Adaptive Watershed Management to Achieve the Designated Use for Aquatic Life: Salt Creek and the Upper DuPage River

WATERCON
Stephen McCracken 03. 18. 2014
Agenda

- The DRSCW
- Project Area Brief
- Program Area Aquatic Life Use and the regulatory environment
- Watershed monitoring, causal analysis and the IPS Tool
- Adaptive Management proposal
- Dealing with change
• Village of Addison
• Arcadis US, Inc.
• Village of Arlington Heights
• Baxter & Woodman, Inc.
• Village of Bartlett
• Village of Bensenville
• Village of Bloomingdale
• Village of Bolingbrook
• CDM Smith
• Village of Carol Stream
• Christopher B. Burke Engineering
• Village of Clarendon Hills
• College of DuPage
• Village of Downers Grove
• Downers Grove Sanitary District
• DuPage County
• DuPage County Health Department
• City of Elmhurst
• Elmhurst-Chicago Stone Company
• Engineering Resource Associates

• Forest Preserve District of DuPage County
• Geosyntec Consultants
• Glenbard Wastewater Authority
• Village of Glen Ellyn
• Village of Glendale Heights
• HDR, Inc.
• HR Green, Inc.
• Village of Hanover Park
• Hey and Associates, Inc.
• Ross A. Hill
• Village of Hinsdale
• Village of Hoffman Estates
• Huff & Huff, Inc.
• Illinois Department of Transportation
• Illinois State Toll Highway Authority
• Inter-Fluve, Inc.
• Village of Itasca
• Village of Lisle
• Village of Lombard
• Metropolitan Water Reclamation District of Greater Chicago
• City of Naperville

• City of Oakbrook Terrace
• Prairie Rivers Network
• RJN Group, Inc.
• Robinson Engineering, Ltd.
• Village of Roselle
• Salt Creek Sanitary District
• Salt Creek Watershed Network
• Village of Schaumburg
• Sierra Club, River Prairie Group
• Strand Associates, Inc.
• Suburban Laboratories, Inc.
• The Conservation Foundation
• The Morton Arboretum
• V3 Companies
• Village of Villa Park
• Walter E. Deuchler Associates
• City of Warrenville
• WellSpring Environmental Products
• City of West Chicago
• Village of Westmont
• City of Wheaton
• Wheaton Sanitary District
• City of Wood Dale
• Village of Woodridge
• York Township Highway Department
DRSCW Project Area

Project Area lies in Cook and DuPage Counties (NE Illinois)

- Approximately 360 square miles of watershed
- Three waterways (100 miles of main stem stream)
- 55 municipal entities
- 156 MGD of effluent (based on DAF) from 25 POTW operators
- Urban to suburban with 48.7% being classified as residential, 24.7% as non-residential urban and 26.6% as open space, including water
- Approved TMDLs for DO and chloride on several reaches
The problem - Not Supporting Designated Use for Aquatic Life in Program Area (2006-7 DRSCW data)
## Simplified Decision Table of Assessment of Aquatic Life Use

<table>
<thead>
<tr>
<th>Bug IBI</th>
<th>Fish IBI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not impaired (M-IBI &gt; 41.8)</td>
</tr>
<tr>
<td>Not impaired (F-IBI &gt; 41)</td>
<td>FULL</td>
</tr>
<tr>
<td>Moderate impaired (20 &lt; F-IBI &lt; 41)</td>
<td>FULL</td>
</tr>
<tr>
<td>Severe impaired (F-IBI &lt; 20)</td>
<td>NON</td>
</tr>
</tbody>
</table>
### 2010 303 (d) Impairment listings for selected segments of program area waterways

