oxygen at Lake Mills vs. the Mouth of the Elwha River. Our average dissolved oxygen level at Lake Mills was 7.2 mg/L (milligrams of oxygen) per liter (of water), whereas at the Mouth of the Elwha, the average was 10.2 mg/L. That is a difference of 3 milligrams per liter! I know that doesn't sound like that much, but that could mean life or death to a fish; it's pretty much smaller range at the Mouth of the Elwha, which was 2.5 mg/L. We had two outliers at Lake Mills, which were 10.6 mg/L instead of 7.2 mg/L. We didn't have any problem collecting the data, but water was really cold. There was an interesting pattern in data at the Mouth of the Elwha; the data points we collected were 9.5, 10, 12, 10, and 9.5 mg/L. Weird, huh.

Conclusions

Our results indicated that there was higher dissolved oxygen at the Mouth of the Elwha than at Lake Mills. Our research supported my hypothesis, which stated that the D.O. level would be higher at the Mouth of the Elwha. This made sense because the water at the Mouth of the Elwha was moving, so it got more aeration than the lake. Our group and another group teamed up to get our results better, and their measure vial was bigger than ours. We had to find what the measure actually was through a big line conversion, and we may have made a mistake. I was surprised at how low the D.O. level was at the lake, because even though the water was not moving, there were more trees at the lake to produce oxygen, and diffusion from the water more often on lakes. If I did this experiment again, I would use the electronic dissolved oxygen meter to make the experiment less messy. In conclusion, the Mouth of the Elwha has a higher D.O. level than Lake Mills.

Manipulated Variable: Location
Responding Variable: Dissolved Oxygen Level

By: Martin Waldrip & Justice Quent