Friends of Hika Bay

Calvin, Pine, Point, Fischer & Centerville Watersheds

Implementing the Friends of Hika Bay Action Plan
River Planning Grant RP-315-18
February 15, 2018 through June 30, 2019

Final Report
June 30, 2019

Project Goals and Objectives

Lakeshore Natural Resource Partnership (LNRP) sponsored a project to support the Friends of Hika Bay as the group continues to build appreciation for the stewardship of the frontal watersheds of Hika Bay along the shore of Lake Michigan.

Project Products and Deliverables

I. Education and Outreach

1. Seminars and Workshops

- Water Quality and 9KE Management Planning for Centerville Creek, Joint Planning Commission for the Village of Cleveland and the Town of Centerville, September 5, 2018
- Southern Creeks Water Quality Presentation at UWGB-Manitowoc, September 14, 2018
- Chautauqua Barn Dance, September 20, 2018 (https://spark.adobe.com/page/jHIQc1iSk3CWT/)
- Lakeshore Water Summit, October 10, 2018
- Presentation to the Pine Creek Conservancy, October 27, 2018
- Project RED in collaboration with the Friends of the Manitowoc River Watershed, June 15, 2019 (Invite sent to Friends of Hika Bay)
- Bluff Land Management in collaboration with the Sheboygan-Manitowoc Bluff Shoreline Phragmites Control Project, June 22, 2019 (Invite sent to Friends of Hika Bay)

2. Outreach

LNRP Social Media

- Multiple Posts
- Vertical Response Announcements

Village of Cleveland Newsletter

- December 2018: LNRP Continues to Implement Phragmites Control Project
- December 2018: Village of Cleveland and LNRP Install Interpretive Kiosks
- March 2019: Point Creek Tree Planting Call for Volunteers

3. Water Quality Analysis

- Southern Creeks Project Data 2018 (electronic format)
- Intern Presentation Lakeshore Water Summit 2018 (electronic format)
- Status of Point and Pine Creek Sites 2018 (electronic format)
- Data from UW-Stevens Point

4. Volunteer Appreciation Event

- Hika Park / Pedestrian Bridge Dedication, June 30, 2018

5. Adopt-a-Park Restoration Activities

- Hika Park: Worked with the Village of Cleveland implementing 2018-2019 Work Plan (attached)
- Hika Park: Installed interpretive kiosks at Centerville Creek and Hika Park Ridge Swale Complex (panels attached)
- Fischer Creek Park: Working with the County on improved facilities and interpretive kiosks
- Point Creek Natural Area: Planted 2,200 trees as part of our Restore the Shore Projects, May 3, 4, and 5, 2019

6. Planning

LNRP facilitates the planning process for the three key areas of activity: Community Engagement, Water Quality, and Restore the Shore Projects

1. Planning Meetings with Lakeshore Water Institute and Water Quality Chair Russ Tooley
- August 28, 2018
- September 25, 2018 (review of student presentation – no agenda)
- October 16, 2018
- February 8, 2019 (conference call)
- February 20, 2019

2. Meetings with the Village of Cleveland and Hika Park Steward John Kirsch
- Village Public Works Committee, July 23, 2018
- Village Staff, August 21, 2018

3. Meetings with Fischer Creek Park and Point Creek Natural Area Management Teams
- August 14, 2018 (field site visit)
- January 30, 2019 (annual PCNA meeting)
- February 19, 2019 (field site visit)

- May 15, 2019 (with County)

4. UW-Manitowoc Intern 2018 Lab Meetings
   - May 11
   - May 30
   - June 13
   - June 27
   - July 11
   - July 18
   - August 1
   - August 15

Assessment of Stream Water Quality in Point and Pine Creeks, Summer 2018

Authors: Rebecca Abler (Rebecca.abler@uwc.edu) and Meghan Jackson

Introduction: The University of Wisconsin-Green Bay, Manitowoc Campus (formerly UW-Manitowoc) has been sampling sites on Point Creek and Pine Creek in Manitowoc County, Wisconsin, since 2012. These creeks, along with Fischer and Calvin creeks, were initially intended to serve as comparison samples to Centerville Creek, which was undergoing extensive restoration at the start of the project. Sample analysis revealed quickly that all creeks in southern Manitowoc County were impacted by inputs of nutrients and bacteria from surrounding land, and that land use and management were issues of importance throughout all watersheds in the study area.

