Wisconsin Wastewater Operators Association

Protecting Our Water Resources: The Future

Bill Hafs - NEW Water 10/2014
The Fox River Contributes 1/3 of All Nutrients to Lake Michigan

Photo credit: Steve Seilo (www.photodynamix.com)
Distinct Gradient of Water Pollution From Fox River to Water North of Little Sturgeon Bay
Priority Sub Watersheds

Map of Lower Fox River Basin

Mouth of East River at the Fox River
Sources of Phosphorus in Lower Fox River (LFR) Basin

(Agriculture 45.7%)

(Municipal WWTFs 15.9%)

(Industrial WWTFs 20.8%)

(Urban (regulated MS4) 12.0%)

(Urban (non-regulated) 2.9%)

(Natural Background 1.0%)

(General Permits 0.4%)

(Data Source: Total Maximum Daily Load - TMDL Watershed Plan for Lower Fox River March 2012)
Sources of Total Suspended Solids in Lower Fox River Basin

(Data Source: Total Maximum Daily Load - TMDL Watershed Plan for Lower Fox River March 2012)
Storm water runoff management

- Grass swales
- Constructed wetlands
- Infiltration basins
- Pervious streets and lots
- Bio retention

Wet Pond at Commercial Site – DNR photo

Concrete pavers in parking lot – DNR photo

Infiltration Basin – DNR photo
Wastewater Treatment

NEW Water Wastewater Treatment Facility
Agriculture Runoff

- Nutrient Management
- Livestock density
- Sustainable Agriculture
- Buffer Strips
- Grassed Waterways
- Barnyard runoff control
- Sod cover – Winter
- Soil Phosphorus levels
- Conservation farm plans
- Rotational Grazing
- Cover Crops
- Wetland Restorations

Brown County photos
Land Use Trends

Brown County total land area is approximately 350,000 acres.

<table>
<thead>
<tr>
<th>Year</th>
<th>Land in Farms*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954</td>
<td>300,900 acres</td>
</tr>
<tr>
<td>1972</td>
<td>274,800 acres</td>
</tr>
<tr>
<td>1978</td>
<td>263,400 acres</td>
</tr>
<tr>
<td>1983</td>
<td>241,500 acres</td>
</tr>
<tr>
<td>2008</td>
<td>162,000 acres</td>
</tr>
<tr>
<td>2012</td>
<td>164,800 acres</td>
</tr>
</tbody>
</table>

Source: 1991 Brown County Farmland Preservation Plan; USDA National Agricultural Statistical Service
<table>
<thead>
<tr>
<th>Year</th>
<th>Dry Hay</th>
<th>%</th>
<th>Acres</th>
<th>Corn Acres (10 year ave.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>86,100</td>
<td>32%</td>
<td>270,000</td>
<td>1970’s - 49,062 acres</td>
</tr>
<tr>
<td>1981</td>
<td>74,000</td>
<td>30%</td>
<td>250,000</td>
<td>1980’s - 57,860 acres</td>
</tr>
<tr>
<td>1995</td>
<td>46,500</td>
<td>26%</td>
<td>180,000</td>
<td>1990’s - 57,880 acres</td>
</tr>
<tr>
<td>2008</td>
<td>33,600</td>
<td>21%</td>
<td>162,000</td>
<td>2000’s - 61,060 acres</td>
</tr>
</tbody>
</table>

2010 – 2014: 67,650 acres
% Change in Total Cattle Numbers from 1983 – 2012

Data taken from 1984 and 2013 Wisconsin Agriculture Statistics

[Map showing percentage changes across Wisconsin with a legend indicating Net Decrease and Net Increase.]
Livestock Concentration
1.54 Acres cropland / cow

