

pH Effects on Phytoplankton Proliferation

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Abstract

The objective of this experiment was to find out how pH affected phytoplankton growth. Phytoplankton samples were taken from Cell 3 of the Lake Waco Wetlands and transferred into mesocosms. The pH was adjusted to five different levels, a specific pH per mesocosm. Samples of water were taken from each mesocosm and processed for chlorophyll *a*. The pH was measured and adjusted each week to maintain the mesocosm's controlled environment. Although chlorophyll processing was done correctly, an insufficient amount of water samples caused the findings to vary. Each week the pH rose to about 8.5 in all five containers, which showed an important relationship between pH and phytoplankton that would require further testing for accuracy.



Introduction

Because plankton are a major part of the food web in the Lake Waco Wetlands, it is important to understand the optimal conditions for plankton growth. Hansen (2002) studied the effects of pH in marine phytoplankton and found that the “uptake of inorganic carbon by phytoplankton during photosynthesis has the potential to increase the pH in the surrounding water”. The hypothesis was that the pH would increase due to phytoplankton growth, in a freshwater environment. The experiment was designed to test phytoplankton growth at different pH levels.

Methods and Materials

- Five mesocosms (18.93 liter plastic buckets) were set up. Each contained Lake Waco Wetlands plankton from Cell 3 and water pumped from the North Bosque River.
- The water pH in each mesocosm was set to 6.0, 6.5, 7.0, 7.5, and 8.0, respectively (Figure 1).
- One liter samples were taken from each bucket, once per week over three weeks.
- These samples were then tested for chlorophyll amounts (as a measurement for a phytoplankton growth).



Figure 1

Results

The pH increased in all five mesocosms (Figures 2 and 3). Chlorophyll was measured to correlate the change in pH with phytoplankton growth. The results from the chlorophyll sampling were greatly varied, because the water sample size for chlorophyll was too small to obtain accurate phytoplankton growth (Figure 4).