<table>
<thead>
<tr>
<th>Water Name</th>
<th>Water ID</th>
<th>Miles/Acres</th>
<th>Designated Use</th>
<th>Impairment Listing</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Br. DuPage R.</td>
<td>IL_GBL-11</td>
<td>3.43</td>
<td>Aquatic Life</td>
<td>Phosphorus (Total)</td>
</tr>
<tr>
<td>Addison Cr.</td>
<td>IL_GLA-02</td>
<td>6.69</td>
<td>Aquatic Life</td>
<td>Aldrin, Chromium (total), chloride, DDT, Hexachlorobenzene, Nickel, Phosphorus (Total)</td>
</tr>
</tbody>
</table>
### Causes and sources of impairment 2010 IR for selected segments of program area waterways

<table>
<thead>
<tr>
<th>AUID</th>
<th>Name</th>
<th>Miles</th>
<th>Causes</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL_GBL-11</td>
<td>East Branch DuPage River</td>
<td>3.4</td>
<td>Alteration in stream-side or littoral vegetative covers, Other flow regime alterations, Dissolved Oxygen, Phosphorus (Total), Polychlorinated biphenyls</td>
<td>Loss of Riparian Habitat, Site Clearance (Land Development or Redevelopment), Streambank Modifications/destabilization, Channelization, Urban Runoff/Storm Sewers, Source Unknown, Municipal Point Source Discharges</td>
</tr>
<tr>
<td>IL_GLA-02</td>
<td>Addison Creek (Salt Creek)</td>
<td>6.7</td>
<td>Aldrin, Alteration in stream-side or littoral vegetative covers, Chloride, Chromium (total), DDT, Hexachlorobenzene, Other flow regime alterations, Phosphorus (Total), Changes in Stream Depth and Velocity Patterns, Fecal Coliform</td>
<td>Contaminated Sediments, Channelization, Loss of Riparian Habitat, Combined Sewer Overflows, Municipal Point Source Discharges, Urban Runoff/Storm Sewers, Upstream Impoundments (e.g., PI-566 NRCS Structures), Dam or Impoundment</td>
</tr>
</tbody>
</table>
The Five Major Factors Which Determine the Integrity of Aquatic Resources

Chemical Variables

- Solubilities
- Adsorption
- Nutrients
- Organics

Biotic Factors

- Parasitism
- Disease
- Reproduction
- Feeding
- Competition
- Predation

Energy Source

- Sunlight
- Organic Matter Inputs
- Nutrients

Habitat Structure

- Riparian Vegetation
- Width/Depth
- Bank Stability
- Channel Morphology
- Gradient
- Instream Cover

INTEGRITY OF THE WATER RESOURCE

Principal Goal of the Clean Water Act

after Karr et al. 1986
Monitoring Bioassessment Plan Elements

- Fish
- Macroinvertebrates
- Habitat - QHEI
- Water Chemistry
- Sediment Chemistry
Fish Index of Biotic Integrity

Fish Communities as Scored by FIBI, West Branch DuPage River 1983, 2006 and 2009

Hanover Park    Bartlett    Warrenville

Naperville

River Miles

Fish Index of Biotic Integrity

1983

2009

2006
"I think you should be more explicit here in step two."
Statistically Demonstrated Stressor Indicators

Environmental Parameter

- Riparian Score
- Riffle Score
- Channel Score
- Substrate Score
- Pool Score
- Chloride
- TKN
- BOD
- NH3N
Composite of Three Scores:

- Rank segments based on how many stressors were present
- Rank extent of open space for segments as proxy for implementability
- Rank segments based on how far biological scores deviate from their benchmark expectations
IPS Priority Sites
Graded 1-6

Number of proximate stressors (-)
Deviation from biological end point (-)
Presence of open space (+)
Our Proposal

- Member POTWs would pay assessments into a pooled fund to complete projects prioritized by the IPS Tool.

- DRSCW would measure the impacts of the projects and report frequently to State and EAGs.

