Great Miami River Citizens’ Water Quality Monitoring

2012 Data Sharing Event
February 23, 2013
Historic 1913 Great Miami River Flood
Hamilton, Ohio - March 25, 1913

High Street bridge – 10 minutes before collapse

High Street bridge – view to the west

High Street bridge – collapsing

High Street bridge – view to the east after bridge collapse

Butler County Historical Society photos
Great Miami River Citizens’ Water Quality Monitoring Program

- **Program development**
  - Purpose
  - Chemical parameters
  - Equipment
  - Funding
  - Sampling strategy

- **Data collection and assessment**
  - River versus tributary comparisons
  - Upstream-downstream correlations
  - Seasonal correlations
  - Sub-watershed studies
  - Land uses/water quality impact areas
    - NPDES/industrial dischargers
    - Agricultural practices and BMPs
    - Restoration projects
    - Septic system hotspots/septic removal areas
    - Landfill areas
    - Urban land uses and storm water BMPs

Ohio River – Great Miami River confluence at the Oxbow wetlands
Watersheds of Southwest Ohio and Southeast Indiana


Source: United States Geological Survey:
http://oh.water.usgs.gov/miam/Maps/hucs_big.gif
Great Miami River Citizens’ Water Quality Monitoring Program

University of Cincinnati Center for Field Studies, 10053 Oxford Rd., New Haven, OH.
Great Miami River Citizens’ Water Quality Monitoring Program

What Data are Collected and Why?

- **Nitrates**
  - **Sources:** Agricultural and urban fertilizers, manure, septic tanks and vehicle exhaust.
  - **Effects:** Excessive algal growth, eutrophication (low oxygen conditions), Blue Baby syndrome and brown blood disease in fish.

- **Total Phosphorous**
  - **Sources:** Excess from WWTP, agricultural and urban fertilizers, manure, septic tanks and soil erosion.
  - **Effects:** Excessive algal growth and eutrophication (low oxygen conditions).

- **pH**
  - **Sources:** Natural stream bed minerals (CaCO3, MgCO3), WWTP discharge and soils (NH3 will elevate pH); elevated by algal photosynthesis and warm waters.
  - **Effects:** Low pH allows toxic compounds to become more available to aquatic organisms.

- **Conductivity (dissolved ions)**
  - **Sources:** Elevated by WWTP discharge, septic systems, agricultural discharge, road salt and warm water.
  - **Effects:** Toxic to aquatic organisms at elevated levels. Nature of toxicity dependent upon ionic presence.

- **Turbidity (cloudiness of water)**
  - **Sources:** Elevated by runoff erosion from row crops, pastures, stream bank erosion, construction sites and high algal content.
  - **Effects:** Inhibits growth of submerged aquatic plants and food supply of aquatic organisms and affects the ability of fish gills to absorb oxygen.

- **E. coli (bacteria)**
  - **Sources:** Elevated by human and animal feces from WWTPs, septic systems and storm water runoff.
  - **Effects:** Gastroenteritis, ear infections and Hepatitis A in humans. Low oxygen due to decomposition.

- **Dissolved Oxygen (DO - % saturation and concentration)**
  - **Sources:** Elevated in cooler temperatures, but can be extremely high with excessive algal growth and photosynthesis due to nutrients. Low dissolved oxygen associated with algal die-off and elevated bacterial concentrations.
  - **Effects:** Over 100% is supersaturated or more oxygen than the maximum amount that the water column can hold at a given temperature and pressure. Above 100%, there will be small gas bubbles. Values between 80%-120% are optimal. Species such as trout and salmon can’t tolerate much above 105% for an extended period. Most fish species can’t survive DO concentrations below 3 mg/L for extended periods.
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How Do We Measure the Data Parameters?

- **Nitrates**
  - Instrumentation: Portable Spectrophotometer
  - Method: Cadmium Reduction Method – Hach 8171

- **Total Phosphorous**
  - Instrumentation: DR 2800 Portable Spectrophotometer
  - Method: Acid Persulfate Digestion – Hach 8190

- **pH**
  - Instrumentation: Oakton 650 pH Meter
  - Range: 0-14
  - Accuracy (0.002), Precision (0.001-0.1)

- **Conductivity (dissolved ions)**
  - Instrumentation: Hach sensION5 Conductivity Meter
  - Range: 0-19,999 uS/cm
  - Accuracy (0.5%), Precision (1 uS)

- **Turbidity (cloudiness of water)**
  - Instrumentation: Hach 2100Q Turbidity Meter
  - Method: U.S. EPA method 180.1
  - Accuracy (2%), Precision (0.01 NTU)

- **E. coli (bacteria)**
  - Method: Total Coliform and E-coli screening using Membrane Filtration, Hach 10029, U.S.EPA 1603

- **Dissolved Oxygen**
  - Instrumentation: YSI 556 multi-probe meter
  - Range: 0-50 mg/L, 0-500% air saturation
  - Accuracy: (2% or 0.2 mg/L), Precision (0.01 mg/L, 0.1% saturation)
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Quality Assurance/Quality Control (QA/QC)

Why do we have to do this?

QC = Quirky Coliforms right??????

