Land Use Affects Water Quality in Candlewood Lake?

Assessing Land Use

Human land use and vegetation features at each location were observed and recorded. Data were recorded in a comprehensive Epicollect smartphone web form, created for this study. Data were exported in the spreadsheet as shown below:

<table>
<thead>
<tr>
<th>Location</th>
<th>Dark Soil</th>
<th>Dark Mix</th>
<th>Medium</th>
<th>Light Mix</th>
<th>Severe Mix</th>
<th>Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lynn Deming Park</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
<tr>
<td>Brookfield Beach (BB)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
<tr>
<td>Brookfield High School (Junior)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
<tr>
<td>Candlewood Orchards (COPO)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
<tr>
<td>Candlewood Nature Center</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
<tr>
<td>South of Kellogg St (KS)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
<tr>
<td>North of Chimney Point Hill (CP)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Low</td>
</tr>
</tbody>
</table>

Results By Test Location

- South of Kellogg Street (KS):
  - High septic usage and proximity
  - High amounts of manicured lawns
  - High boat activity
  - High amounts of asphalt and dirt parking and traffic
  - Low vegetation, minimal to block run-off into lake
  - Land usage (see map & table) corresponds to negative water results (see water quality section):
    - o Dark Soil
    - o Highest levels of phosphates, nitrates, nitrites, and ammonia
    - o High weed growth indicating high phosphates (1)

Candlewood Orchards (COPO):

- Second worst in land use, second highest in water quality test results

Brookfield Beach (BB):

- Third worst in land use, unexpected low result in phosphates
- Possible explanations: low use of detergents or current patterns

North of Chimney Point (CP) and Lynn Deming (LD):

- Lowest amount of human land use, lowest test results
- Best water quality of the 5 locations

Focal Question

How does land use around Candlewood Lake affect water quality?

Scope of Study

Five (5) test locations that have different degree of land use were chosen to be tested for seven (7) water quality variables.

Assessing Water Quality

- Water samples were taken and tested for phosphates, nitrates, nitrites, and ammonia using Hach test kits at each location.
- A conductivity meter was used to measure temperature and conductivity at each location as well.
- This method was performed in August 2017 (Test #1 – light blue) & October 2017 (Test #2 – dark blue).

References

- Conductivity (%): Safe level in marine environments 0.02 - 0.4, Toxic to fish > 0.03

Results By Test Category

- Phosphate levels are very high at all locations except Brookfield Beach, indicating accelerating Eutrophication (5). Further testing at a more sensitive scale might reveal unacceptable levels.
- Nitrate and nitrite levels are high at KS at 2 ppm and 0.15 ppm, above ideal levels of 0.1 to 0.2 ppm and 0.01 to 0.04 ppm, respectively. Nitrite levels are the same for COPO test location.
- Ammonia levels are above the toxic level to fish at 0.03 ppm at all test locations and above the 0.4 ppm maximum safe level in marine environments at KS with test readings at 0.5 ppm.
- Conductivity is inconsistent with temperature readings indicating other factors other than temperature is affecting the conductivity of the water.

James (Jaich’i) Levi¹ | Justin Mack²,³

¹Brookfield High School (Junior) | ²Sarah Noble Intermediate School (Teacher) | ³Pratt Nature Center (Board Member)