UPPER BIG BLUE NRD
WATER QUALITY MANAGEMENT PLAN

Stakeholder Meeting #1
December 16, 2020
Agenda

• Welcome and Overview of Zoom
• Overview of Project
• Stakeholder Introductions
• Existing Conditions
• Existing Programs
• Stakeholder Roundtable
• Next Steps
WELCOME!
Virtual Meeting Overview

- Camera location
- Microphone location
- Settings for testing equipment
- Chat location

Andrea Gebhart
Facilitator
JEO Consulting Group
Virtual Meeting Overview

- Add to the chat box at anytime
- Mute if not actively participating
- Will take breaks for questions and discussion
- Meeting is being recorded
Project Overview
Water Quality Management Plan

• 2017
  • Received funding to develop a Water Quality Management Plan (WQMP)

• 2018
  • Commenced stakeholder involvement to develop the WQMP and set Target and Special Priority Areas

• 2019
  • The final plan was submitted to EPA and approval given in March
Water Quality Management Plan

• The approved plan allows the district to:
  • Address resource concerns in Target and Special Priority Areas
  • Apply for federal funds to assist in BMP implementation
  • Partner with landowners to put BMPs on the ground
Stakeholder Goals

1. Enhance the surface and groundwater resources using comprehensive and collaborative programs that restore and protect our natural resources

2. Increase awareness of the effects of human activities on water quality and support actions to restore and protect our water resources

3. Land and water resources will be stable and productive using community-supported best management practices

4. Achieve surface and groundwater quality to meet the needs of domestic, industrial, agricultural, recreational, and ecological uses
Stakeholder Objectives

1. Continue to monitor surface and groundwater conditions to ensure management actions are based on sound data.

2. Develop working partnerships with local, state, and federal organizations.

3. Address deficiencies in natural resources education and knowledge transfer and develop tools to facilitate management of our natural resources.

4. Lessen erosion rates using soil health practices; better manage stream and riparian corridors to reduce levels of atrazine and *E. coli* runoff.

5. Ensure the safety and quality of drinking water supplies and tracking progress to meeting plan goals.
Action Plan

**ACTION PLAN FRAMEWORK**

**Upper Big Blue Natural Resources District Water Quality Management Plan**

**MONITORING**
Consistently collecting and evaluating data over time to track progress.

**EDUCATION**
Information and outreach efforts aimed at increasing awareness of and encouraging participation in water quality improvement activities.

**PROJECTS**
Specific initiatives that seek to directly restore or protect water quality in the district. Projects may be time-bound or on-going.

**POLICY**
Guidelines or protocols set forth by a governing authority to achieve a specific outcome.
Next Step: Implementation

Following EPA approval of the WQMP, the Upper Big Blue NRD sought stakeholder participation to help identify and prioritize implementation practices that will be supported by landowners within the targeted areas.
Next Step: Implementation

• Three stakeholder meetings
  • December 2020
  • January 2021
  • February 2021

• One public meeting
  • March 2021
Stakeholder Introductions
Stakeholder Introductions

Please introduce yourself:
• Name
• Location, about how long you’ve been in district
• Occupation/Interest in Water Quality
• Why did you choose to be part of this effort?

David Cast
• Name: Landowner/Operator
• Occupation/Interest: Municipality

Adam Darbro
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator

Tena Ehlers
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator

Anthony Kriefels
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator

Gayle Marsh
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator

John Mittman
• Name: Landowner/Operator
• Occupation/Interest: Agri-Business

Gary Moody
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator

Patty Morner
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator

Steve Moseley
• Name: Landowner/Operator
• Occupation/Interest: Recreation

Doyle Onnen
• Name: Landowner/Operator
• Occupation/Interest: Land Management

Leslie Pohl
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator

Aaron Sindelar
• Name: Landowner/Operator
• Occupation/Interest: Agri-Business

Jess Spotanski
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator

Brent Swartzendruber
• Name: Landowner/Operator
• Occupation/Interest: Landowner/Operator
Stakeholders

Beaver Creek WQMP Stakeholders

Legend
- Stakeholders
- Upper Beaver Creek (Unknown)
- Lower Beaver Creek (Atrazine)
- Recharge Lake Watershed (Nutrients)
- Beaver Cr. Watershed

Hamilton Co.
- Jess Spotanski
- Adam Darbro
- Gary Moody
- Gayle Marsh

York Co.
- Leslie Pohl
- Aaron Sindelar
- Steve Mosely
- John Mitmann
- Anthony Kreifels

Seward Co.
- Tena Ehlers
- Benedict
- Thayer

Hall Co.
- David Cast
- Patty Morner

Upper Big Blue NRD
319 E 25th Street
York, NE 68467
(402) 362-4401
www.upperbigblue.org
Also here
Project Team and NRD Staff

Marie Krausnick
UBBNRD Water Dept Manager

Jack Wergin
UBBNRD Projects Dept Manager

Adam Rupe
JEO

Elbert Traylor
NE Dept. Environment & Energy (NDEE)
Also here
Technical Resources

• Matthew Perrion, Nebraska Game and Parks
• Jennifer Swanson, Nebraska Association of Resource Districts
• Josh Bowers, NRCS District Conservationist
• Jenny Rees, UNL Extension Educator for York County
• Steve Melvin, UNL Extension Educator for Hamilton County
NRD Board Members

- Paul Bethune
- Jeff Bohaty
- Richard Bohaty#
- Doug Bruns*
- David Robotham
- Doug Dickinson
- Gary Eberle*
- Rodney Grotz#
- Roger Houdersheldt
- Bill Kuehner
- Linda Luebbe
- John Miller
- Larry Moore
- Micheal Nuss
- Rhonda Rich
- Kendall Siebert#
- William Stahly
- Merlin Volkmer*
- Paul Weiss
- Lynn Yates

* Term ends 1/21/2021
# Term begins 1/21/2021
Did you complete the questionnaire?
Existing Conditions