Didn’t we already run this sample?
### Great Miami River Citizens’ Water Quality Monitoring Program

**Quality Assurance/Quality Control (QA/QC)**

<table>
<thead>
<tr>
<th>Chemical Parameter</th>
<th>Percent of Lab Duplicate Samples</th>
<th>Median % Difference in Lab Duplicates</th>
<th>Percent of Field Duplicate Samples</th>
<th>Median % Difference in Field Duplicates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductivity</td>
<td>11.7</td>
<td>0.5</td>
<td>3.1</td>
<td>2.9</td>
</tr>
<tr>
<td>pH</td>
<td>10.9</td>
<td>0.3</td>
<td>3.1</td>
<td>1.0</td>
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<tr>
<td>Turbidity</td>
<td>11.7</td>
<td>6.0 (0.6 NTU numerical difference)</td>
<td>3.1</td>
<td>48.7 (3.0 NTU numerical difference)</td>
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<tr>
<td>Phosphorus</td>
<td>21.2</td>
<td>11.1 (0.01 mg/L numerical difference)</td>
<td>3.0</td>
<td>21.4 (0.04 mg/L numerical difference)</td>
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<tr>
<td>Waterway Sampled</td>
<td>Number of Sample Sites</td>
<td>Waterway Sampled</td>
<td>Number of Sample Sites</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------------------</td>
<td>------------------------------------------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td>Banklick Creek</td>
<td>3 (+1)</td>
<td>Lee Creek tributaries</td>
<td>1 (-1)</td>
<td></td>
</tr>
<tr>
<td>Banklick Creek tributary</td>
<td>1</td>
<td>Miami Whitewater Lake</td>
<td>1 (+1)</td>
<td></td>
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<tr>
<td>Blue Rock Creek</td>
<td>1</td>
<td>Miami Whitewater Lake outflow</td>
<td>1 (+1)</td>
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<tr>
<td>Brierly Creek</td>
<td>1</td>
<td>Mullen Creek</td>
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<tr>
<td>Dry Fork of Whitewater River</td>
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<td>North Branch Blue Rock Creek</td>
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<tr>
<td>Dry Fork of Whitewater River tributary</td>
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<td>Ohio River</td>
<td>3</td>
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<tr>
<td>Dunlap Run</td>
<td>1 (+1)</td>
<td>Owl Creek</td>
<td>1</td>
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<tr>
<td>Eagle Creek</td>
<td>1</td>
<td>Oxbow Ponds</td>
<td>3 (-2)</td>
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<td>Forfeit Creek</td>
<td>1</td>
<td>Paddys Run</td>
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<td>Fox Run</td>
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<td>Sand Run</td>
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<tr>
<td>Great Miami River</td>
<td>13 (+1)</td>
<td>Sheed Creek</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Great Miami River unnamed tributaries</td>
<td>1 (-1)</td>
<td>Sheed Creek tributary</td>
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<tr>
<td>Howard Creek</td>
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<td>Strimple – MWW Lake inflow</td>
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<tr>
<td>Indian Creek</td>
<td>1</td>
<td>Taylor Creek</td>
<td>4 (+1)</td>
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<tr>
<td>Jameson Creek</td>
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<td>Jordan Creek</td>
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<td>Two-Mile Creek</td>
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<tr>
<td>Kolb Creek</td>
<td>0 (-1)</td>
<td>Wesselman Creek</td>
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<tr>
<td>Lee Creek</td>
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<td>Whitewater River</td>
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<tr>
<td>Lee Creek tributaries</td>
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<td>Whitewater River tributary</td>
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</tbody>
</table>
# Great Miami River Citizens’ Water Quality Monitoring Program

## Public Involvement and Sampling Accomplishments: 2010-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Volunteer Hours and Value</th>
<th># Sample Sites, Analyses and Samples</th>
<th>Collaborative Data Presentations and Events</th>
</tr>
</thead>
</table>
| 2010 | Hours: 750  
Value: $18,870 | • Total sites: 71  
• Monthly range: 15-45 sites  
• Analyses: 1,644  
• Samples: 274  
- 30/mo. ave. | • Data sharing presentation to volunteer samplers in February 2011 on 2010 data. |
| 2011 | Hours: 1,066  
Value: $27,300 | • Total sites: 73  
• Monthly range: 38-64 sites  
• Analyses: 2,994  
• Samples: 499  
- 55/mo. ave. | • Local TV segment (Channel 5 Project Earth)  
• Ohio EPA  
• Greater Cincinnati MSD  
• Hamilton County Environmental Action Commission  
• Land Lab for Price Hill Middle School students  
• Oxbow Inc.  
• Green Umbrella  
• University of Cincinnati Planning Students |
| 2012 | Hours: 1,233  
Value: $32,144 | • Total sites: 74  
• Monthly range: 63-80 sites  
• Analyses: 3,942  
• Samples: 657  
- 73/mo. ave. | • Data sharing presentation to volunteer samplers in February 2012 on 2011 data.  
• OKI Council of Governments Regional Conservation Council annual meeting.  
• StormCon National Conference (Denver, CO).  
• Great Miami River Days.  
• Great Outdoor Weekend event.  
• Hamilton County Public Health.  
• Land Conservancy of Hamilton County annual meeting.  
• Watershed Management Association of Ohio (WMAO) annual meeting (Columbus, OH). |