Aaron Ostlund
Red River Basin Commission
Presented at 3rd International Sustainable Wetland Plant Management Conference
June 1st, 2017
North Ottawa Impoundment
North Ottawa Impoundment Operation Plan

- Flood Damage Reduction – 16K ac-ft Gated Storage (BdSWD)
- Water Quality – Sedimentation and nutrient uptake by vegetation (RRBC)
- Habitat Enhancement – Moist Soils Management for migrating waterfowl and shorebirds (MNDNR)
Interior Diking Network

• Water level manipulation in A4 & B4 cells
  • Sedimentation
  • Nutrient Removal
Water Quality Operations

- Water level manipulation for A4 and B4
- Water quality monitoring

Sedimentation in Cell A4

Nutrient uptake in Cell B4
Water level manipulation in A4 & B4 cells
Nutrient uptake by wetland plants including Cattail in Cell B4
Birds are using the impoundment
Build it (manage it) and they will come
Habitat Enhancement
Moist Soils Management

<table>
<thead>
<tr>
<th>Species</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada Goose (all subspecies)</td>
<td>892</td>
</tr>
<tr>
<td>Greater white-fronted Goose</td>
<td>120</td>
</tr>
<tr>
<td>Snow goose (lesser?)</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total Geese</strong></td>
<td><strong>1016</strong></td>
</tr>
</tbody>
</table>

### North Ottawa Impoundment
**Oct. 13, 2016 Waterfowl Survey**

<table>
<thead>
<tr>
<th>Species</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mallard</td>
<td>1254</td>
</tr>
<tr>
<td>Northern pintail</td>
<td>705</td>
</tr>
<tr>
<td>Gadwall</td>
<td>10</td>
</tr>
<tr>
<td>Green-winged teal</td>
<td>2800</td>
</tr>
<tr>
<td>Blue-winged teal</td>
<td>625</td>
</tr>
<tr>
<td>Northern shoveler</td>
<td>500</td>
</tr>
<tr>
<td>Wood duck</td>
<td>200</td>
</tr>
<tr>
<td>American wigeon</td>
<td>12</td>
</tr>
<tr>
<td>Redhead</td>
<td>1050</td>
</tr>
<tr>
<td>Canvasback</td>
<td>150</td>
</tr>
<tr>
<td>Ring-necked duck</td>
<td>400</td>
</tr>
<tr>
<td>Lesser scaup</td>
<td>3</td>
</tr>
<tr>
<td>Ruddy duck</td>
<td>6</td>
</tr>
<tr>
<td>Bufflehead</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total ducks</strong></td>
<td><strong>7723</strong></td>
</tr>
</tbody>
</table>
Nutrient Reduction Need

• RRBC working with International Red River Board - excess nutrients is one of greatest water quality issues for Red River Basin

• Excess nutrients increase frequency and severity of algae growth that affect drinking water, use of beaches, damage fish and aquatic life

• Red River delivers 15% water but 60% phosphorus

• USGS Long-term monitoring (1990-2008)
  • 50% Increase Total Dissolved Solids
  • 60% Increase Total Phosphorus
  • 70% Increase Total Nitrogen
Nutrient Concentrations - Total P - 2010–2016
(Red River at Emerson)
What Part Does Ag Play

- Agriculture is backbone of Red River Basin economy
- Cropland is largest land use in basin (~85%)
- Red River Phosphorus Load: 16% Point Source, 84% Nonpoint
- Need new methods to reduce nonpoint nutrient runoff
Monitoring Initiatives
**North Ottawa C Cell 2016 Load Reductions**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reduction</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP Load Reduction</td>
<td>157 lbs</td>
<td>27%</td>
</tr>
<tr>
<td>TN Load Reduction</td>
<td>3,212 lbs</td>
<td>51%</td>
</tr>
<tr>
<td>TSS Load Reduction</td>
<td>26,306 lbs</td>
<td>57%</td>
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<td></td>
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<tr>
<td>--------------------------</td>
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<td>--------------------------</td>
</tr>
<tr>
<td><strong>TP Load Reduction</strong></td>
<td>852 lbs</td>
<td><strong>TP % Load Reduction</strong></td>
</tr>
<tr>
<td><strong>TN Load Reduction</strong></td>
<td>14,976 lbs</td>
<td><strong>TN % Load Reduction</strong></td>
</tr>
<tr>
<td><strong>TSS Load Reduction</strong></td>
<td>41,129 lbs</td>
<td><strong>TSS % Load Reduction</strong></td>
</tr>
</tbody>
</table>
Significant WQ Benefits and Further Opportunities...

• Holding time to achieve sedimentation
• Slower drawdown rates to limit sediment export
• Wetland plant management to take up nutrients
• Biomass harvesting to prevent nutrient saturation
Seasonal Cattail Biomass and Nutrient Accumulation

Dry Pounds per Acre

- Biomass Yield
- Nitrogen
- Phosphorus

Maximum Nutrient Uptake
Green Biomass Harvest
Dry Biomass Harvest

Garver, E.G., Dubbe, D.R. and Pratt, D.C., 1988
Harvesting Biomass for Nutrient Recovery
### Harvesting Biomass for Nutrient Recovery

#### Harvested Biomass
- **4.76 tons** per acre

#### Captured Nutrients
- **Nitrogen**: 47.64 lbs N per acre
- **Phosphorus**: 6.61 lbs P per acre
- **Potassium**: 48.86 lbs K per acre

#### Target Nutrients

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>2016 Nutrient Loads</th>
<th>Cattail Capture Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>26,727 lbs</td>
<td>561 Acres</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>1,871 lbs</td>
<td>283 acres</td>
</tr>
</tbody>
</table>

#### Nutrient Loads and Capture Capacity for Cattail
- **Nitrogen**: 26,727 lbs
- **Phosphorus**: 1,871 lbs
Biomass Utilization
Agricultural Soil Amendment / Green Manure
Biomass Utilization

- Agricultural Soil Amendment – Green Manure
- Bioenergy – Fuel Pellets
- Biocomposites and products – Added Value
Biomass Utilization
So Far...

- Impoundments Can Be Effective at Capturing Nutrient Runoff
- Don’t Site Too Far Up In Watershed
- Don’t Construct Linear Borrow Areas
- Harvest Vegetation To Remove Nutrients
- Effectiveness Requires Management
Still Many Questions
Nutrient Speciation and Cycling?
Nutrient Uptake and Treatment Efficiency?
Climate Variability?
Economics of BMP?
North Ottawa Nutrient Capture and Biomass Harvesting

Project Publication YouTube Link

http://youtu.be/5X5E3APpsMQ
Acknowledgements

• MN DNR Nongame Wildlife Program, MN LCCMR Environment and Natural Resource Trust Fund, MPCA/EPA 319 and The Bush Foundation

• Project partners; MN DNR Glenwood Area Wildlife staff, RRBC, UMN, NDSU, BdSWD
North Ottawa Nutrient Capture and Biomass Harvesting