This report focuses on the 2018 status of water quality in Point and Pine Creeks. Context from historical sampling will be provided along with the graphical depiction and explanation of this summer's data.

Sample Locations: Two sample sites were established for both Point and Pine Creeks in 2012 (maps provided in results section). Each site was within a boundary of Hwy 43 on the west and CTH LS on the right. These were chosen to minimize any impact of major traffic corridors and/or backflow from Lake Michigan. The sampling was limited to two sites in order to allocate resources to the larger, watershed-level study of Centerville Creek, although additional sites have been sampled in various years as parts of special projects.

Methodology and Rationale: Samples were taken on a weekly basis from each site from Memorial Day through the end of August. Additional samples were collected within 24 and 48 hour intervals following rain events, defined as rainfall of equal to or over 0.5". Analyses performed included physical parameters (water temperature, pH, turbidity, stream flow velocity, and dissolved oxygen levels), nutrient levels (phosphates

and ammonia), and bacterial load (*E. coli*).

Yearly observation indicates that phosphate and bacterial levels are some of the key indicators of water quality compromise in these creeks, and therefore these are a particular focus in 2018. Phosphates lead to algal blooms in the creeks and in Lake Michigan, which in turn impact the lake ecosystem, tourism, property values, and aesthetics. *E. coli* bacteria are an indicator of recent fecal contamination, which can pose a public health hazard as other organisms, including harmful bacteria, viruses, and parasites may be present. In order to help determine sources of these contaminants, we track turbidity (cloudiness), which gives an indication of the amount of suspended matter in the water, and stream flow, which indicates increased volume of water in the streams. Each of these can correspond to surface runoff.

At times, other indicators of stream health can spike during the sampling season. While generally, dissolved oxygen levels remain high (>5 mg/L) in all our sampled streams, low water levels during warm, dry summer months can cause oxygen to drop. In addition, strong runoff events and/or unusual events such as manure spills have caused ammonia to spike occasionally (e.g., a temporary elevation of ammonia in Pine Creek following a manure leak in Summer, 2017). These occasional events are of concern because both low oxygen and high ammonia can cause die-offs of aquatic life in the streams.