Overview of Watershed
Recharge Lake
Beaver Creek Watershed
Watershed Background

- Overall WQMP goal = improved water quality using voluntary BMPs
- Planning effort was used to prioritize these efforts
  - Stakeholder & public input
  - Existing data
- First Target Areas:
  - Beaver Creek Watershed
  - Recharge Lake
Implementation Framework

- The plan helps guide the district’s priorities
- Based on data, resources needs, and public interest
- Creates eligibility for additional partnerships and funding for projects
- Some projects may be led by other partners
Implementation Framework

- Multiple “types” of projects were identified
- Detailed recommendations were included for prioritized projects within each type
- Not all projects are likely to be completed – it’s more of a menu
Target Areas for BMP Implementation

Legend:
- Planning Area
- Planning Area HUC8
- UBBN RD Boundary
- Counties
  - Title 117 Lakes
  - Title 117 Streams
- Wellhead Protection Areas

Nitrate Mngt. Zone:
- Phase 1
- Phase 2
- Phase 3

Priority Waterbody Overview:
- Tier 1 Lakes
- Tier 1 Streams
- Approximate Stream Drainage
  - Beaver Creek
  - Beaver Creek Headwaters

- Recharge Lake (BB3-L0080)
  - Category 5 - Impaired
  - Mercury (n/a), Chl a., Nutrients

- Beaver Creek (BB3-10300)
  - Category 4a - Impaired w/ TMDL
  - Atrazine, Aq. Life

- Beaver Creek (BB3-10400)
  - Category 5 - Impaired Aquatic Life
Watershed Background

- Total Planning Area = 1.9 M acres
- West Fork Big Blue = 857,185 acres
- Beaver Creek = 193,015 acres
- Recharge Lake drainage area = 8,549 acres
- Nearly all farmed
Recharge Lake Location
Existing Conditions
Recharge Lake

• **Introduction**
  49 acres, ground water recharge

• **Reservoir Timeline**
  1990: Construction, fish stockings/sampling
  2002: Renovation
  2003 – present: Fish stockings/sampling
Existing Conditions
Recharge Lake

• Fishery
  Largemouth Bass, Bluegill, Channel Catfish

• Issues
  Common Carp
  Water quality
  Bank erosion
  Sedimentation
  -sediment dyke, lake depth
Existing Conditions
Beaver Creek Watershed
Existing Conditions
Beaver Creek Watershed

• Designated as “impaired” due to
  • High Atrazine
  • Poor Habitat

• Also concerns regarding:
  • Nutrients
  • Sediment

• Bacteria impairment on West Fork Big Blue (downstream)
Watershed Pollutants & Sources Targeted for BMPs

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Primary Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrazine</td>
<td>• Runoff from corn ground</td>
</tr>
</tbody>
</table>

Affects

• Toxic to aquatic life
  • Hormone and reproductive affects
• Can also negatively affect drinking water / human health
Watershed Pollutants & Sources Targeted for BMPs

<table>
<thead>
<tr>
<th>Pollutant</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Atrazine</td>
<td>• Runoff from corn ground</td>
</tr>
<tr>
<td>Nutrients (Phosphorus &amp; Nitrogen)</td>
<td>• Fertilizer leaching to groundwater from corn ground</td>
</tr>
<tr>
<td></td>
<td>• Runoff from crop ground</td>
</tr>
<tr>
<td></td>
<td>• Small animal feeding operations</td>
</tr>
<tr>
<td></td>
<td>• Failing septic systems</td>
</tr>
<tr>
<td></td>
<td>• Urban runoff</td>
</tr>
</tbody>
</table>
Watershed Pollutants & Sources Targeted for BMPs

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<tr>
<td></td>
<td>• Small animal feeding operations</td>
</tr>
<tr>
<td></td>
<td>• Failing septic systems</td>
</tr>
<tr>
<td></td>
<td>• Urban runoff</td>
</tr>
<tr>
<td>Sediment</td>
<td>• Field erosion (sheet, rill, gullies)</td>
</tr>
<tr>
<td></td>
<td>• Stream erosion</td>
</tr>
</tbody>
</table>

**Affects**
- Degraded drinking water
- Filling in of lakes (sediment)
- Degradation of physical habitat in streams
- Algae blooms (sometimes toxic)
# Watershed Pollutants & Sources Targeted for BMPs

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<th>Primary Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Atrazine</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Affects</strong></td>
<td>• Some forms can cause human illness</td>
</tr>
<tr>
<td></td>
<td>• Used as an “indicator” for other harmful pathogens present due to fecal contamination</td>
</tr>
<tr>
<td><strong>Contaminated Water May Cause:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• “Crypto” (diarrheal disease)</td>
</tr>
<tr>
<td></td>
<td>• Giardia (beaver fever)</td>
</tr>
<tr>
<td></td>
<td>• Skin Rashes</td>
</tr>
<tr>
<td></td>
<td>• Eye &amp; Ear infections</td>
</tr>
<tr>
<td></td>
<td>• Hepatitis</td>
</tr>
<tr>
<td></td>
<td>• Respiratory Infections</td>
</tr>
<tr>
<td><strong>E. coli Bacteria</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Manure application</td>
</tr>
<tr>
<td></td>
<td>• Small animal feeding operations</td>
</tr>
<tr>
<td></td>
<td>• Wildlife</td>
</tr>
<tr>
<td></td>
<td>• Urban runoff (pets and wildlife)</td>
</tr>
<tr>
<td></td>
<td>• Failing septic systems</td>
</tr>
</tbody>
</table>
BMPs Determined by Voluntary Landowners / Producers

- Ideally multiple BMPs can be implemented or installed in each field, for a “layering effect”
- Many BMPs will treat multiple types of pollutants
- BMPs identified for multiple scales
  - Soil Health
  - In-Field
  - Edge-of-Field
  - Riparian
  - Urban
BMPs Determined by Voluntary Landowners / Producers