<table>
<thead>
<tr>
<th>County</th>
<th>Cattle</th>
<th>Cropland</th>
<th>Acres/Cow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown</td>
<td>105,000</td>
<td>162,000</td>
<td>1.54</td>
</tr>
<tr>
<td>Outagamie</td>
<td>85,000</td>
<td>194,700</td>
<td>2.29</td>
</tr>
<tr>
<td>Clark</td>
<td>136,500</td>
<td>235,800</td>
<td>1.73</td>
</tr>
<tr>
<td>Manitowoc</td>
<td>97,000</td>
<td>183,800</td>
<td>1.89</td>
</tr>
<tr>
<td>Calumet</td>
<td>60,000</td>
<td>120,900</td>
<td>2.02</td>
</tr>
</tbody>
</table>

Source: NASS.
Green Bay has a Dead Zone

Oxygen
July 17 thru Sept 12

<table>
<thead>
<tr>
<th>Days &lt; 5 mg/L</th>
<th>Ave. DO mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990: 4</td>
<td>3.8</td>
</tr>
<tr>
<td>2005: 17</td>
<td>3.1</td>
</tr>
<tr>
<td>2009: 28</td>
<td>3.5</td>
</tr>
<tr>
<td>2010: 39</td>
<td>1.7</td>
</tr>
<tr>
<td>2011: 43</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Oxygen depleted water in Green Bay has increased in size and duration.

Source: NEW Water Ambient Water Quality Monitoring, UWM.
Long Term Phosphorus Trend

Source: NEW Water Ambient Water Quality Monitoring
## Total Phosphorus Loadings - TMDL

<table>
<thead>
<tr>
<th>Source</th>
<th>Total Phosphorus (lbs./yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Background</td>
<td>5,609</td>
</tr>
<tr>
<td>Agricultural</td>
<td>251,382</td>
</tr>
<tr>
<td>Urban (non-regulatory)</td>
<td>15,960</td>
</tr>
<tr>
<td>Urban Regulated (MS4)</td>
<td>65,829</td>
</tr>
<tr>
<td>Construction Sites</td>
<td>7,296</td>
</tr>
<tr>
<td>General Permits</td>
<td>2,041</td>
</tr>
<tr>
<td>Industrial WWTFs</td>
<td>114,426</td>
</tr>
<tr>
<td>Municipal WWTFs *</td>
<td>87,160</td>
</tr>
<tr>
<td><strong>Total In-Basin</strong></td>
<td><strong>549,703</strong></td>
</tr>
<tr>
<td>Lake Winnebago</td>
<td>716,954</td>
</tr>
<tr>
<td><strong>Total (In-Basin + Lake Winnebago)</strong></td>
<td><strong>1,266,657</strong></td>
</tr>
</tbody>
</table>

*Outfall of NEW Water into Fox River September 2013*

Source of tables: Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay (March 2012)
NEW Water Background information

31,624 lbs Phosphorus (P) discharge per year (Green Bay & De Pere Facilities) is less than 3% of total P entering Green Bay from Fox River (1.2 million lbs. P/ year).

9,332 lbs P reduction target required by Total Maximum Daily Load (TMDL) Watershed Plan at NEW Water.

$223 – $394 million dollars estimated cost for additional treatment to reduce P to target at NEW Water. ($23,896 - $42,220 cost per pound).

9,332 lbs reduction target is less than 1% of P entering Green Bay every year from the Lower Fox River Basin.
# Economics of Phosphorus (P)

## Lower Fox River TMDL Estimated Capital Costs:

<table>
<thead>
<tr>
<th>Source</th>
<th>Estimated Costs</th>
<th>Sources P TMDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal WWTF’s</td>
<td>$400 – $500 million</td>
<td>87,160 lbs/yr</td>
</tr>
<tr>
<td>NEW Water</td>
<td>($223 - $394 million)</td>
<td>26,059 lbs/yr</td>
</tr>
<tr>
<td>(capital costs 2010 and 2025)</td>
<td>(included as part of total)</td>
<td></td>
</tr>
<tr>
<td>MS4’s storm water:</td>
<td>$200 - $400 million</td>
<td>65,829 lbs/yr</td>
</tr>
<tr>
<td>(2013 FWWA Conference)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial WWTF’s:</td>
<td>$200 million</td>
<td>114,429 lbs/ yr</td>
</tr>
<tr>
<td>Agriculture</td>
<td>$</td>
<td>251,382 lbs/yr</td>
</tr>
</tbody>
</table>