- Phosphorous permit limits for Member POTWs would be delayed for 2-3 permit cycles. A P management plan would be developed.
## DRSCW Physical Restoration Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>River</th>
<th>Project Description</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fullersburg Woods dam modification and stream restoration</td>
<td>Salt Creek</td>
<td>Modify dam to eliminate pond and allow fish passage. Rebuild stream habitat.</td>
<td>Raise fIBI from 19 to 27. Raise mIBI from 35 to &gt; 42 for 1.5 miles of river and introduce new fish species upstream.</td>
</tr>
<tr>
<td>Fawell Dam Fish Passage Modification and lower West Branch Restoration</td>
<td>West Branch</td>
<td>Modify dam to allow fish species passage to the 24 miles of upstream river. Rebuild stream habitat for .0 miles.</td>
<td>Raise fIBI from 17.5 to 27 for 2 miles upstream of project.</td>
</tr>
<tr>
<td>Southern East Branch Stream Enhancement Project</td>
<td>East Branch</td>
<td>Rebuild stream habitat for 2 miles of stream corridor.</td>
<td>Raise fIBI from 27-35 to &gt; 42. Raise mIBI from 27-35 to 42.</td>
</tr>
<tr>
<td>Oak Meadows Golf Course dam removal and stream restoration</td>
<td>Salt Creek</td>
<td>Rebuild stream habitat for 1.5 miles of stream corridor.</td>
<td>Raise MIBI from 21 to &gt; 35 to 1-1.5 miles of river. Raise fIBI from 19 to 25 for 1.5 miles of river.</td>
</tr>
<tr>
<td>Project</td>
<td>Project Description</td>
<td>Objectives</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Chloride Abatement</td>
<td>Education program for pre-wetting, anti-icing and calibrating equipment.</td>
<td>Increase communities participating in survey by 10 (currently 33). 18 communities anti-icing (currently 12). 33 communities pre wetting (currently 33). Storing exposed salt 0 (currently 11).</td>
<td></td>
</tr>
<tr>
<td>PAH Abatement</td>
<td>Voluntary agreement to discontinue use of coal tar sealants by members.</td>
<td>75% of agency members discontinue use of coal tar sealants for public operations.</td>
<td></td>
</tr>
<tr>
<td>Municipal Level IPS Information &amp; Outreach</td>
<td>Design and disseminate an IPS report and summary tailored to member communities.</td>
<td>Integrate IPS outputs into local projects and decision making.</td>
<td></td>
</tr>
</tbody>
</table>
Aquatic life use attainment map for E. Branch DuPage River biological sampling sites in 2007, 2011, and 2012 (upper mainstem only).

Fish Species Collected Upstream Only After Dam Removal

- quillback carpsucker
- river carpsucker
- hornyhead chub
- Creek Chub
- blackstripe topminnow
- channel catfish
- goldfish
- pumpkinseed
- johnny darter
What about P

- Plant owners to identify ways to reduce effluent phosphorus levels within their plants existing footprints and/or via readily implementable source control

- Generate a phosphorous reduction facilities plan

- The DRSCW to evaluate phosphorous reduction from non-point source controls

- Look at trading between point sources
Adapting to Change
Elgin O’Hare Western Access Project (EOWA)
Chloride TMDLs Goals

- IEPA TMDL recommended chloride load reductions
  - East Branch DuPage River - 33% reduction
  - West Branch DuPage River - 35% reduction
  - Salt Creek - 14% reduction

<table>
<thead>
<tr>
<th></th>
<th>Salt Creek</th>
<th>East Branch</th>
<th>West Branch</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMDL Target,</td>
<td>13,300</td>
<td>5,200</td>
<td>13,700</td>
<td>32,200</td>
</tr>
<tr>
<td>Tons of Cl⁻/yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMDL Baseline,</td>
<td>15,500</td>
<td>7,800</td>
<td>21,100</td>
<td>44,400</td>
</tr>
<tr>
<td>Tons of Cl⁻/yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRSCW Baseline,</td>
<td>32,600</td>
<td>16,900</td>
<td>21,200</td>
<td>70,700</td>
</tr>
<tr>
<td>Tons of Cl⁻/yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Survey Results 2007-2012 Alternative Practices

