2014 Water Quality Report Card Review

Mills & Pipe Creek

Breann Hohman,
Watershed Coordinator
Erie Soil and Water Conservation District
Watershed Management

- What do we have?
- What do we want?
- How/where do we put this into action?
- How do we stay on target?
Why we monitor

- Understand our systems
- Identify pollutants/stressors
- Engage community
- Motivate stewardship change
- Target & evaluate improvement efforts
Quick Facts

- 42 sq miles
- 66% Agriculture
- 25% Urban
- 8% Natural
- Groundwater
- Quarries
- WWTP
Quick Facts

- 48 sq miles
- 41% Urban
- 39% Agriculture
- 16% Natural
- Storm driven
- Quarries
Where we monitor

Mills Creek
- 6 Sites

Pipe Creek
- 7 Sites
Where we monitor

Sawmill Creek
- 3 Sites

Old Woman Creek
- 10 Sites
What we monitor

- **In The Field**
  - Temperature
  - pH
  - Dissolved Oxygen
  - Turbidity in TSS

- **In the Lab**
  - Nitrate
  - Ammonia
  - Soluble Reactive Phosphorus
  - Turbidity in NTUs
  - Conductivity
Monitoring Program

- First monitoring season 2008
  - Started with Old Woman Creek and Pipe Creek
  - Sawmill and Mills Creek (2011)
- Monthly monitoring April-November
- 30 volunteers
- Macro monitoring in summer
- Report Cards began in 2012
Development of Report Cards

Step 1
Select indicators
Review suitability of indicators
Select reporting regions (spatial scale)

and
Select scoring approach: Progress toward a target or use relative ranking of reporting region

Step 2
Indicator development
Progress toward a target
New indicator required (based on existing data)
Establish target
Test sensitivity of indicator
Use existing indicator

Step 3
Integrate into overarching index
Develop method of assessing progress toward target
Integrate indicator scores into overarching index

Step 4
Communication
Communication strategy
Indicators

Nitrogen, monitored as nitrate, is a type of nutrient pollution which is found in fertilizer and untreated waste. In excess this chemical can lead to algal blooms.

Phosphorus, monitored as soluble reactive phosphorus, is another type of nutrient pollution which is found in fertilizer and untreated waste. In excess this chemical can lead to algal blooms.

Turbidity is a measure of cloudiness of the water typically caused by sediment-laden runoff. Excessive sediment in the water can clog fish gills, and cover macroinvertebrate habitat and fish eggs.

Vital Sign Indicators are a collection of pH, temperature, dissolved oxygen, and ammonia. Like our blood pressure, these parameters can identify if a serious problem is present.

Benthic macroinvertebrates are aquatic organisms with no backbone and are visible to the naked eye. Some are very intolerant to pollution, therefore make great indicators of water health.

Bacteria, measured as E. coli, are microorganisms commonly found in untreated waste. Many bacteria are harmful to human health and can restrict our drinking and recreational water uses.
How do we determine what’s normal?

- EPA/OEPA established criteria
- Threshold methodology – Report Card Development

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td>Range 5-30 Celsius (April-November)</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>6-9 to maintain aquatic life</td>
</tr>
<tr>
<td><strong>Dissolved Oxygen</strong></td>
<td>Range 6-14mg/L</td>
</tr>
<tr>
<td></td>
<td>&lt;4mg/L can result in fish kills</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
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<tbody>
<tr>
<td><strong>Turbidity</strong></td>
<td>10 NTUs</td>
</tr>
<tr>
<td><strong>Ammonia</strong></td>
<td>Range = .3 mg/L to 2.3mg/L (depending on pH and water temperature)</td>
</tr>
<tr>
<td><strong>Nitrate</strong></td>
<td>10mg/L (Drinking Water Standard)</td>
</tr>
<tr>
<td></td>
<td>.0295 mg/L in Mills/Pipe/Sawmill</td>
</tr>
<tr>
<td></td>
<td>.0425 mg/L OWC - .084mg/L (Liles Rd)</td>
</tr>
<tr>
<td><strong>SRP (Phosphorus)</strong></td>
<td>23 ug/L</td>
</tr>
</tbody>
</table>
Calculating a score

1. Sort data by station

<table>
<thead>
<tr>
<th>Station</th>
<th>Date</th>
<th>Time</th>
<th>DO value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strecker Rd (PC-70)</td>
<td>4/22/12</td>
<td>15:00</td>
<td>16.0</td>
</tr>
<tr>
<td>Strecker Rd (PC-70)</td>
<td>5/21/12</td>
<td>10:00</td>
<td>7.0</td>
</tr>
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<td>6/18/12</td>
<td>9:45</td>
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<td>9:40</td>
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2. Calculate the score for each data point

Ex: If DO > 5.0 mg/l, then Score = Pass (or 100)

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<tr>
<th>Station</th>
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3. Calculate the score for each station

Ex: ((Total # of scores = Pass)/(Total # of scores for that station)) * 100 = % total

