IMPROVING WATER QUALITY IN FOX RIVER

FOX RIVER WATERSHED INVESTIGATION

October 14, 2014

Alena Bartosova, Illinois State Water Survey
ACKNOWLEDGMENTS

- Fox River Study Group, Inc.
- Fox Metro WRD, Fox River WRD, City of Aurora, City of Elgin, MWRD Greater Chicago, McHenry County
- IEPA, USGS, NOAA, ...

ISWS modeling team:


Phase 1-2: Karla Andrew, Erin Bauer, Jennifer Byard, Christopher Jennings, Vern Knapp, Brad Larson, Michael Machesky, Sally McConkey, Sarah Milton, Jaswinder Singh, Mustafa Rahim, Mary Richardson
**PROJECT OVERVIEW**

**Phase I: 2002-2003**
- Understand Available Information
  - Water quality (FoxDB)
  - GIS data
  - Literature review and publication database
  - How to address the issues

**Phase II: 2003-2009**
- Develop Planning Tools
  - HSPF: loads, storm events
  - QUAL2K: DO regime during low flows
  - Monitoring plan
  - Biological data (FoxDB modified)

**Phase III: 2006-2013**
- Integrated Monitoring/Refine models
  - Low flow monitoring
  - Storm event monitoring
  - Refinement of Planning Tools
  - Evaluate management options (scenarios)

**Phase IV: 2013-...**
- Implementation
  - Propose & promote management actions
  - Evaluate planned WWTP expansions, NPDES permits, etc.
  - Continued model update & monitoring
  - Implementation Plan
Other constituents evaluated in our study:
Sediment
Nitrogen
Fecal Coliforms
Sources of TP in Fox River Watershed

Area between Stratton Dam and Fox River confluence with Illinois River
Determined from calibrated HSPF model runs for 1991-2011
TP DURING JUNE 2012 SAMPLING

Geneva (Fabyan)
Aurora (Sullivan)
Montgomery (Ashland)
Oswego (Millstone Park)
Yorkville (above dam)
Sheridan
St. Charles (above dam)
South Elgin (above dam)
Elgin (Kimball)
Elgin (National)
I-90
Burtons Bridge
Algonquin
I-90
Elgin (Kimball)
Elgin (National)
South Elgin (above dam)
St. Charles (above dam)
Geneva (Fabyan)
Aurora (Sullivan)
Montgomery (Ashland)
Oswego (Millstone Park)
Yorkville (above dam)
Sheridan

Fox River Station, Upstream to Downstream

Total phosphorus concentration (mg/L)

Mainstem
Tributaries
CALIBRATED QUAL2K MODEL: SIMULATED CHLOROPHYLL A
FUTURE SCENARIOS:

TOTAL PHOSPHORUS DURING LOW FLOWS

Varies with TP limit on NPDES

### Table: TP limit (mg/l) and Number of dams removed

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Major Facility</th>
<th>Minor Facility</th>
<th>Number of dams removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>No limit*</td>
<td>No limit*</td>
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<td>3</td>
<td>1.0</td>
<td>No limit</td>
<td>8</td>
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<tr>
<td>4</td>
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<td>No limit</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>0.5</td>
<td>No limit</td>
<td>13</td>
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</table>
FUTURE SCENARIOS:

PHYTOPLANKTON DURING LOW FLOWS

Varies with number of dams removed
**FUTURE SCENARIOS:**

**BOTTOM ALGAE DURING LOW FLOWS**

Varies with number of dams removed

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**Average Bottom Algae (mgA/m²): Current Upstream Conditions**

Legend:
- **Baseline**
- **Scenario 1**
- **Scenario 2**
- **Scenario 3**
- **Scenario 4**
- **Scenario 5**
- **Dam**
- **Tributary**

**Graph Details:***
- Tyler Creek
- Poplar Creek
- South Elgin

**Table**

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<th>Scenario</th>
<th>TP limit (mg/l)</th>
<th>Number of dams removed</th>
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<tr>
<td></td>
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</tr>
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<tr>
<td>4</td>
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<tr>
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</tbody>
</table>

**Detail:** South Elgin Dam
Simulated TP Load: BASELINE

Watershed
lbs/ac/yr
0.07-0.18
0.18 - 0.28
0.28 - 0.42
0.42 - 0.62
0.62 - 0.99

BASELINE
HSPF MODEL

AVERAGE TOTAL PHOSPHORUS LOAD
The darker the blue, the higher the change in TP load from baseline.
# SUMMARY: IMPACT OF MANAGEMENT OPTIONS

<table>
<thead>
<tr>
<th>Management Option</th>
<th>Change in Total Phosphorus</th>
<th>Change in Phytoplankton chlorophyll a during low flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average annual load</td>
<td>Concentrations during low flow</td>
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<tr>
<td>Urban BMPs</td>
<td>&lt;1%</td>
<td>--</td>
</tr>
<tr>
<td>Conservation tillage</td>
<td>-5%</td>
<td>--</td>
</tr>
<tr>
<td>NPDES facilities: 1 mg/l limit</td>
<td>-33%</td>
<td>-56%</td>
</tr>
<tr>
<td>0.1 mg/l limit</td>
<td>--</td>
<td>-80%</td>
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<tr>
<td>Dam removal: 8 dams removed</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>all dams removed</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Notes: Change in concentrations derived from median concentrations across the simulated reaches. Change in Dissolved Oxygen concentrations determined from the model is not reliable.
THANK YOU!

http://ilrdss.isws.illinois.edu/fox/