• Cover Crops
• Fertilizer Management
• Buffer Strips
• Wetland Restoration
• Irrigation Management
• Manure Management
• Many others!
# Estimated Total Costs

## Table 72: Implementation Costs for the Beaver Creek Target Area

<table>
<thead>
<tr>
<th>Practice</th>
<th>Units</th>
<th>Units Applied</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education/Outreach</td>
<td>Year</td>
<td>5</td>
<td>$10,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Non-Structural/Avoidance</td>
<td>Acre</td>
<td>38,000</td>
<td>$55</td>
<td>$2,090,000</td>
</tr>
<tr>
<td>OWTS Upgrade</td>
<td>Each</td>
<td>1,356</td>
<td>$5,500</td>
<td>$7,458,000</td>
</tr>
<tr>
<td>Pet Waste Pickup</td>
<td>Each</td>
<td>4</td>
<td>$5,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Irrigation Water Management Suite</td>
<td>Acre</td>
<td>61,000</td>
<td>$34</td>
<td>$2,074,000</td>
</tr>
<tr>
<td>Grazing Lands Management Suite</td>
<td>Acre</td>
<td>5,200</td>
<td>$21</td>
<td>$109,200</td>
</tr>
<tr>
<td>Cover Crops</td>
<td>Acre</td>
<td>76,300</td>
<td>$66</td>
<td>$5,035,800</td>
</tr>
<tr>
<td>Riparian Buffers</td>
<td>Acre</td>
<td>750</td>
<td>$1,634</td>
<td>$1,225,500</td>
</tr>
<tr>
<td>No-Till</td>
<td>Acre</td>
<td>38,100</td>
<td>$22</td>
<td>$838,200</td>
</tr>
<tr>
<td>Reduced-Till</td>
<td>Acre</td>
<td>30,500</td>
<td>$42</td>
<td>$1,291,000</td>
</tr>
<tr>
<td>Contour Buffer Strip</td>
<td>Acre</td>
<td>500</td>
<td>$288</td>
<td>$144,000</td>
</tr>
<tr>
<td>Non-Permitted AFO Suite</td>
<td>Each</td>
<td>67</td>
<td>$20,000</td>
<td>$1,340,000</td>
</tr>
<tr>
<td>Farm Ponds/Sediment Basins/Wetland Construction</td>
<td>Each</td>
<td>202</td>
<td>$46,200</td>
<td>$9,332,400</td>
</tr>
<tr>
<td>Wetland Restoration</td>
<td>Acre</td>
<td>2,400</td>
<td>$3,277</td>
<td>$7,884,800</td>
</tr>
<tr>
<td>Terraces</td>
<td>Foot</td>
<td>420,000</td>
<td>$3</td>
<td>$1,260,000</td>
</tr>
<tr>
<td>WASCOBs</td>
<td>Foot</td>
<td>226,000</td>
<td>$3</td>
<td>$678,000</td>
</tr>
<tr>
<td>Grassed Waterway</td>
<td>Acre</td>
<td>1,000</td>
<td>$8,357</td>
<td>$8,357,000</td>
</tr>
<tr>
<td>Land Use Change</td>
<td>Year</td>
<td>5</td>
<td>$5,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>Urban Stormwater Practice Suite</td>
<td>Year</td>
<td>4</td>
<td>$10,000</td>
<td>$40,000</td>
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</tbody>
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### Subtotal (Drainage Area Treatment)

$47,222,900

### Subtotal (In-Stream Work)

$20,040,000

### Subtotal (Planning/Monitoring)

$125,000

### Total

$67,387,900

## Table 60: Implementation Costs for the Recharge Lake Target Area

<table>
<thead>
<tr>
<th>Practice</th>
<th>Units</th>
<th>Units Applied</th>
<th>Unit Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education/Outreach</td>
<td>Year</td>
<td>5</td>
<td>$2,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Non-Structural/Avoidance</td>
<td>Acre</td>
<td>1,870</td>
<td>$55</td>
<td>$102,850</td>
</tr>
<tr>
<td>OWTS Upgrade</td>
<td>Each</td>
<td>43</td>
<td>$5,500</td>
<td>$238,500</td>
</tr>
<tr>
<td>Pet Waste Pickup</td>
<td>Each</td>
<td>1</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Irrigation Water Management Suite</td>
<td>Acre</td>
<td>3,000</td>
<td>$34</td>
<td>$102,000</td>
</tr>
<tr>
<td>Grazing Lands Management Suite</td>
<td>Acre</td>
<td>200</td>
<td>$21</td>
<td>$4,200</td>
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<tr>
<td>Cover Crops</td>
<td>Acre</td>
<td>3,700</td>
<td>$66</td>
<td>$244,200</td>
</tr>
<tr>
<td>Riparian Buffers</td>
<td>Acre</td>
<td>30</td>
<td>$1,634</td>
<td>$49,020</td>
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<tr>
<td>No-Till</td>
<td>Acre</td>
<td>1,870</td>
<td>$22</td>
<td>$41,140</td>
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<tr>
<td>Reduced-Till</td>
<td>Acre</td>
<td>1,500</td>
<td>$42</td>
<td>$63,000</td>
</tr>
<tr>
<td>Contour Buffer Strip</td>
<td>Acre</td>
<td>10</td>
<td>$288</td>
<td>$2,880</td>
</tr>
<tr>
<td>Non-Permitted AFO Suite</td>
<td>Each</td>
<td>2</td>
<td>$20,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>Farm Ponds/Sediment Basins/Wetland Construction</td>
<td>Each</td>
<td>9</td>
<td>$46,200</td>
<td>$415,800</td>
</tr>
<tr>
<td>Wetland Restoration</td>
<td>Acre</td>
<td>40</td>
<td>$3,277</td>
<td>$131,080</td>
</tr>
<tr>
<td>Terraces</td>
<td>Foot</td>
<td>9,200</td>
<td>$3</td>
<td>$27,600</td>
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<tr>
<td>WASCOBs</td>
<td>Foot</td>
<td>11,100</td>
<td>$3</td>
<td>$33,300</td>
</tr>
<tr>
<td>Grassed Waterway</td>
<td>Acre</td>
<td>30</td>
<td>$6,357</td>
<td>$190,710</td>
</tr>
<tr>
<td>Land Use Change</td>
<td>Year</td>
<td>5</td>
<td>$1,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Urban Stormwater Practice Suite</td>
<td>Year</td>
<td>0</td>
<td>$10,000</td>
<td>$0</td>
</tr>
</tbody>
</table>

### Subtotal (Drainage Area Treatment)

$1,704,280

### Subtotal (In-Stream Work)

$1,336,000

### Subtotal (In-Lake Work)

$2,639,000

### Subtotal (Planning/Monitoring)

$75,000

### Total

$5,954,280
Estimated Total Costs

Are these estimates achievable?

