Monitoring Alkalinity in the Waccamaw River at Murrells Landing, South Carolina
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Abstract

Alkalinity is a water property that measures the waters’ ability to neutralize acids to stay at a stable pH level. The alkalinity is changed based on the number of carbonates (bases) in the water, and these carbonates come from the rocks, soil and the ecosystems that feed from the water. Low alkalinity can cause acidification, which can lead to lowered pH levels, affecting aquatic organisms and ecosystems. The Waccamaw River at Murrells Landing, South Carolina, has a measured alkalinity of 16.24 mg CaCO₃/L, which is below the high point of 20 mg CaCO₃/L and pH remained within the standard at an average of 6.

Materials & Methods

Our equipment used to measure alkalinity is as follows:
- Digital titrator
- 100-mL graduated cylinder
- 250-mL beaker
- pH meter with combination temperature and reference electrode (pH “pocket pal”)
- Sulfuric acid titration cartridge, 0.16 N

As we can see earlier on in our data, we had very high measurements of alkalinity. Within the past two years, we have discussed causes fishes, plants and animals in and out of the water through the soil on the banks or from acid rain as acids tend to enter the ecosystems near Murrell’s landing. As we can see earlier on in our data, we had very high measurements of alkalinity. Within the past two years, we have discussed causes fishes, plants and animals in and out of the water to be affected.

Results

All samples were collected between June 06, 2006 and February 24, 2021 at Murrells Landing, South Carolina. The water samples were taken following the processes described in (UMASS, 2020). Alkalinity was also measured following the same processes.

Background & Motivation

- If alkalinity gets too low the water’s pH can become critical. In the Waccamaw river this can affect the ecosystems in the water, which could potentially affect the wildlife and populations outside the water.
- Acid rain is a factor that throws the pH in the water off. Acid rain comes from the rainwater becoming concentrated with CO₂ (Wurts & Durborow, 1992).
- When this rainwater becomes runoff, it generally will flow over rocks, and the pH of the stormwater runoff will become more basic.
- If rainwater lands directly in the water it will get neutralized by the buffer, but if the alkalinity happens to be too low this could pose a hazard to life in the water.
- The pH scale starts at zero, being the most acidic and goes to fourteen. The number seven means it has a neutral pH.

Table 1: Alkalinity Classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Alkalinity (ppm CaCO₃)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidified</td>
<td>Less than or equal to 0 and a pH lower than 5.0</td>
</tr>
<tr>
<td>Critical</td>
<td>Greater than 5 and up to 2</td>
</tr>
<tr>
<td>Endangered</td>
<td>Greater than 2 and up to 5</td>
</tr>
<tr>
<td>Highly Sensitive</td>
<td>Greater than 5 and up to 10</td>
</tr>
<tr>
<td>Sensitive</td>
<td>Greater than 10 and up to 20</td>
</tr>
<tr>
<td>Not Sensitive</td>
<td>Greater than 20</td>
</tr>
</tbody>
</table>

Table 1: Alkalinity Time Trend

Table 1: Alkalinity Rain and Time Trend

Figure 1: Satellite Image of the Sampling Site at Murrells Landing, South Carolina.

Figure 2: The device being held is the Hach Digital Titrator.

Through time we can see the alkalinity of the water around the Murrells Landing has been decreasing. This could potentially be critical to the ecosystems around and in the Waccamaw River. A possible fix for this could be to line some parts of the river with some rocks so that the runoff gives us some more bases in the water, but for now we should continue to monitor the ecosystems and the alkalinities to make a more educated decision.

Conclusion

Table 1: Alkalinity Rain and Time Trend

References

(UMASS, 2020) "Volunteer Water Monitoring Program.”


Table 2: Alkalinity Rain and Time Trend

Table 3: Alkalinity Raw Data ("Volunteer Water Quality Monitoring Program," n.d.)