Results and Discussion: Pine Creek

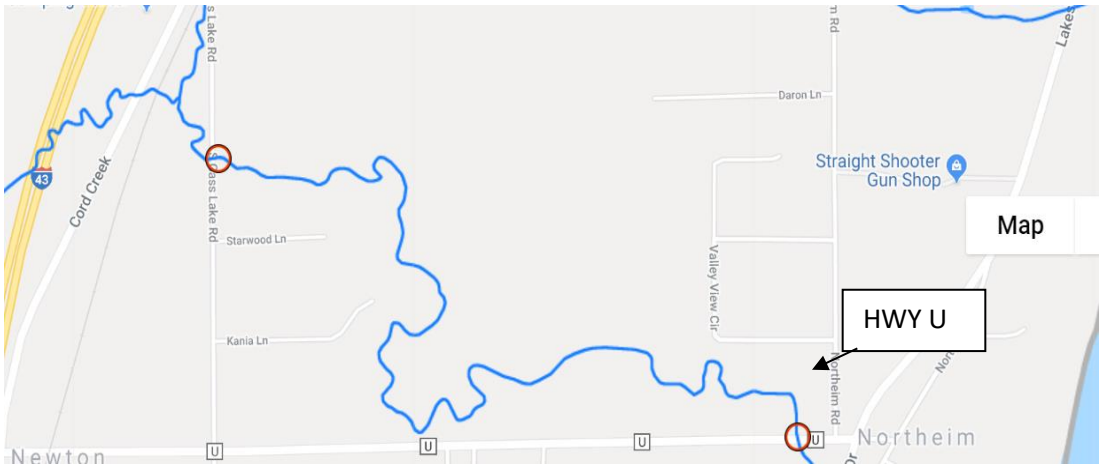


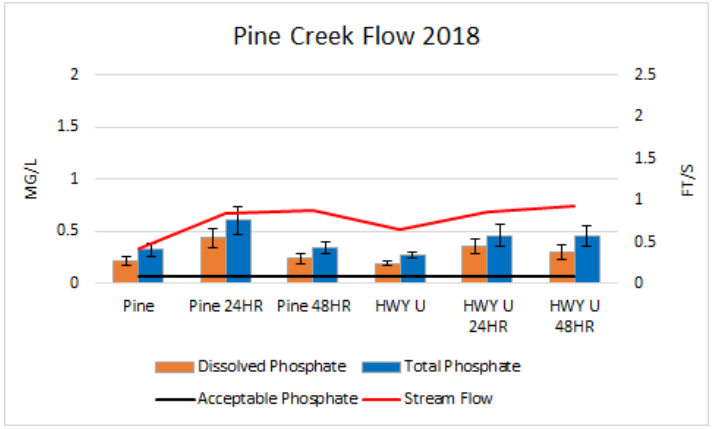
Fig. 1: Location of sampling sites on Pine Creek. Upstream site, located on S. Gass Lake Rd east of CTH CR, is designated "Pine", and downstream site, located on CTH U just west of the intersection with Northeim Rd, as "HWY U". These sites will be referred to using those designations in future graphs and figures.

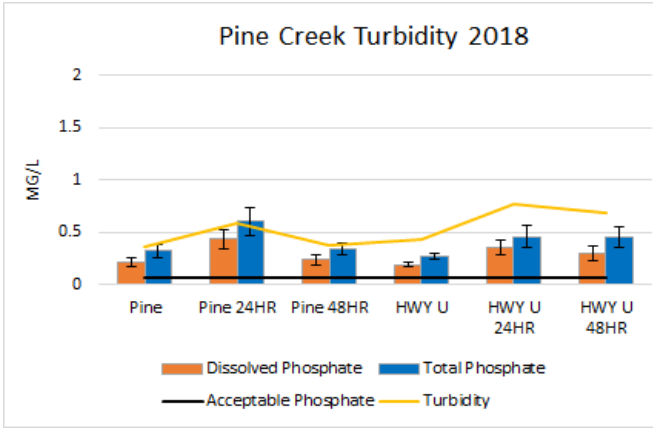
I. *Phosphate Levels and Corresponding Flow/Turbidity*: The following data graphs show the average phosphate levels (dissolved phosphates, indicating how much phosphate is immediately available to algae, and total phosphates, which indicates all phosphate including sediments), stream flow velocity "flow", and turbidity. The labels on the x-axis indicate both the location ("Pine" or "HWY U") and rain-event status. For example:

- "Pine" = average of all samples taken when there was no preceding rain event
- "Pine 24HR" = average of all samples taken within 24 hours following a rain event
- "Pine 48HR" = average of all samples taken within 48 hours following a rain event

This convention will be followed for all graphs on Pine and Point Creek.

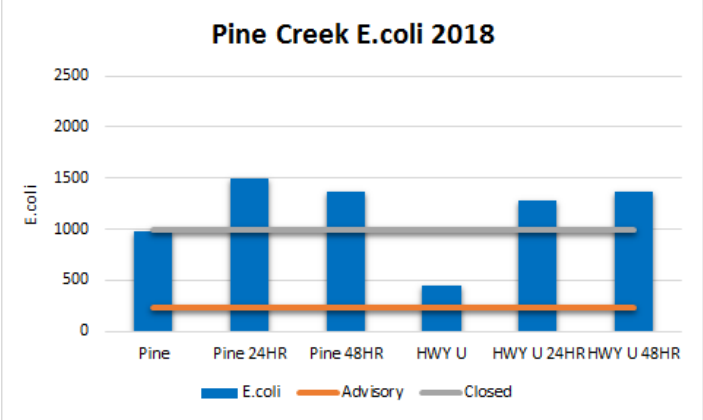
Phosphate concentrations are indicated by the orange and blue bars on each graph, with values on the left hand y-axis ("mg/L"). Flow velocity is indicated by the red line on the left-side graph, with values on the right y-axis (ft/s). Turbidity is indicated by the yellow line on the right side graph, with values on the right y-axis (NTU).