How do we increase adoption or implementation of these practices by voluntary and willing landowners?
Discussion
Existing Programs
Existing NRD Programs

• Land Treatment Program
• Nebraska Buffer Strip Program
• Private Dams Program
• Municipal Water System Assistance Program
Land Treatment Program

- Nebraska Soil and Water Conservation Program
  - Created in 1977
  - Provides Financial Assistance to Private Landowners for Installation of Soil and Water Conservation Practices
- Natural Resources Commission
  - 27 members
  - Responsibilities
    - Determine eligible practices
    - Establish operating procedures
    - Allocate annual funds among the 23 NRDs
Land Treatment Program

- Nebraska Soil and Water Conservation Program
  - Funding
    - $1 million divided equally between 23 NRDs ($43,478 each)
    - Additional funds distributed based on conservation needs
      - Based on National Resources Inventory
      - 2020 range $120,105 - $10,472 per NRD
    - Upper Big Blue NRD – 2020 Funding
      - NSWCP 2020 - $43,478 + $28,838 = $72,316
      - Upper Big Blue NRD budgeted $175,000 of NRD Funds in 2020
      - $72,316 (NSWCP) + $175,000 (NRD) = $243,316
Land Treatment Program

- Nebraska Soil and Water Conservation Program
  - Upper Big Blue NRD – Approved Practices
    - Terraces
    - Dams
    - Diversions
    - Sediment Control Basins
    - Pasture Planting
    - Grade Stabilization
    - Streambank Stabilization
    - Grassed Waterways
    - Sub-Surface Drip Irrigation
    - Windbreaks
    - Planned Grazing Systems
    - Brush Management
    - Variable Rate Irrigation
Land Treatment Program

• Cost Share Rates
  • 75% of Actual Costs or State Average EQIP Rate
  • Maximum of $7,500 per Landowner per year

• Timeframe
  • NRCS Completes Design
  • Landowner Signs Application
  • Landowner Requests Authorization Number from NRD
  • 90 days to Complete Project
    • Windbreak Renovation has 18 months to complete
Nebraska Buffer Strip Program

- Nebraska Department of Agriculture
- Administered by the NRDs
- Provide Protection between cropland and waterbodies
  - Stabilize the environment and filter agrichemicals such as fertilizers and pesticides
- Provide Landowner Assistance for
  - Filter Strips (narrow strips of grass)
  - Riparian Forest Buffer Strips (strips containing trees and grass)
    - placed next to seasonal or permanent streams, wetlands, and ponds
- Reduces field runoff
  - 30-60% of pesticides
  - Up to 60% or more of certain pathogens
  - Up to 75% or more of sediment
Nebraska Buffer Strip Program

- Funded by fees assessed on registered pesticides
- Filter Strips – Widths - 20 feet – 120 feet
- Riparian Forest Buffer Strips – Widths - 55 feet – 180 feet
- Irrigated Cropland
  - With other Gov Program - $250/acre minus payment from other program
  - Without other Gov Program - $225/acre minus payment from any other program
- Non-Irrigated Cropland
  - With other Gov Program – 20% of the average CRP soil rental rate
  - Without other Gov Program – 120% of the average CRP soil rental rate plus $5/acre minus payment for any other program
- In no case may payments from all programs exceed $250/acre
Nebraska Buffer Strip Program

Buffer Distribution
- Non-irrigated Buffers
- Irrigated Buffers

Nebraska Department of Agriculture
Nebraska Buffer Strip Program
Nebraska Buffer Strip Program

- Contracts – 5 year or 10 year terms
- 2019 Nebraska
  - 673 Contracts 5,555 Acres  Avg $131/acre
- 2020 Upper Big Blue NRD
  - 24 Contracts 174 acres  Avg $183/acre
UBBNRD Private Dams Program

• New or Re-built Dams on Private Property
• Provides planning, design, and cost-share
• NRCS provides design and const assistance
• Cost Share – 75% up to Max $50,000
• Must meet resource concern
  • Flood Prevention
  • Erosion Control
  • Groundwater Recharge
  • Sediment Control
  • Water Conservation
  • Fish and Wildlife Benefits
• Started in 2016
  • Completed 15 Dams – avg cost share $22,600
UBBNRD Private Dams Program
Municipal Water System Assistance Program

• Provides financial assistance to communities to mitigate the impacts of non-point source groundwater contamination for the protection and public health of the community’s residents.
  • Must have an approved Wellhead Protection Area Plan
  • District will contribute 25% of the local share not to exceed $50,000.00 for small communities and $100,000.00 for large communities
Municipal Water System Assistance Program
Discussion
All meeting attendees welcome to participate
Next Steps

• Stakeholder Meeting #2
  Wednesday, January 20, 2021, 6:30-8:30 p.m.

• Stakeholder Meeting #3
  Wednesday, February 17, 2021, 6:30-8:30 p.m.