**Total:** $800 Million - $1.1 Billion

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**Note:** Brown County LWCD $45 million dollars on all Agriculture BMP’s, Staff, and Programs from 1983-2012.
NEW Water WPDES Permit Timeline

**Year 1** - Operations & Needs Report is due.

**Year 2** - Alternatives evaluation update.

**Year 3** - Alternatives evaluation plan draft.

**Year 4** - Alternatives evaluation plan final.
   - Adaptive Management or Treatment.

**Year 5** - Begin plan, apply for new permit.

**Year 7-9** - Meet new permit limits if treatment is selected.
   - If Adaptive Management is selected – Annual watershed reports are due.
Adaptive Management

- A voluntary option for point source facilities to comply with phosphorus limits in NR 217. (0.1mg/L)
- Watershed approach where a point source can fund other point or nonpoint sources to control phosphorus.
- A strategy built on partnerships between point source facilities, municipalities, industry, landowners, private and public groups.
Silver Creek Pilot Project
Silver Creek Watershed (LF05-8) a sub-watershed of the Lower Duck Creek (HUC12 040302040106)

<table>
<thead>
<tr>
<th>Watershed Area</th>
<th>4799.8 acres (7.50 mi²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS4</td>
<td>346 acres (7.2% of watershed)</td>
</tr>
<tr>
<td>Land cover</td>
<td></td>
</tr>
<tr>
<td>2012 Cropland Data Layer</td>
<td>Agricultural: 2296.4 acres (47.8%)</td>
</tr>
<tr>
<td>USDA NRCS</td>
<td>Forest: 585.1 acres (12.2%)</td>
</tr>
<tr>
<td></td>
<td>Grassland: 12.3 acres (0.3%)</td>
</tr>
<tr>
<td></td>
<td>Pasture: 1065 acres (22.2%)</td>
</tr>
<tr>
<td></td>
<td>Urban: 503.9 acres (10.5%)</td>
</tr>
<tr>
<td></td>
<td>Water: 64.5 acres (1.3%)</td>
</tr>
<tr>
<td></td>
<td>Wetlands: 272.6 acres (5.7%)</td>
</tr>
<tr>
<td>Stream Length</td>
<td>14.93 miles</td>
</tr>
<tr>
<td>TMDL Phosphorus Baseline Load</td>
<td>3391 lbs. (0.71 lbs. per acre)</td>
</tr>
</tbody>
</table>
Silver Creek Pilot Project 2013 - 2018

Stream restoration in 5 years

- Evaluate Adaptive Management on small scale.
- Is .075 mg/L in Silver Creek attainable?
- Agreement with Oneida Tribe.
- Can stream be restored?
- Evaluate phosphorus reduction in cost per pound.
- Partnerships will be key.
Silver Creek Pilot Project Partnerships
Silver Creek Pilot Project 2013 -2018

- Stream Monitoring USGS, UWGB, NEW Water.
- Steering Committee.
- Inventory of watershed.
- Implementation.
- Project evaluation.
Adaptive Management Model

Goals

Plan and Prioritize

Implement

Evaluate

Monitor

Adjust
Revised Adaptive Management Model - Silver Creek

Goals
- 0.075 mg/L Phosphorus

WQ Monitor and Model
- Plan and Prioritize
- Implement

Evaluate

WQ Monitor and Model

Adjust
Water Quality Monitoring Season Averages 6/14 – 10/14

- Fish Creek Road: 0.171 mg/L P
- Crook Road: 0.702 mg/L P
- County U: 0.170 mg/L P
- Florist Drive: 0.117 mg/L P
- Hwy 172: 0.153 mg/L P

Water Quality Standard:

0.075 mg/L P
Silver Creek Pilot Project

- How much land will need to be taken out of production?

- What is economic cost to Agriculture?

- Sustainable permanent decisions.

- Spend the least amount of dollars to accomplish the greatest water quality. Benefit our rate payers, community water quality.