- Phosphate concentrations are consistently above the acceptable level for streams and rivers (0.075 mg/l, indicated by the horizontal black bar on the bottom of the graph, regardless of rain event status.
- There is no trend of higher phosphate upstream or downstream, averages are not significantly different between Pine and HWY U. This indicates multiple, non-point sources along the creek.
- Dissolved phosphates are a large proportion of total phosphate (bars are close to the same size), indicating that sediment runoff (e.g., solids from the surface) is not the only source.
- Rain does increase phosphorus concentrations at both sites, with the largest effect within 24 hours.
- Stream flow and turbidity correspond with each other and both increase after rain events, indicating that water volumes and sediments are higher in the creek after rain, as expected.

II. *Bacterial levels in Pine Creek samples*:



The x-axis follows the same convention as the previous graphs, indicating location and rain event status. Bacterial concentrations are along the Y-axis. The orange line indicates the threshold above which the EPA considers a beach or public waterway under "Advisory" status, meaning enter at your own risk. The gray line indicates the threshold above which a beach would be closed due to bacterial contamination.

- All sample locations consistently had bacterial levels above the advisory threshold, indicating a non-point, continuous source of contamination
- The downstream site, HWY U, was one of the lower sites on average of all sites sampled in Summer 2018
- Rain significantly increased bacterial contamination, indicating either surface runoff or subsurface seepage of manure from surrounding areas. Sources may be manure, leaky septic systems, or other animal waste.

Other 2018 data: Other parameters (pH, dissolved oxygen, ammonia, and temperature) were within the normal range for both sites during the sampling season. Detailed analysis is still in process, however, initial reads indicate that rain or seasonal variation showed no impact on trends for these parameters.

2017 comparison: Phosphate levels were significantly higher at the upstream site on Pine Creek ("Pine") in 2017, both with and without rain events. Levels of dissolved and total phosphate were approximately four to five times higher in 2017 without rain events for the upstream site. Phosphate levels were slightly higher in 2017 at the downstream site (HWY U) than they were in 2018, but this is likely not a significant difference. The upstream averages in 2017 may have been influenced by a mid-summer manure leak from a storage facility at a local dairy located farther upstream from our study locations. Observations by student researchers, showed that the manure effects did reach the "Pine" sample site, but that HWY U was much less affected. Sample analysis, indicated a spike of phosphorus, ammonia, and bacteria at "Pine" following the spill. Although this was a temporary spike, it may be skewing the average for 2017. We are looking at a deeper statistical analysis of the data to further examine this.

Rain events did not appear to create a significant difference in phosphate levels in 2017, which is different than what we've seen in prior years and in 2018. We suggest that the significant early rainfall in spring 2017 saturated surrounding land areas, and may have resulted in a more constant contribution of nutrients to creeks in Manitowoc County in that year.