• Public Meeting/Input
  March 2021
IMPLEMENTATION PHASE

UPPER BIG BLUE NRD
WATER QUALITY MANAGEMENT PLAN

THANK YOU!
SUPPORT ASSESSMENTS

NDEE has conducted beneficial use support assessments on 18 of the 26 stream segments in the planning area, as shown in Table 30 and visualized in Figure 50. Of the 18 stream segments assessed, ten are identified as impaired. The highest level of stream impairments occurs in the West Fork Big Blue Subbasin where 75% of the total stream segments and 85% of the assessed segments are impaired.

Table 30: Beneficial Use Support Summary for Stream Segments in the Planning Area

<table>
<thead>
<tr>
<th></th>
<th>Upper Big Blue</th>
<th>Middle Big Blue</th>
<th>West Fork Big Blue</th>
<th>Turkey Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Stream Segments</td>
<td>6</td>
<td>10</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Number Assessed</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Number Impaired</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>% of Total Segments Impaired</td>
<td>33%</td>
<td>20%</td>
<td>75%</td>
<td>0%</td>
</tr>
<tr>
<td>% of Assessed Segments Impaired</td>
<td>50%</td>
<td>40%</td>
<td>85%</td>
<td>0%</td>
</tr>
<tr>
<td>Total Stream Segment Miles</td>
<td>172 miles</td>
<td>80 miles</td>
<td>244 miles</td>
<td>80 miles</td>
</tr>
<tr>
<td>Miles Assessed</td>
<td>155 miles</td>
<td>80 miles</td>
<td>236 miles</td>
<td>80 miles</td>
</tr>
<tr>
<td>Miles Impaired</td>
<td>84 miles</td>
<td>33 miles</td>
<td>144 miles</td>
<td>0 miles</td>
</tr>
<tr>
<td>% of Total Miles Impaired</td>
<td>49%</td>
<td>41%</td>
<td>59%</td>
<td>0%</td>
</tr>
<tr>
<td>% of Assessed Miles Impaired</td>
<td>54%</td>
<td>55%</td>
<td>61%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: NDEQ (2018a)

Figure 50: Beneficial Use Support Summary for Stream Segments in the Planning Area
### Table 32: Impaired Stream Segments in the Planning Area

<table>
<thead>
<tr>
<th>Subbasin</th>
<th>Stream Name</th>
<th>Segment</th>
<th>Beneficial Use (Pollutant Causing Impairment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Big Blue</td>
<td>Lincoln Creek</td>
<td>BB4-20900</td>
<td>Aquatic Life (Impaired Aquatic Community)</td>
</tr>
<tr>
<td></td>
<td>Big Blue River</td>
<td>BB4-40000</td>
<td>Aquatic Life (Atrazine)</td>
</tr>
<tr>
<td>Middle Big Blue</td>
<td>Big Blue River</td>
<td>BB4-10000</td>
<td>Recreation (Bacteria), Aquatic Life (Atrazine)</td>
</tr>
<tr>
<td></td>
<td>Big Blue River</td>
<td>BB4-20000</td>
<td>Recreation (Bacteria)</td>
</tr>
<tr>
<td>West Fork Big Blue</td>
<td>West Fork Big Blue River</td>
<td>BB3-10000</td>
<td>Recreation (Bacteria), Aquatic Life (Impaired Aquatic Community, Atrazine)</td>
</tr>
<tr>
<td></td>
<td>Walnut Creek</td>
<td>BB3-10200</td>
<td>Aquatic Life (Impaired Aquatic Community)</td>
</tr>
<tr>
<td></td>
<td>Beaver Creek</td>
<td>BB3-10300</td>
<td>Aquatic Life (Atrazine)</td>
</tr>
<tr>
<td></td>
<td>Beaver Creek</td>
<td>BB3-10400</td>
<td>Aquatic Life (Impaired Aquatic Community)</td>
</tr>
<tr>
<td></td>
<td>West Fork Big Blue River</td>
<td>BB3-20000</td>
<td>Recreation (Bacteria), Aquatic Life (Impaired Aquatic Community, Atrazine)</td>
</tr>
<tr>
<td>Turkey Creek</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: NDEQ, 2018a

### Figure 52: Causes of Stream Impairment in the Planning Area

Source: NDEQ (2018a)
Figure 22: Designated Title 117 Lakes in the Planning Area
NDEE has conducted beneficial use support assessments on 12 of the 18 lakes in the planning area, as shown in Table 31 and visualized in Figure 51. Of the 12 lakes assessed, eight are identified as being impaired. The highest level of lake impairments occurs in the West Fork Big Blue Subbasin where 67% of the total lakes and 75% of the assessed lakes are impaired.

**Table 31: Beneficial Use Support Summary for Lakes in the Planning Area**

<table>
<thead>
<tr>
<th></th>
<th>Upper Big Blue</th>
<th>Middle Big Blue</th>
<th>West Fork Big Blue</th>
<th>Turkey Creek</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Lakes</td>
<td>6</td>
<td>0</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Number Assessed</td>
<td>4</td>
<td>0</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Number Impaired</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>% of Total Lakes Impaired</td>
<td>33%</td>
<td>0%</td>
<td>67%</td>
<td>0%</td>
</tr>
<tr>
<td>% of Assessed Lakes Impaired</td>
<td>50%</td>
<td>0%</td>
<td>75%</td>
<td>0%</td>
</tr>
<tr>
<td>Total Number of Acres</td>
<td>54 acres</td>
<td>0 acres</td>
<td>200 acres</td>
<td>1 acre</td>
</tr>
<tr>
<td>Acres Assessed</td>
<td>43 acres</td>
<td>0 acres</td>
<td>189 acres</td>
<td>0 acres</td>
</tr>
<tr>
<td>Acres Impaired</td>
<td>38 acres</td>
<td>0 acres</td>
<td>168 acres</td>
<td>0 acres</td>
</tr>
<tr>
<td>% of Total Acres Impaired</td>
<td>70%</td>
<td>0%</td>
<td>84%</td>
<td>0%</td>
</tr>
<tr>
<td>% of Assessed Acres Impaired</td>
<td>88%</td>
<td>0%</td>
<td>89%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: NDEQ, 2018a

**Figure 51: Beneficial Use Support Summary for Lakes in the Planning Area**
5.06 POLLUTANTS OF CONCERN

INTRODUCTION

Sources of pollution can be separated in two primary categories: point sources and nonpoint sources. A point source is any discernible, confined, discrete conveyance from which pollutants can be discharged. Point source pollution can be easily tracked along the pollutant’s travel path and identified at the source. Examples would include any pipe, ditch, tunnel, conduit, or well that might discharge pollutants. The discharge from some point sources is regulated by the National Pollutant Discharge Elimination System (NPDES) permit program. Many agricultural, industrial, and municipal facilities are required to obtain NPDES permit coverage. However, individual homes connected to a municipal or septic system typically do not need coverage under a NPDES permit.