<table>
<thead>
<tr>
<th>Station</th>
<th>Station Score</th>
<th>Watershed</th>
<th>Watershed Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strecker Rd (PC-70)</td>
<td>100</td>
<td>Main Stem</td>
<td>94.6</td>
</tr>
<tr>
<td>Harris Rd (PC-60)</td>
<td>100</td>
<td>Main Stem</td>
<td>100</td>
</tr>
<tr>
<td>Patten Tract Rd (PC-50)</td>
<td>100</td>
<td>Main Stem</td>
<td>100</td>
</tr>
<tr>
<td>Bogart Rd (PC-40)</td>
<td>87.5</td>
<td>Main Stem</td>
<td></td>
</tr>
<tr>
<td>Columbus Ave (PC-30)</td>
<td>100</td>
<td>Main Stem</td>
<td></td>
</tr>
<tr>
<td>Oakland Cemetery (PC-25)</td>
<td>75</td>
<td>Main Stem</td>
<td></td>
</tr>
<tr>
<td>Perkins Ave (PC-20)</td>
<td>100</td>
<td>Main Stem</td>
<td></td>
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# Meaning of the score

<table>
<thead>
<tr>
<th>Measured indicator value</th>
<th>Multiple Thresholds</th>
<th>Grade</th>
<th>% Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>Pristine condition</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Impaired condition</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Score (%)</th>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥80 to &lt;100</td>
<td>A+</td>
<td>Good</td>
</tr>
<tr>
<td>≥95 to &lt;100</td>
<td>A</td>
<td>Good</td>
</tr>
<tr>
<td>≥85 to &lt;95</td>
<td>A</td>
<td>Good</td>
</tr>
<tr>
<td>≥75 to &lt;85</td>
<td>B+</td>
<td>Moderately Good</td>
</tr>
<tr>
<td>≥65 to &lt;75</td>
<td>B</td>
<td>Moderately Good</td>
</tr>
<tr>
<td>≥55 to &lt;65</td>
<td>C+</td>
<td>Moderate</td>
</tr>
<tr>
<td>≥45 to &lt;55</td>
<td>C</td>
<td>Moderate</td>
</tr>
<tr>
<td>≥35 to &lt;40</td>
<td>D+</td>
<td>Poor</td>
</tr>
<tr>
<td>≥25 to &lt;35</td>
<td>D</td>
<td>Poor</td>
</tr>
<tr>
<td>≥20 to &lt;25</td>
<td>D–</td>
<td>Poor</td>
</tr>
<tr>
<td>≥0 to &lt;20</td>
<td>F</td>
<td>Very poor</td>
</tr>
</tbody>
</table>
How did we score?
Mills Creek 2014 Report Card

Mills Creek

Overall the Mills Creek grade increased to a D from an F in 2013. The increase is most likely attributed to the addition of 2 sites which had better water quality and macroinvertebrate sampling.

Nutrients are a continued concern for stream health. N and P received poor grades again in 2014. Sites on the mainstem received lowered grades than adjacent tributaries suggesting increased nutrient inputs are entering from the Bellevue area.

Vital Signs

Indicators

What do these grades mean?

A: 80–100%. All water quality indicators meet desired levels. Quality of water in these locations tends to be very good, most often leading to preferred habitat conditions for aquatic life.

B: 60–80%. Most water quality indicators meet desired levels. Quality of water in these locations tends to be good, often leading to acceptable habitat conditions for aquatic life.

C: 40–60%. There is a mix of good and poor levels of water quality indicators. Quality of water in these locations tends to be fair, leading to sufficient habitat conditions for aquatic life.

D: 20–40%. Some or few water quality indicators meet desired levels. Quality of water in these locations tends to be poor, often leading to degraded habitat conditions for aquatic life.

F: 0–20%. Very few or no water quality indicators meet desired levels. Quality of water in these locations tends to be very poor, most often leading to unacceptable habitat conditions for aquatic life.

ND: No Data (ND) is a designation used for areas where there is either insufficient or no data to give a grade on desired health levels.
Pipe Creek 2014 Report Card

Pipe Creek
Pipe Creek received an overall C-grade, which is a slight improvement from the D+ received in 2013. The increase was likely due the addition of macroinvertebrate data.

Nitrogen and Turbidity a Concern for Stream Health
The creek received another overall failing grade for Nitrate with all sites failing individually except Oakland Cemetery which received a B. This suggests nitrogen inputs are occurring throughout the mainstem with the creek unable to filter it out. The Oakland site is the only non-mainstem site.

Vital Signs Indicators
pH too high at Bogart Rd site

What do these grades mean?

A
80–100%. All water quality indicators meet desired levels. Quality of water in these locations tends to be very good, most often leading to preferred habitat conditions for aquatic life.

B
60–80%. Most water quality indicators meet desired levels. Quality of water in these locations tends to be good, often leading to acceptable habitat conditions for aquatic life.

C
40–60%. There is a mix of good and poor levels of water quality indicators. Quality of water in these locations tends to be fair, leading to sufficient habitat conditions for aquatic life.