- Build watershed partnerships: Industry, AG, Storm water, Wastewater, Community leaders.
Silver Creek

SILVER CREEK PILOT PROJECT KICKS OFF

With phosphorus and nutrient run-off in the news these days, NEW Water is working on its own phosphorus reduction plan, in order to meet its permit requirements with the Wisconsin Department of Natural Resources (DNR).

In 2016, NEW Water will be required to further reduce the amount of phosphorus it discharges into the Fox River, which is 31,624 pounds per year, or less than 3% of the overall phosphorus in the Bay, according to the DNR. NEW Water would need to build a new facility to further reduce phosphorus discharge, which is estimated to cost more than $220 million. In lieu of that, the DNR is allowing point sources, such as NEW Water, to pursue Adaptive Management (AM), which would allow the facility to work with the community to reduce phosphorus.

“This is a community-wide problem needing a community-wide solution,” said Bill Hats, Director of Environmental Program Services. “To meet our permit requirements for phosphorus discharge at NEW Water, we are implementing a pilot project in Silver Creek, and we have assembled a great team of partners.”

Additional Information

- Silver Creek Kick Off Meeting Presentation
- Project Charter
- Landowner Factsheet
- Map: Water Quality Sampling Locations and Land Use

Silver Creek Project Map

http://www.newwater.us/projects/silver-creek-project/
Lower Fox River Challenges

15 Sub-watersheds in LFR basin.

20 Permitted Industrial WWTFs.

14 Permitted Municipal WWTFs.

42 units of government.

15 WPDES permitted CAFOs.

TMDL phosphorus reduction goal = 59%.

TMDL TSS reduction goal = 55%.

Reduced Cropland & Increased Livestock density.

NR151 and NR243 were developed before Water Quality Standards.
Challenges associated with Change
A PRACTICAL PROBLEM

The first of the series of advertisements published by the two local sulphite paper manufacturers (1) against sulphite liquor, a public nuisance knowing (2) ANOTHER, where papers of objectionable color, and (3) EXCESSIVE ISSUING, which form is in danger of nature worsening among us...

Oxidation reduces some primarily from wood sap to paper in critical tissue. This advertisement, the second of the series, gives emphasis to meeting specifically with special sulphite liquor as brought out by tenderness in her work's paper solution bearing. These are fall and bring answers to a hundred of questions which were asked during the time we are calling.

FACT No. 2

Now that the sulphite liquor is in the position of making sulphite liquor for you, the consumer and the end-user, the thickening and the thinning of the paper is just the same. These do this without the use of any of these chemicals which we are less interested in the thinning of the paper.

WHAT IS POLLUTION?

Government, public officials, and all persons in the state that have to deal with Wisconsin's papers. That the law enforcement and the pollution control must be obtained. These have also been from the Illinois' last in Great Britain and the state of Canada. Many of these papers have been used in the thinning of the paper by the thinnest and the thinnest, the use of these chemicals which we are less interested in the thinning of the paper.

FACT NO. 1

Equal to the sulphite paper in color, this too is the same. That it is difficult to thin, as the thinnest and the thinnest, the use of these chemicals which we are less interested in the thinning of the paper.

But Progress Is Being Made

Greater advances have been made since 1933 than at present. The plain experimental papers and commercial experimental plant may mean a very far-reaching economic improvement, provided we are economically practical. Only time and further study can provide the answers.

The Truth About Sulphite Liquor!

Sulphite liquor is a misnomer in the trade of papers. It does not put but better in the papers.

The Logical Approach

Papers for advertising are the first of sulphite paper manufacturers covered one important point about sulphite paper. That is, without doubt, of sulphite paper in the lower end of New York and London, easy to use with any other papers inherently different from the public, health benefits of tendering away.

NEW Water

This brand of the Green Bay Metropolitan Sewerage District
'East River Perfume' Helps Cover the Odor
But the Nose Knows That Old Scent Remains

By Harry Maier
Press-Gazette Staff Writer

The assignment for the day from the city editor was to get a reaction story to the odor treatment plant being conducted on the East River.

