Water Quality in Lake Matoaka and the Surrounding Watershed

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Research Sponsored by Virginia Environmental Endowment
We sampled 6 locations on the lake, 6 in the surrounding streams, and 5 locations throughout the watershed.
Watershed Response to Rainstorms

The following graphs illustrate changes in conductivity, pH, and dissolved oxygen following a rainstorm.

Sampling Location behind Ace Hardware, pre-rainstorm
Watershed Conductivity - Pre-Rain and Post-Rain

Watershed Location

6/24/02
7/2/02
7/8/02
7/14/2002 (Post-Rain)
Watershed pH - Pre-rain and Post-rain

Average of 4 samples - June 17-July 8
7/14/2002 - Post-rainstorm
Watershed Dissolved Oxygen
Pre-Rain and Post-Rain

Dissolved Oxygen (mg/L)

Watershed Location

6/24/02
7/2/02
7/8/02
7/14/2002 (Post-rain)
Ammonium Concentrations - Developed vs. Forested Areas

- Developed - Ace Shopping Center 1
- Developed - Ace Shopping Center 2
- Forested - Eastern State Casey Property
- Forested - Eastern State

Ammonium Concentration (micromoles/L)

- 24-Jun
- 2-Jul
- 8-Jul
Nutrient Analysis

The following charts illustrate the average concentration of three different, dissolved inorganic nutrients – ammonium, phosphate, and nitrate – in the Lake and in the surrounding streams. The levels of nutrients in the lake are generally one order of magnitude lower than levels in the streams. All concentrations expressed in micromoles per liter of water.

Thus, we can conclude that Lake Matoaka acts as a sink for inorganic nutrients. Based on the presence of extensive algal blooms in the lake, most of the dissolved nutrient load from streams is incorporated into living organic matter. In addition, some of the nitrate must also be used for anaerobic decomposition in the anoxic lake sediments (denitrification).
Phosphate Concentrations

Streams: 0.03, 0.01, 0.00, 0.00, 0.00, 0.00, 0.00, 0.01, 0.10

Lake: 3.76, 0.10, 0.00, 0.50

Locations:
- Streams: Various locations on the map
- Lake: Motoaka Lake

Note: The map shows various geographical features and locations with different phosphate concentrations.
Ammonium Concentrations

- Streams
- Lake

Streams:
- 8.4
- 15.2
- 2.8
- 15.8
- 2.9

Lake:
- .22
- .54
- .37
- .24
- .37
- .87
- 12.8
Nitrate Concentrations

Streams

Lake

Nitrate Concentrations

- Streams
- Lake

- 48.17
- 3.41
- 24.76
- 1.12
- 12.23
- 26.95
- 18.91
- .65
- .21
- .00
- .11
- .02
Dissolved Oxygen Profiles

Three Sampling Locations

- Zipline
- West Arm of Lake
- East Arm of Lake
Dissolved Oxygen Analysis

• Dissolved Oxygen Levels clearly show a significant drop between 2 and 3 meters below surface waters indicating lake eutrophication --the decomposition of organic material in deeper lake waters decreases amounts of dissolved oxygen.
Conclusions

- Nutrient concentrations are consistently higher in streams that run through developed areas than in streams that run through forested areas.

- Lake Matoaka acts as a sink for nutrients from surrounding streams, as nutrients are taken up by algae and submersed aquatic vegetation.

- Lake Matoaka has a pronounced oxycline, and the lake is hypoxic-anoxic below 2 m. The decomposition of organic matter drives down the oxygen concentration in the summertime.