Identifying permitted facilities is important in developing a water quality management plan. While these facilities are assumed to be meeting all their permit requirements, their pollutant load contributions do need to be accounted for. This allows for the identification of nonpoint pollution loads to be clearly identified and separated. Nonpoint sources of pollution come from facilities, activities, or land uses that do not meet regulatory requirements to be considered point sources. Because these facilities are not regulated, are typically smaller, or are otherwise not well defined, they are thus treated as nonpoint sources for management purposes. This is conceptually illustrated below in Figure 54.
Figure 34: Most Recent Nitrate Concentrations from Wells Sampled from 1996 to 2015

Figure 35: Wellhead Protection Areas and Maximum Nitrate Levels
### Table 26: Applicable Water Quality Standards

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Beneficial Use</th>
<th>Chronic Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em> Bacteria</td>
<td>Primary Contact Recreation</td>
<td>Geometric Mean-126 col/100mls</td>
</tr>
<tr>
<td>Atrazine</td>
<td>Aquatic Life</td>
<td>12.00 µg/L</td>
</tr>
<tr>
<td>pH</td>
<td>Aquatic Life</td>
<td>Acceptable Range = 6.5 – 9.0</td>
</tr>
<tr>
<td><em>Lakes Only (Eastern)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>Aquatic Life</td>
<td>50 µg/L</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>Aquatic Life</td>
<td>1000 µg/L</td>
</tr>
<tr>
<td>Chlorophyll-a</td>
<td>Aquatic Life</td>
<td>10 mg/m²</td>
</tr>
<tr>
<td>Sedimentation</td>
<td>Aesthetics</td>
<td>Total Conservation Pool Volume Loss &gt; 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conservation Pool Volume Loss &lt; 0.75%/year</td>
</tr>
</tbody>
</table>
Figure 60: Flowchart of Waterbody Prioritization Process
District-Wide Water Quality Management Plan

Oxbow Trails Reservoir

Oxbow Trails Reservoir is a Category 5 waterbody with the Aquatic Life nutrients. The lake is located in the Upper Big Blue subbasin, east of Ulm.

Lincoln Creek

Two impaired segments of Lincoln Creek were selected as Tier 2 or headwaters segment and the downstream segment. The headwaters se waterbody with an aquatic community impairment. The downstream se waterbody with no impairment. Both segments are located in the Upper run approximately from northwest of the City of York to Seward.

Table 48: List of Priority Waterbodies

<table>
<thead>
<tr>
<th>Subbasin</th>
<th>Tier</th>
<th>Waterbody ID</th>
<th>Name</th>
<th>Impaired Use</th>
<th>Cause of Impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Fork Big Blue</td>
<td>1</td>
<td>BB3-10400</td>
<td>Beaver Creek – Headwaters to Unnamed Creek</td>
<td>Aquatic Life</td>
<td>Unknown</td>
</tr>
<tr>
<td>West Fork Big Blue</td>
<td>1</td>
<td>BB3-10300</td>
<td>Beaver Creek – Unnamed Creek to West Fork Big Blue River</td>
<td>Aquatic Life</td>
<td>Atrazine</td>
</tr>
<tr>
<td>West Fork Big Blue</td>
<td>1</td>
<td>BB3-10680</td>
<td>Recharge Lake</td>
<td>Aquatic Life</td>
<td>Nutrients</td>
</tr>
<tr>
<td>West Fork Big Blue</td>
<td>2</td>
<td>BB3-20100</td>
<td>School Creek</td>
<td>Aquatic Life</td>
<td>Atrazine</td>
</tr>
<tr>
<td>West Fork Big Blue</td>
<td>2</td>
<td>BB3-20050</td>
<td>Lake Hastings</td>
<td>Aquatic Life &amp; Aesthetics</td>
<td>Nutrients &amp; Sediment</td>
</tr>
<tr>
<td>Upper Big Blue</td>
<td>2</td>
<td>BB4-20050</td>
<td>Lincoln Creek – Headwaters to Unnamed Creek</td>
<td>Aquatic Life</td>
<td>Unknown</td>
</tr>
<tr>
<td>Upper Big Blue</td>
<td>2</td>
<td>BB4-20600</td>
<td>Lincoln Creek – Unnamed Creek to Big Blue River</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Upper Big Blue</td>
<td>2</td>
<td>BB4-20035</td>
<td>Oxbow Trails Reservoir</td>
<td>Aquatic Life</td>
<td>Nutrients</td>
</tr>
</tbody>
</table>

Source: NDEQ, 2018a

9.05 SPECIAL PRIORITY AREAS

SPAs provide flexibility to address identified small-scale areas with specific, limited, and timely needs that lie outside of the target areas. They address issues that occur widely across the planning area and may affect not only water quality, but also the health and safety of humans. Additionally, some priority BMPs do not have specifically targeted land uses or an easily defined subwatershed associated with their implementation; thus, SPAs do not count towards the 20% Rule. Some BMPs, when implemented in broad areas, have greater appeal to the public and spur greater involvement. SPAs allow for the opportunity to implement practices outside of target areas and are eligible for Section 319 funding. Projects in these areas are excellent candidates for partnering opportunities. The following SPAs have been identified:

ON-SITE WASTEWATER TREATMENT SYSTEMS

New regulations and design standards for on-site wastewater systems in 2004 offered an opportunity to address potential sources of bacterial and nutrient contamination in waterbodies. The On-site Wastewater System Upgrade practice for Section 319 projects was created to support pumping and inspections on-site wastewater systems and to replace systems installed before 2004.
Bacteria Levels

Table 2 provides a summary of the calculated *E. coli* seasonal geometric mean performed by NDEQ (2013). Figure 1 shows the spatial location of the impaired stream segments in the UBBNRD.