D
20–40%. Some or few water quality indicators meet desired levels. Quality of water in these locations tends to be poor, often leading to degraded habitat conditions for aquatic life.

F
0–20%. Very few or no water quality indicators meet desired levels. Quality of water in these locations tends to be very poor, most often leading to unacceptable habitat conditions for aquatic life.

ND
No Data (ND) is a designation used for areas where there is either insufficient or no data to give a grade on desired health levels.
Mixed Precipitation Observed

- **Pipe and Mills Creek**
  - Normal spring
  - Below average summer
  - Mixed fall (Wet -> Dry)

- **Old Woman Creek**
  - Above avg. rainfall April, May, September
  - Below average in summer

- Only one storm sampled by volunteers
Turbidity Trends – Pipe Creek

- Threshold: 10 NTUs

Year | NTUs
---|---
2008 | 207
2009 | 84.8
2010 | 197
2011 | 201
2012 | 207
2013 | 207
2014 | 207
TSS Trends – Pipe Creek
Turbidity Trends – Mills Creek

Threshold: 10 NTUs

NTUs

2011  |  2012  |  2013  |  2014

2011 | 2012 | 2013 | 2014
Reducing Sediment

- Grassed Waterway
- No-till
- Stream Buffer
Reducing Sediment

Properly installed Silt fence

Storm drain protection
Nitrate Trends – Pipe Creek

Drinking Water Standard – 10mg/L

Threshold 0.295mg/L
Nitrate Trends – Mills Creek

Drinking Water Standard – 10mg/L

Threshold 0.295mg/L
Phosphorus Trends- Pipe Creek

SRP Threshold 23 µg/L
Phosphorus Trends- Mills Creek

SRP Threshold: 23 µg/L

Year:
- 2011
- 2012
- 2013
- 2014

Concentration (µg/l):
- 2011: 150 µg/l
- 2012: 450 µg/l
- 2013: 100 µg/l
- 2014: 200 µg/l
Mills Creek

**Average SRP**

- Strecker W: 250
- Strecker E: 50
- Miller W: 150
- Miller E: 10

**Nitrate**

- Strecker W: 12
- Strecker E: 2
- Miller W: 6
- Miller E: 4

**Turbidity**

- Strecker W: 15
- Strecker E: 20
- Miller W: 10
- Miller E: 5
Reducing Nutrients

Nutrient Management

Storm Water Diversion

Cover Crops

Soil Test
Calculate & Plan
Sample & Test Manure

Spread Manure Properly

Waste Water Treatment Improvements

Septic System Maintenance
Macroinvertebrates

- Can indicate chronic pollutants
<table>
<thead>
<tr>
<th>What You Can Do</th>
<th>Who Benefits</th>
<th>What’s Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave a natural area along a stream or ditch</td>
<td>Grass or wooded buffers help filter pollutants and reduce flood damage</td>
<td>N  P  S</td>
</tr>
<tr>
<td>Remember to inspect and pump out your septic system every 3–5 years</td>
<td>A properly maintained septic system prevents costly repairs and untreated sewage discharge into our streams</td>
<td>N  P  S</td>
</tr>
<tr>
<td>Help your community develop a plan that supports low impact development</td>
<td>Smart development fosters growth and protects the local resources and character of a community</td>
<td>N  P  S</td>
</tr>
<tr>
<td>Follow the “4Rs” of fertilizer use: Right source, Right amount, Right place, Right time</td>
<td>The “4Rs” approach promotes the wise use of fertilizer by farmers, residents, and landscapers to reduce costly nutrient loss that pollutes our streams</td>
<td>N  P  S</td>
</tr>
<tr>
<td>Plant cover crops</td>
<td>Cover crops build healthy soils that help hold back nutrients and water and increase crop yields</td>
<td>N  P  S</td>
</tr>
<tr>
<td>Plant a rain garden or install a rain barrel</td>
<td>Rain gardens and rain barrels help reduce stormwater runoff and can cut down on landscaping costs</td>
<td>N  P  S</td>
</tr>
<tr>
<td>Install a drainage management system</td>
<td>Managing field drainage reduces nutrient loss while saving water for when your crops need it the most</td>
<td>N  P  S</td>
</tr>
<tr>
<td>Properly manage livestock &amp; pet waste</td>
<td>Storing and disposing of animal waste properly reduces nutrients and prevents harmful bacteria from fouling beaches</td>
<td>N  P</td>
</tr>
</tbody>
</table>
What are we doing?

- Storm water management
- Storm drain stenciling
- Rain gardens/Rain barrels
- Pervious pavement projects
- Manure storage facility
- 2 Septic System replacements
- Stream buffers
Who Makes This Program Possible

- Volunteers
- Old Woman Creek Reserve/ODNR Div. Of Wildlife
- Erie Soil and Water Conservation District
- NOAA National Estuarine Research Reserve System
- NOAA National Weather Service COCORAHs Program
- Friends of Old Woman Creek and Pipe Creek
- Monitoring Committee
Be part of the solution!

Connect with us for tips and inspiration

Eriesoilandwater.org