We eagerly grabbed this assignment while making note of that fact that our backyard huddled against the river and we had been raising the success of the chemical treatment, too.

Preparations for getting the story started were made at our back yard in the 1200 block of St. Clair Street.

First we observed the wind direction, noting it when the strong smell of the East River was blown toward the Backyard.

Next, we looked at the situation on the North Side, knowing that the other side of the river was in pain at the moment. Things started happening immediately, however.

First, the wind began to blow the smell to the opposite side of the river. As it did so, the chemical treatment, too.

We penciled swiftly into action, making notes of the time, position of the sun, speed of wind and intensity of the chemical treatment, too.

The odor was almost unbearable, but several summits of residents along the North Side were waiting for the chemical treatment, too.

After noting the situation, we decided to go down to the river and see what was going on. As it did so, the chemical treatment, too.

Starting with Norm Pigeon at the Star Printing Co., located at Main Street and the river, and working east to the D-X service station, we were able to come up with the reaction of individuals for the story.

Pigeon admitted that the chemical had improved the situation.

Not as Noticeable

Richard Crowl of Helgen

son Plumbing Co., Mrs. I. Parmenter of Mecca, School of Music and Mrs. Kitty Holch of Sue and Kit's East Shop, all along or near the river said they hadn't noticed the odor this year, or else the chemical had reduced its intensity.

No one of the opinion that the problem is licked, and everyone wants a more permanent solution.

At that time we resumed personal observations of the slow moving river.

The odor was becoming almost unbearable when a little boat came chugging up the river with some important looking persons aboard. They passed slowly, quite intent on the project at hand.

We didn't take long for the breeze to pick up the smell—resembling a high-class perfume in Paris. We immediately questioned which odor was better.

At least the offensive odors were departed, but soon we noticed it only was the chemical treatment, too.

The much stronger 'East smell' soon regained first place standing as the leading odor in the area.

To Assess Results

Expressing an official view on the East River situation, Earl Molton, deputy health commissioner and a member of the city's Water Pollution Commission, said the committee would wait until the present 10-day trial period is over before making a decision on whether the treatment should be continued.

He said his department is making an hourly check, 24 hours a day, of the sulfide content of the water and the odor in the air. He also is receiving daily reports from several persons who reside along the river, as to conditions.

One of the major problems faced is the continuous fluctuation in the level of the water. Mohr noted that Thursday the level varied by two feet, meaning that the surface water moved several miles.

He said the oil base chemical to freshen the air is supposed to be applied on a daily basis since it was started last Tuesday.

To Report Findings

Mohr will turn his findings over to the local commission and the State Water Pollution Committee. The latter group approved the contract with Airtek, Inc., a local firm which is attempting to combat the odors.

The project costs the city $100 per day with a maximum fee of $10,000 for this year. The city has the right to cancel the contract at any time.
1967: Big Changes Coming – Joint Treatment of Municipal and Industrial Waste

Possible Breakthrough Seen In Treatment of Mill Wastes

Experiment in Green Bay Points to Solution of Major Pollution Source

Sewage Plant Can Handle Paper Mill Wastes, Study Shows

Firm Hired To Plan New Sewage Plant

$251,250 Grant Okayed for MSD

Funds Allow Test of New Process To Treat Industrial, City Waste
Can We Protect Lake Michigan From Green Bay?
Buffer Strips – Before/ After Installation

Site 1 before buffer strip

Source: Brown County
Buffer Strip - After Installation

Source: Brown County

Site 1 after buffer strip
Before Buffer Strip Installation

Source: Brown County

Site 2 before buffer strip
Buffer Strip After Installation

Source: Brown County

Site 2 after buffer strip
Before Buffer Strip Installation

Site 3 before buffer strip

Source: Brown County
Buffer Strip After Installation

Site 3 after buffer strip
Thank You

- The work you do with Water Quality is most important and appreciated.

- You are Stewards of Our Water 24/7/365.

- To conclude I want to share a video with you that I found inspirational and relevant:

Questions?

Bill Hafs |  
Director of Environmental Programs  
Green Bay Metropolitan Sewerage District  

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