### Table 2. NDEQ (2013) Calculated *E. coli* Seasonal Geometric Mean Summary

<table>
<thead>
<tr>
<th>Water Body Name</th>
<th>Waterbody ID</th>
<th>Seasonal Geometric Mean (#/100ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>West Fork Big Blue</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Fork Big Blue River: School Creek to Beaver Creek</td>
<td>BB3-20000</td>
<td>2019</td>
</tr>
<tr>
<td>West Fork Big Blue River: Beaver Creek to Big Blue River</td>
<td>BB3-10000</td>
<td>1699</td>
</tr>
<tr>
<td><strong>Middle Big Blue</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big Blue River - Lincoln Creek to Blue Bluff Dam</td>
<td>BB4-20000</td>
<td>782</td>
</tr>
<tr>
<td>Big Blue River - Blue Bluff Dam to West Fork Big Blue River</td>
<td>BB4-10000</td>
<td>776</td>
</tr>
</tbody>
</table>

### Table 10. Estimated *E. coli* Load Reductions Within the Targeted Title 117 Segments after BMP Implementation

<table>
<thead>
<tr>
<th>Segment ID</th>
<th>Waterbody Name</th>
<th>Pre-BMP Implementation</th>
<th>Existing Seasonal Geometric Mean (CFU/100 ml)</th>
<th>Post-BMP Implementation</th>
<th>Estimated Percent Reduction</th>
<th>Estimated Seasonal Geometric Mean (CFU/100 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB3-10300</td>
<td>Beaver Creek</td>
<td>Existing Load (billion CFU)</td>
<td>650800</td>
<td>Estimated Load (billion CFU)</td>
<td>259400</td>
<td>Estimated Percent Reduction</td>
</tr>
<tr>
<td>BB3-10000</td>
<td>West Fork Big Blue River</td>
<td>2841900</td>
<td>1699</td>
<td>2407800</td>
<td>15%</td>
<td>1444</td>
</tr>
</tbody>
</table>
Nutrients

Figure 5: Phosphorus Sources and Annual Average Loads to Beaver Creek

Figure 6: Nitrogen Sources and Annual Average Loads to Beaver Creek
Sediment

**Figure 7:** Sediment Sources and Annual Average Loads to Beaver Creek
Recharge Lake Water Quality

Table 30: Estimated Phosphorus Reductions and Water Quality Targets for Recharge Lake

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Phosphorus Load Load (lbs/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning total phosphorus load</td>
<td>32,235</td>
</tr>
<tr>
<td>Drainage area BMP reductions</td>
<td>11,449</td>
</tr>
<tr>
<td>Extended wet detention reduction</td>
<td>14,342</td>
</tr>
<tr>
<td>In-lake wetlands reduction</td>
<td>2,835</td>
</tr>
<tr>
<td>Lake deepening reduction</td>
<td>3,248</td>
</tr>
<tr>
<td>Total reduction</td>
<td>31,868</td>
</tr>
<tr>
<td>Expected load</td>
<td>367</td>
</tr>
<tr>
<td>Phosphorus loading capacity</td>
<td>590</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Phosphorus Concentration (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Concentration</td>
<td>495</td>
</tr>
<tr>
<td>Expected Concentration</td>
<td>44</td>
</tr>
<tr>
<td>In-Lake Water Quality Standard</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 49: Recharge Lake Nutrient Concentrations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data Period</th>
<th>Number of Samples</th>
<th>Mean Value (µg/L)</th>
<th>Water Quality Standard (µg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>2002 – 2010</td>
<td>15</td>
<td>495</td>
<td>50</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>2002 – 2010</td>
<td>14</td>
<td>2,180</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Source: USEPA, 2019

Table 32: Estimated Sediment Load Reductions for Recharge Lake

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sediment Load (tons/yr.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning total sediment load</td>
<td>6,050</td>
</tr>
<tr>
<td>Drainage area BMP reductions</td>
<td>3,343</td>
</tr>
<tr>
<td>Extended wet detention reduction</td>
<td>2,328</td>
</tr>
<tr>
<td>In-lake wetlands reduction</td>
<td>296</td>
</tr>
<tr>
<td>Lake deepening reduction</td>
<td>Not Estimated</td>
</tr>
<tr>
<td>Total reduction</td>
<td>5,967</td>
</tr>
<tr>
<td>Expected load</td>
<td>83</td>
</tr>
<tr>
<td>Sediment loading target</td>
<td>NA</td>
</tr>
</tbody>
</table>
Reservoir Deepening

Sediment removal from the Recharge Lake will reduce bottom sediment re-suspension and increase the reservoir's ability to attenuate nutrients. Nitrogen reduction benefits were not determined for lake deepening due to the lack of data and literature.

A target of increasing the conservation pool storage volume measured in 2016 by 20% or 62 acre-feet. If the 20% storage volume increase was achieved, current in-lake phosphorus concentration would decrease by an estimated 40.7 μg/L. This equates to an annual load reduction of 3,248 lbs/yr. or a 10% reduction to the current total phosphorus load.