E. coli levels have remained fairly constant on average from 2014-18

Results and Discussion: Point Creek

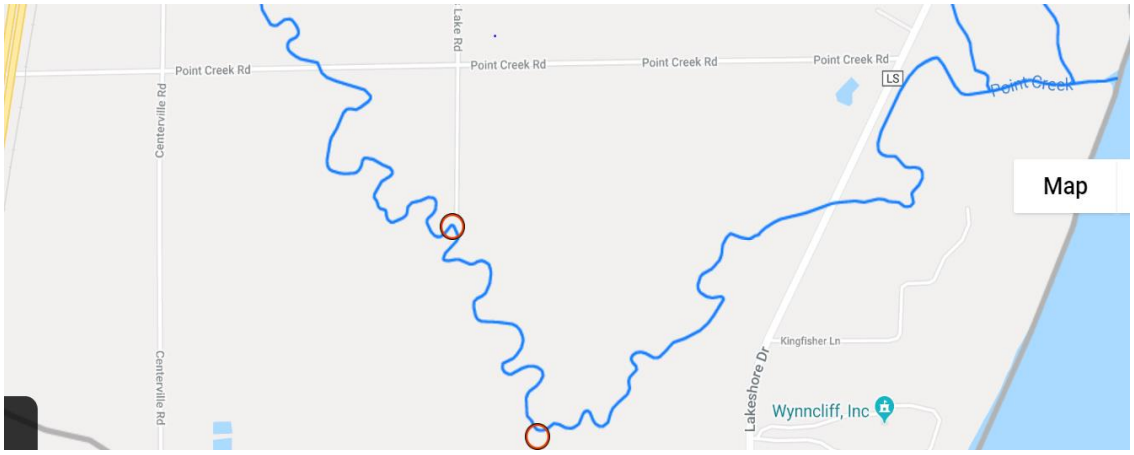
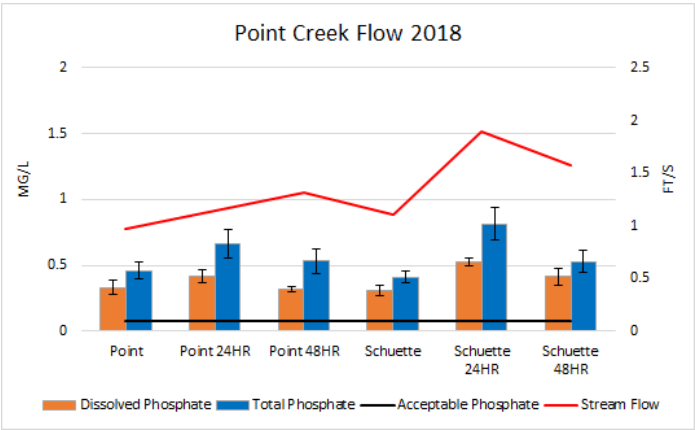


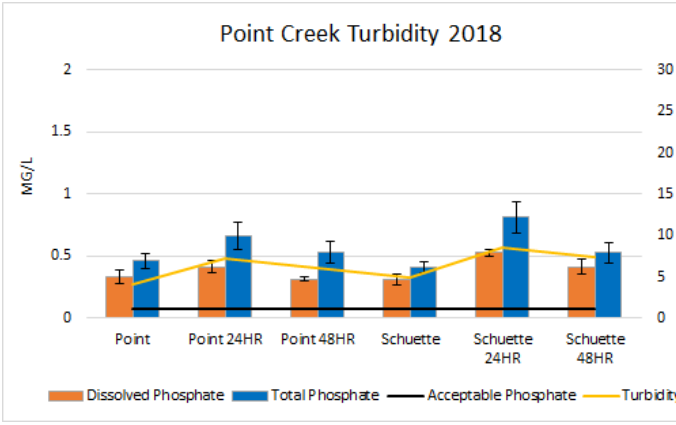
Fig. 2: Location of sampling sites on Point Creek. Upstream site, located at the southern end of S. Gass Lake Rd, is designated "Point", and downstream site, located on the Schuette property on CTH X just west of CTH LX, as "Schuette". These sites will be referred to using those designations in future graphs and figures.

I. *Phosphate Levels and Corresponding Flow/Turbidity*: The following data graphs show the average phosphate levels (dissolved phosphates, indicating how much phosphate is immediately available to algae, and total phosphates, which indicates all phosphate including sediments), stream flow velocity "flow", and turbidity. The labels on the x-axis indicate both the location ("Point" or "Schuette") and rain-event status. For example:

- "Point" = average of all samples taken when there was no preceding rain event
- "Point 24HR" = average of all samples taken within 24 hours following a rain event
- "Point 48HR" = average of all samples taken within 48 hours following a rain event