Deicing and Snow Removal Agents Questionnaire Response

- Pre-wetted NaCl
- Dry NaCl
- Liquid CaCl2
- Beet Juice
- Liquid NaCl
- CMA
- Liquid MgCl2
- KA
- Abrasives
- Dry or Pre-wetted MgCl2
- Urea
- Dry or Pre-wetted CaCl2
- KCl

Percentage per Respondants 2007
Percentage per Respondants 2010
Percentage per Respondants 2012
Project Details

- 25 miles of Mainline Improvements
- 16 Service Interchanges
- 4 System Interchanges
- 16 miles of Arterial Improvements
- Provisions for Transit and Bicycle/Pedestrian Facilities
Salt Creek and West Branch have been under a chloride TMDL since 2004

Chlorides indentified as a priority impairment to aquatic life in 2010 by locally funded causal analysis

Local agencies have been working aggressively to lower chlorides from winter deicing operations since before 2007
## Problem Analysis

Salt Application Summary for Elgin O'Hare Western Access Project

**Limits**

### Estimated Annual Salt Application Totals

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Lane miles (^a)</th>
<th>Salt Applied, ton/yr (^b)</th>
<th>Increase from Existing Condition Ton/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing (Baseline) Condition</td>
<td>159</td>
<td>3,959</td>
<td>N/A</td>
</tr>
<tr>
<td>Initial Construction Phase (ICP)</td>
<td>264</td>
<td>7,847</td>
<td>3,888</td>
</tr>
<tr>
<td>DRSCW Watersheds</td>
<td></td>
<td></td>
<td>1,482</td>
</tr>
</tbody>
</table>

Lane miles include arterial/collector and freeway lane miles located within the project limits.

Considers two different salt application rates depending on the roadway class.

Arterial/collector roads are loaded at 14 ton/lane mile/year. Freeways are loaded at 39.7 ton/lane mile/year.
Concept

Two steps to reach “no net increase”

- Tollway would rationalize current practices (estimated reduction of 20%)
- Remaining increase in loading would be offset by reductions in loading from communities neighboring EOWA (Tier 1 communities)
  - Additionally partners agreed to offset at a minimum ratio of 1-1.25 so target 1,853 tons
Project Area and Tier 1 Municipalities
Activities
Salt Reduction Steps
1) Driver training
2) Salt spreader calibration
3) Develop appropriate application rates
4) Pre-wet de-icer
5) Equipment updates
   - Speed servo controls
   - On-board pre-wet
   - Computer controls
6) Coordinate salt application during plowing
7) Control salt spread width
8) Prioritize road system
9) Anti-Ice
Bounce and Scatter Collection Graphs Treated V Untreated Salt at 25 mph with a Conveyor System (Pre-wetting)

Average Salt Displacement

<table>
<thead>
<tr>
<th>Average Salt Displacement</th>
<th>Untreated</th>
<th>Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>± 0' - 4'</td>
<td></td>
<td>±100%</td>
</tr>
<tr>
<td>± 4' - 8'</td>
<td>±30%</td>
<td>±50%</td>
</tr>
<tr>
<td>± 8' - 12'</td>
<td>±15%</td>
<td>±25%</td>
</tr>
<tr>
<td>± 12' - 24'</td>
<td>±5%</td>
<td>±10%</td>
</tr>
</tbody>
</table>

Source: Michigan DOT Salt Bounce and Scatter Study PROJECT SUMMARY REPORT Final November 2012
Anti-icing (liquids applications)

“Anti-icing is the application of a de-icer to the roadway before a frost or snowfall to prevent melted snow and ice from forming a bond with the road surface”
Evaluation

- Agency Baselines being set currently
- Documentation of training and implementation
- In-stream monitoring for impacted waterways
Questions ?