Areas of Recharge Lake that are less than 10 feet deep should be considered to be a higher priority for deepening. While current water depths have not been documented, a majority of the sediment removal would occur in the upper portion of the reservoir (Figure 12). A number of different methods can be used to remove deposited sediment including: sluicing, hydraulic dredging, and dry excavation. Although all options should be evaluated, dry excavation is the most cost-effective and has been the most commonly used on lakes in the area.
Vision

• The water resources of the Upper Big Blue Natural Resources District will be locally managed by the District, in cooperation with its partners and stakeholders, through conservation, protection, and responsible development for the health and welfare of the people of the District.
Goal #1

1. The quality of surface water and groundwater resources in the basin will be enhanced through a comprehensive and collaborative program that efficiently and effectively implements actions to restore and protect natural resources from degradation and impairment.
Goal #2

1.

2. Resource managers, public officials, community leaders, and private citizens will understand the effects of human activities on water quality and support actions to restore and protect water resources from impairment by nonpoint source pollution.
Goals #3 and #4

1.

2.

3. Land and water resources will be stable and productive using community-supported best management practices

4. The water quality of surface and groundwater resources will meet the conditions necessary to support domestic, industrial, agricultural, recreational, and ecological uses.
Water Quality and Pollutant Reductions

Table 77: Summary of Target Area Pollutant Load Reductions

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Beginning Load</th>
<th>Expected Post-BMP Load</th>
<th>Reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recharge Lake</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphorus (lbs/yr)</td>
<td>32,235</td>
<td>367</td>
<td>98.86%</td>
</tr>
<tr>
<td>Nitrogen (lbs/yr)</td>
<td>53,682</td>
<td>8,335</td>
<td>84.47%</td>
</tr>
<tr>
<td>Sediment (tons/yr)</td>
<td>6,050</td>
<td>83</td>
<td>98.63%</td>
</tr>
<tr>
<td><strong>Beaver Creek</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phosphorus (lbs/yr)</td>
<td>344,006</td>
<td>137,637</td>
<td>59.99%</td>
</tr>
<tr>
<td>Nitrogen (lbs/yr)</td>
<td>1,228,735</td>
<td>645,946</td>
<td>47.43%</td>
</tr>
<tr>
<td>Sediment (tons/yr)</td>
<td>93,632</td>
<td>40,665</td>
<td>56.57%</td>
</tr>
<tr>
<td>Atrazine (ug/L)</td>
<td>45.46</td>
<td>14.23</td>
<td>68.72%</td>
</tr>
<tr>
<td>E. coli Bacteria (billion CFU)</td>
<td>650,800</td>
<td>259,400</td>
<td>60.14%</td>
</tr>
</tbody>
</table>

Source: Water Quality Modeling
Monitoring Data

- Utilized NDEQ collected data
  - Approximately last 20 years
  - 12 lake sites (multiple sites per lake)
  - 24 stream sites
- Parameters of Interest
  - *E. coli* bacteria
  - Atrazine
  - Nutrients (phosphorus and nitrogen)
  - Sediment
Period of Record
Stream Sampling
Period of Record
Lake Sampling
Atrazine Concentrations
All Streams

May & June Average Atrazine Concentrations (2002-2017)

Water Quality Standard

 *= Outside Planning Area
 ** = Impaired for Atrazine

Monitoring Station Locations

Water Quality Standard (12 ug/L)

Other Stations Shown in Blue.

Ambient Stations Shown in Red.
E. Coli Concentrations
All Streams


- School Creek (Grafton)
- W.F. Big Blue (Dorchester)*
- Lincoln Creek (W. of Seward)
- Big Blue (S. of Crete)*
- Big Blue (N.W. of Seward)
- Big Blue (Surprise)

* = Outside Planning Area
** = Impaired for Bacteria

Monitoring Station Locations

Water Quality Standard (126col/100mls)

Other Stations Shown in Blue.
Ambient Stations Shown in Red.
Nutrient Concentrations - All Lakes

Average Available Lake Phosphorus Concentrations (2002-2016)

<table>
<thead>
<tr>
<th>Lake</th>
<th>Total Phosphorus (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seward City Lake</td>
<td>812</td>
</tr>
<tr>
<td>Recharge Lake**</td>
<td>495</td>
</tr>
<tr>
<td>Lake Hastings**</td>
<td>169</td>
</tr>
<tr>
<td>Heartwell Lake</td>
<td>126</td>
</tr>
</tbody>
</table>

**=Impaired for Nutrients
Water Quality Standard (50μg/L)

Average Available Lake Nitrogen Concentrations (2002-2016)

<table>
<thead>
<tr>
<th>Lake</th>
<th>Total Nitrogen (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heartwell Lake</td>
<td>2337</td>
</tr>
<tr>
<td>Seward City Lake</td>
<td>2276</td>
</tr>
<tr>
<td>Recharge Lake**</td>
<td>2180</td>
</tr>
<tr>
<td>Lake Hastings**</td>
<td>1713</td>
</tr>
</tbody>
</table>

**=Impaired for Nutrients
Water Quality Standard (1000μg/L)
Atrazine - West Big Blue River

Mean May&June Atrazine Concentrations for Station W Big Blue, Dorchester
WBID: BB3-10000 West Fork Big Blue River

- Trendline

Water Quality Standard

$R^2 = 0.0145$

$n = 67$

$p = 0.0027$
E. coli over time
West Big Blue River

Geometric Mean E. coli Concentrations for Station W Big Blue, Dorchester (May-Sept)
WBID: BB3-10000 West Fork Big Blue River

<table>
<thead>
<tr>
<th>Year</th>
<th>Geometric Mean E. coli Concentration (#col/100mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>1540.26</td>
</tr>
<tr>
<td>2012</td>
<td>600</td>
</tr>
<tr>
<td>2017</td>
<td>800</td>
</tr>
</tbody>
</table>

Water Quality Standard (126col/100mL)

n = 55
p = 0.42
Takeaways

• Streams
  • Decreasing atrazine trends, but still some high levels
  • Increasing *E. coli* levels

• Lakes
  • Not enough data to look at trends
  • All sampled lakes do not meet nutrient standards

• Many waterbodies lack data

• Next steps
  • Develop water quality model
  • Clarify future monitoring needs

• Think about: *How can existing data help to determine priorities?*