Figure 2: Comparison of Initial pH and Final pH, week 1

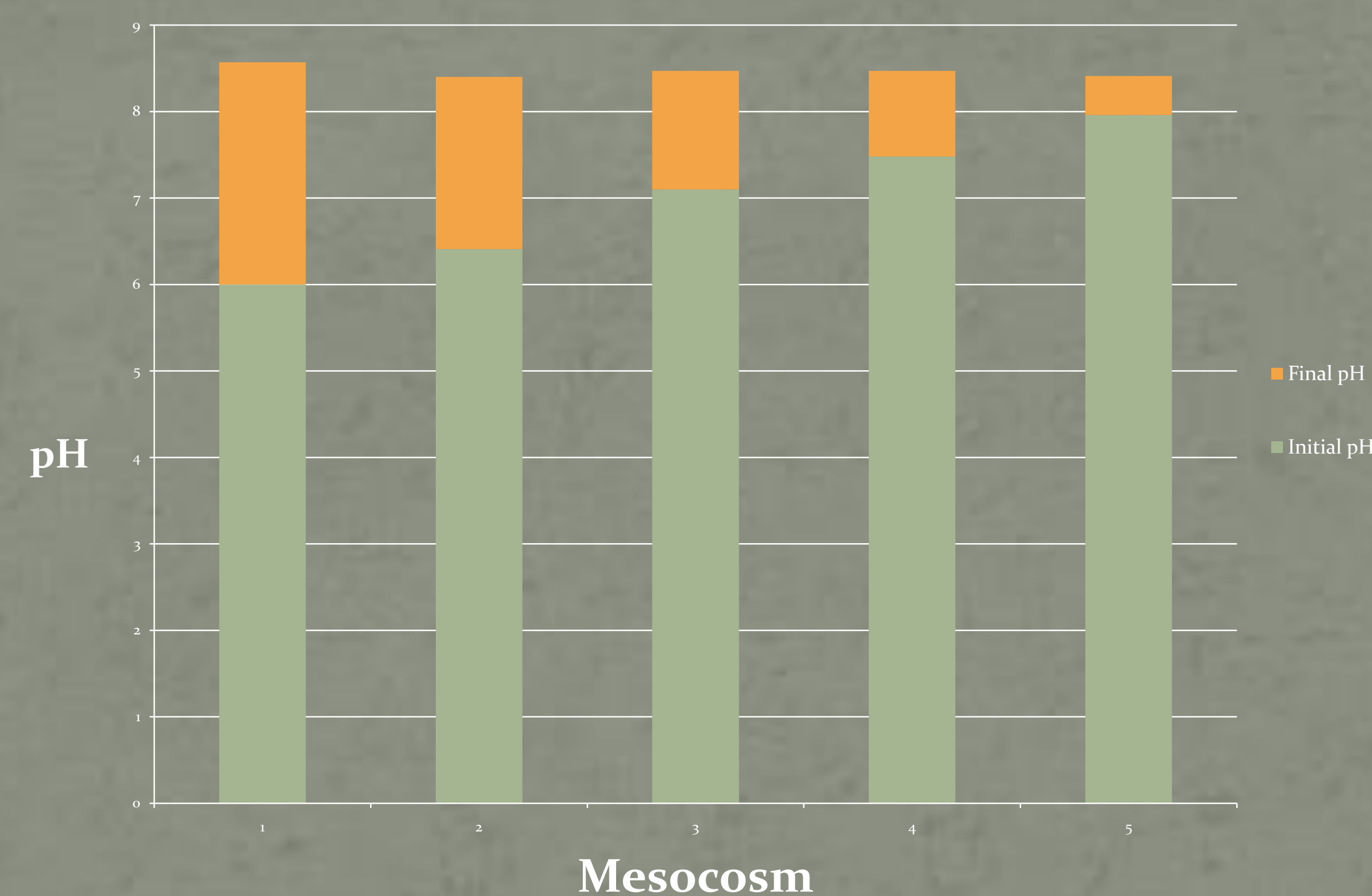


Figure 3: Comparison of Initial pH and Final pH, week 2

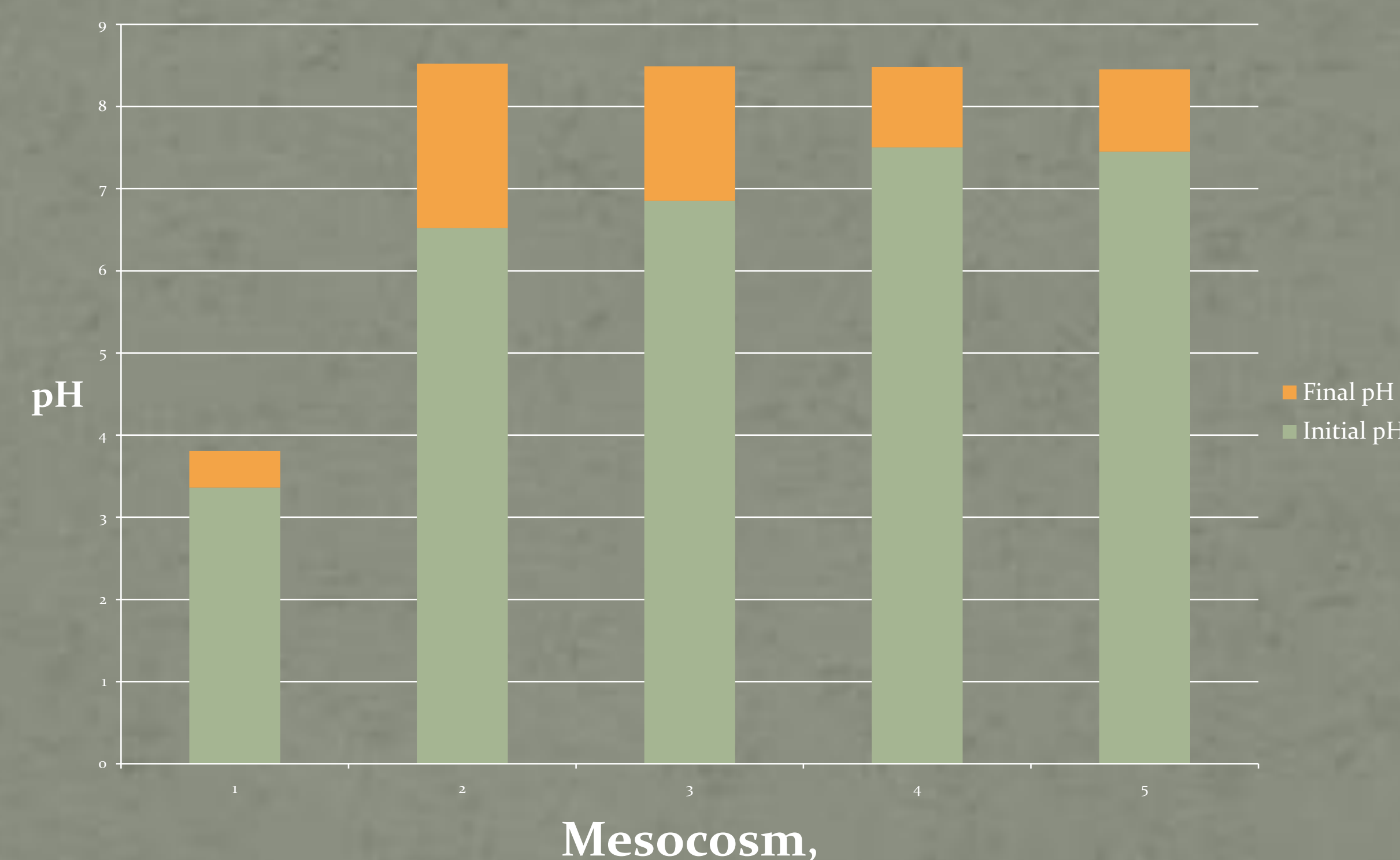
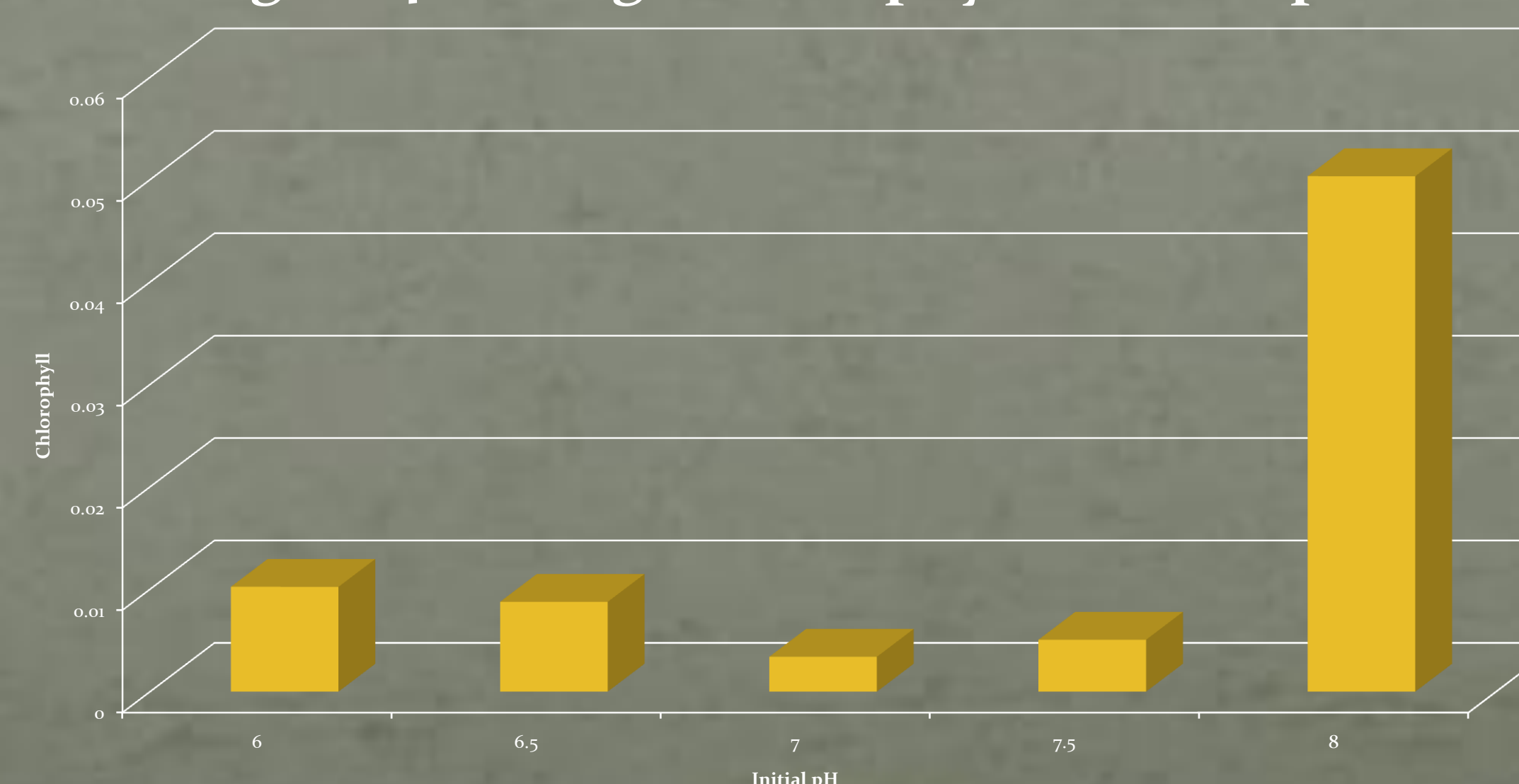


Figure 4: Average Chlorophyll v. Initial pH



Discussion:

There was a relationship between phytoplankton and the pH of the mesocosms. The relationship can be identified without accurate chlorophyll measurements, as noted by Kolbe and Luedke (2005) and Buskey (2008), during plankton blooms, it is common to see pH values in the 8 to 9 range.” Though there was visible plankton growth, the small water sample did not lead to conclusive evidence of measureable plankton growth. A pH of 8.5 seems to be the optimal pH for phytoplankton in the Lake Waco Wetlands because of the uniform shift in all five mesocosms.

Conclusion

The optimal pH for phytoplankton has great significance, because they are primary producers in the Lake Waco Wetland ecosystem (Kolbe and Luedke 2005). When phytoplankton reach their optimal pH, they no longer have to expend energy to alter the water's pH. This extra energy can then be used for reproduction and growth, which benefits the rest of the Wetlands' food chain.

References

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