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How Healthy is the Magoon Pond Watershed

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How Healthy is the Magoon Pond Watershed?

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Purpose of study

The purpose of this independent study was to assess the health of the physical and biological properties of the Magoun pond.
The Magoun Pond is located in Marshfield, Massachusetts.
The Magoun Pond is on a tributary to the North River.
As you can see, the Magoun pond is located in the center of a very residential area.
We had to calculate the water flow at different test locations to calculate the amount of water discharged from each part of the watershed. We also had to take depth measurements at each site in order to construct a stream profile.
Millpond Inlet Stream Profile

Depth (cm)

Inverse Average Depth
Macro/Invertebrates

- Freshwater macroinvertebrates are animals without backbones that are larger than ½ millimeter.

- These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life.

- Benthos is an important part of the food chain, being food for fish, while feeding on algae and bacteria.

  **Why use them to determine water quality?**

- Benthos are not very mobile so they are less apt to escape the effects of pollutants that diminish water quality. Therefore, benthos can give us reliable information on stream and lake water quality.

- Their long life cycles allow studies conducted by aquatic ecologists to determine any decline in environmental quality.
A Biological Index is a statistical tool used to evaluate the ecological integrity of a community, based after the species tolerance in the environment.

To determine the water quality using our invertebrate samples, each organism is given a value depending on its water quality indication (lower values for better water quality indicators.)

We then insert our data into a biological index.

The site with the lowest value has the highest water quality.
<table>
<thead>
<tr>
<th>Score Range</th>
<th>Water Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0-3.75</td>
<td>Excellent</td>
</tr>
<tr>
<td>3.76-4.25</td>
<td>Very Good</td>
</tr>
<tr>
<td>4.26-5.00</td>
<td>Good</td>
</tr>
<tr>
<td>5.01-5.75</td>
<td>Fair</td>
</tr>
<tr>
<td>5.76-6.50</td>
<td>Fairly-Poor</td>
</tr>
<tr>
<td>6.51-7.25</td>
<td>Poor</td>
</tr>
<tr>
<td>7.26-10.00</td>
<td>Very Poor</td>
</tr>
</tbody>
</table>
Good Indicators
Trichoptera

• Caddisfly’s can be used as an indicator of excellent water quality.
• Many of them build cases of plant material, sand, pebbles or debris in which they live.
• Caddisfly’s will feed on Detritus and micro-algae.
The Dragonfly is an indicator of Fair water quality.

Dragonfly’s are valuable predators in the pond habitat.

Some Dragonfly nymphs even hunt on land.
Poor Indicators
Simuliidae

- The Blackfly larvae is an indicator of poor water quality.
- Most black flies regain nourishment by sucking the blood of other animals.
- Blackfly’s are a common nuisance for humans.
## Bio-index: Pond

<table>
<thead>
<tr>
<th>Taxonomic Group</th>
<th>Group</th>
<th>Actual Count</th>
<th>Avg. Count</th>
<th>Group %</th>
<th>Avg. Org</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ephemeroptera</td>
<td>4</td>
<td>20</td>
<td>20</td>
<td>32</td>
<td>70.00</td>
<td>280.0</td>
</tr>
<tr>
<td>Trichoptera</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>10.50</td>
<td>31.5</td>
</tr>
<tr>
<td>Diptera (Chironomidea)</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3.50</td>
<td>24.5</td>
</tr>
<tr>
<td>Diptera (Other)</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0.0</td>
</tr>
<tr>
<td>Odonata</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>10</td>
<td>21.00</td>
<td>105.0</td>
</tr>
<tr>
<td>Coleoptera</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>8</td>
<td>17.50</td>
<td>70.0</td>
</tr>
<tr>
<td>Amphipoda</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3.50</td>
<td>24.5</td>
</tr>
<tr>
<td>Isopoda</td>
<td>8</td>
<td>15</td>
<td>15</td>
<td>24</td>
<td>52.50</td>
<td>420.0</td>
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<tr>
<td>Decapoda</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0.0</td>
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<tr>
<td>Gastropoda</td>
<td>7</td>
<td>10</td>
<td>10</td>
<td>16</td>
<td>35.00</td>
<td>245.0</td>
</tr>
<tr>
<td>Pelecypodia</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0.0</td>
</tr>
<tr>
<td>Hiruinea</td>
<td>10</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>7.00</td>
<td>70.0</td>
</tr>
<tr>
<td>Megaloptera</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0.0</td>
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</table>

**Totals**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>220.50</th>
<th>1270.5</th>
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<tbody>
<tr>
<td></td>
<td>63</td>
<td>63.00</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MGI**

5.76
Most Abundant Invertebrates

**Inlet:**
1) Ephemerotera 2) Trichoptera 3) Amphipoda
   (Mayflies) (Caddisflies) (Scuds)

**Pond:**
1) Ephemerotera 2) Isopoda 3) Gastropoda
   (Mayflies) (Scuds) (Snails)

**Outlet:**
1) Ephemerotera 2) Coleoptera 3) Gastropoda
   (Mayflies) (Water Beetles) (Snails)
### Percent of Tolerant and Intolerant Invertebrates

<table>
<thead>
<tr>
<th>Site</th>
<th>Percent Tolerant</th>
<th>Percent Intolerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet</td>
<td>49%</td>
<td>24%</td>
</tr>
<tr>
<td>Pond</td>
<td>46%</td>
<td>5%</td>
</tr>
<tr>
<td>Outlet</td>
<td>4%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Inlet Test Site

- Test site: 1.83 meters wide
- Test site: 17.5 centimeters at deepest spot
- Test site: Flow was 6.81 CFS
- Test site: Discharge was 192.85 L/s
- Test site: Water Quality was “Fair”

- The MGBI was 5.27
Pond Test Site

- According to our biological index the water quality of the pond was on the fringe of being “Poor”.
- We did not calculate the flow because our Pond test site was standing water.
  - The MGBI was 5.76
Outlet Test Site

- Test site: 4.88 meters wide
- Test site: 13 centimeters at deepest spot
- Test site: Flow was 5.22 CFS
- Test site: Discharge was 147.83 L/s
- Test site: Water quality was “Very Good”

- The MGBI was 4.12
From the data we were able to gather through our biological index, flow rates and stream profiles, we were able to make a conclusion of the health of the Magoun Pond watershed.
Reference

• McCafferty, W. Patrick. *Aquatic Entomology*. Massachusetts: Jones and Bartlett Publishers, 1998
• Mr. James Merritt, Ph.D. Unquestioned Master of Marshfield High School’s Biological World.