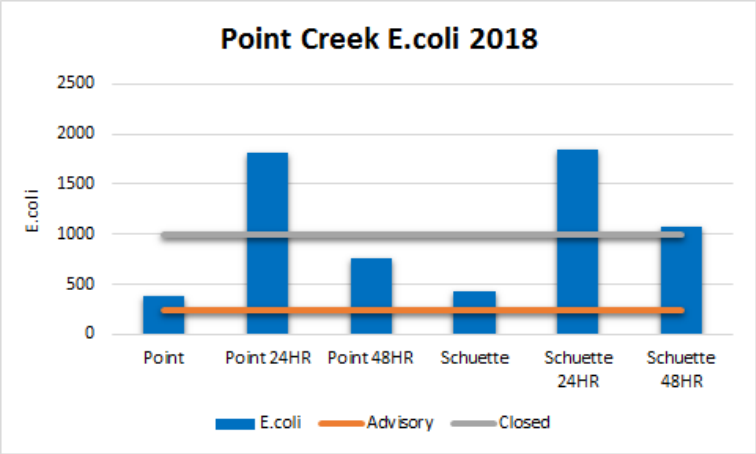
This convention will be followed for all graphs on Pine and Point Creek.





- Phosphate concentrations are consistently above the acceptable level for streams and rivers (0.075 mg/l, indicated by the horizontal black bar on the bottom of the graph, regardless of rain event status.
- There is no trend of higher phosphate upstream or downstream, averages are not significantly different between Point and Schuette. This indicates multiple, non-point sources along the creek.
- Dissolved phosphates are a large proportion of total phosphate (bars are close to the same size), indicating that sediment runoff (e.g., solids from the surface) is not the only source.
- Rain increases phosphorus concentrations at both sites, with the largest effect within 24 hours. However, the increase at the upstream site is minimal, suggesting that this may be simple variability in the data. Further statistical analysis will shed more light on this question. Rain appears to have a stronger impact on both flow and phosphates at the Schuette site.
- Stream flow and turbidity correspond with each other and both increase after rain events, indicating that water volumes and sediments are higher in the creek after rain, as expected.

II. *Bacterial levels in Point Creek samples*:



The x-axis follows the same convention as the previous graphs, indicating location and rain event status. Bacterial concentrations are along the Y-axis. The orange line indicates the threshold above which the EPA considers a beach or public waterway under "Advisory" status, meaning enter at your own risk. The gray line indicates the threshold above which a beach would be closed due to bacterial contamination.

- All sample locations consistently had bacterial levels above the advisory threshold, indicating a non-point, continuous source of contamination
    - Non-rain event samples were among the lowest of all sample sites on all creeks.
- Rain significantly increased bacterial contamination, indicating either surface runoff or subsurface seepage of manure from surrounding areas. Sources may be manure, leaky septic systems, or other animal waste.
- The fact that rain significantly increased *E. coli*, but not necessarily phosphates, indicates that there may be a constant phosphate source (seepage, saturated soil, etc), while *E. coli* is much more influenced by runoff.

Other 2018 data: Other parameters (pH, dissolved oxygen, ammonia, and temperature) were within the normal range for both sites during the sampling season. Detailed analysis is still in process, however, initial reads indicate that rain or seasonal variation showed no impact on trends for these parameters.

2017 comparison: There was no significant difference between 2017 and 2018 phosphate (dissolved or total) levels for either site when there were no rain events preceding sampling. In addition, the "Point" site showed no differences for phosphate levels when rain was a factor. The Schuette site showed a slight elevation of phosphates with rain events in 2018 as compared to 2017—further statistical testing needs to determine whether this is significant. This is a major difference in trends as compared to Pine Creek, where 2018 showed significantly *lower* phosphate concentrations compared to 2017. This demonstrates the high variability among watersheds even within a relatively small geographic area. It is also important to note that Pine Creek was affected

by a manure spill in 2017, while Point Creek was not in the vicinity of that spill.

Rain events did not appear to create a significant difference in phosphate levels in 2017, which is different than what we've seen in prior years, but *does* correspond to 2018 findings. Further testing is needed in future years to see if this is a trend in rain impacts.

E. coli levels have remained fairly constant on average from 2014-18. However, prior years' analysis did not look at differences in *E. coli* with and without rain events across the years. 2018 showed a significant impact of rain on *E. coli*, so that analysis is scheduled to be completed in the future.