

By Corey Hanson, Red Lake Watershed District Water Quality Coordinator. 3/29/2017.

- ✓ Watershed Restoration and Protection project updates – finishing draft Red Lake River Watershed Total Maximum Daily Load and Watershed Restoration and Protection Strategy reports.
- ✓ Red Lake River Watershed Restoration and Protection Project Informational Brochure

### **Long-Term Monitoring**

- A data review was completed for the long-term monitoring program data that was collected and submitted in 2016.

### **Clearwater River Watershed Restoration and Protection Strategy (WRAPS) Project**

- Objective 3 – Flow Monitoring
  - Water level loggers were retrieved from Clearwater River watershed monitoring sites in early December, as the weather was finally cold enough for the water in stream to begin freezing.
- Objective 5 – Stream Channel Stability Assessment
  - Flow data files from Silver Creek, Poplar River, and the Lost River were shared with MNDNR geomorphology staff.
- Objective 7 – Data entry
  - A data was completed for the 2016 data that was collected and submitted for the Clearwater River WRAPS project.

### **Red Lake River Watershed Assessment Project (Watershed Restoration and Protection – WRAP)**

The end date of the Red Lake River WRAP contract was December 31, 2016.

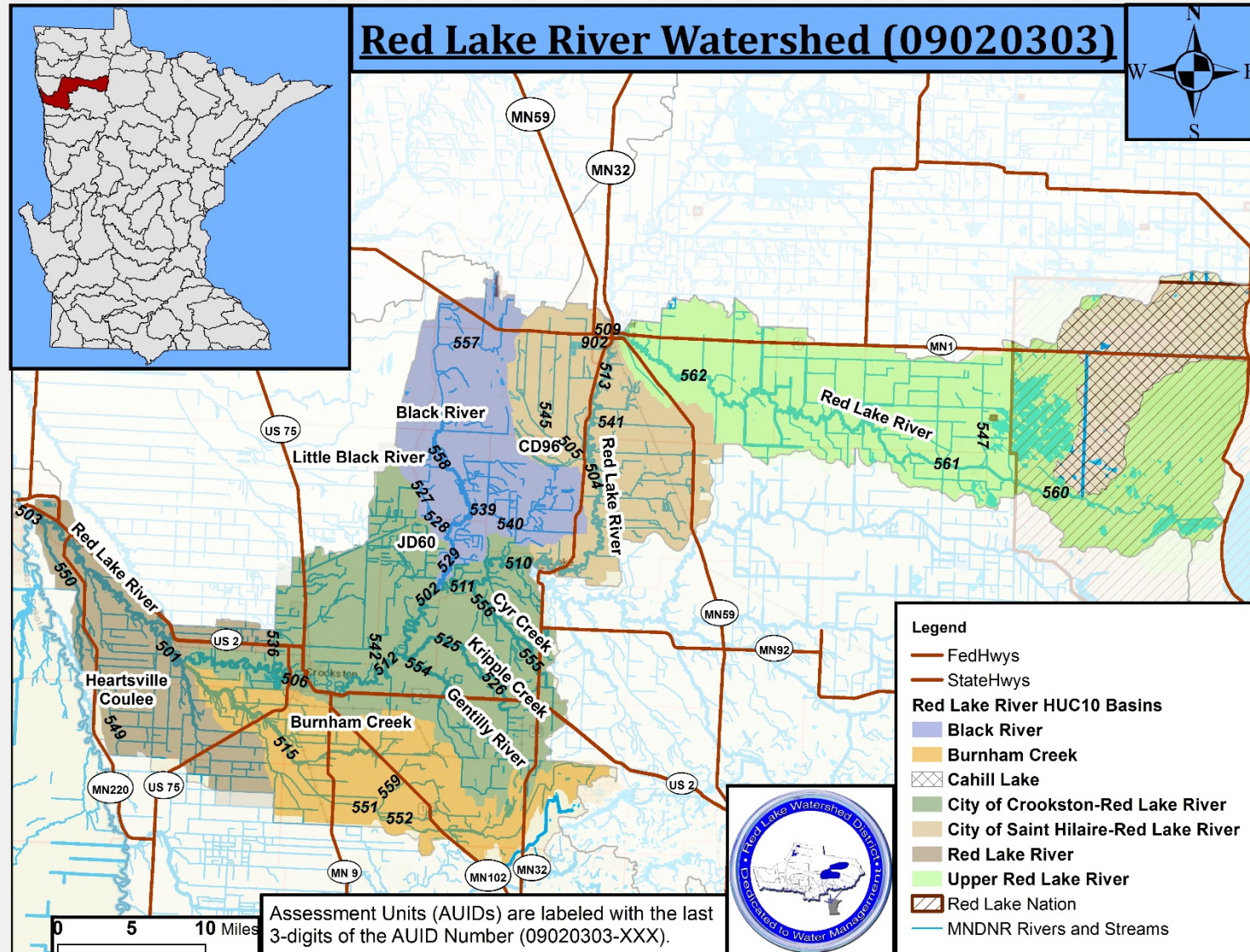
- Task 1 – Existing Data
  - MPCA responses to comments on the 2016 Draft List of Impaired waters were received on 12/28/16.
- Task 5 – Flow Monitoring
  - Water level loggers were removed from Red Lake River watershed monitoring sites in early December, as the weather was finally cold enough for the water in stream to begin freezing.
- Task 10 – Civic Engagement
  - The WRAPS/TMDL public involvement and civic engagement section was reviewed by RMB Environmental Laboratories staff (civic engagement subcontractor)
  - RLWD staff edited and added to the mailing list for the Red Lake River WRAPS update brochure/newsletter.
  - An informational brochure was mailed to residents, agency staff, and other stakeholders within the Red Lake River watershed (see the end of this report).

- Task 12 – Reports
  - RLWD staff spent time writing the Red Lake River Watershed Total Maximum Daily Load (TMDL) report.
    - PTMApp maps
    - Stream power index maps
    - Seasonal variation of E. coli levels
    - E. coli TMDL Development section
    - Population trends
    - Reasonable assurance
    - MS4 information
    - Seasonal variation of total suspended solids concentrations along the Red Lake River.
    - Implementation plan
    - TMDL summary table
    - Revised map of assessment units and impairments
    - A cost estimate of implementation projects was compiled using projected costs from the Red Lake River One Watershed One Plan document for activities that were pertinent to the impairments in the Red Lake River.
    - A first draft of the Red Lake River Watershed TMDL document was completed on December 9, 2016.
    - RLWD staff read/reviewed the draft Red Lake River Watershed TMDL document.
    - RLWD staff applied edits to the draft TMDL document after a review of the document was completed.
    - A second draft of the Red Lake River Watershed TMDL report was completed on December 19, 2016. That draft was shared with members of the Red Lake River WRAPS Technical Advisory Committee.
    - An updated draft of the Red Lake River Watershed TMDL was uploaded to the RLWD FTP site and a link was shared with the MPCA and the Red Lake River WRAPS technical advisory committee.
  - RLWD staff spent time writing the Red Lake River Watershed Restoration and Protection Strategy (WRAPS) report.
    - Restoration and Protection Strategy tables, formatted by Stephanie Klamm of the MN DNR, were reviewed, edited, and inserted into the Red Lake River WRAP document. The maps, text, and tables of the Restoration and Protection Strategies section of the WRAPS report were organized and edited. The maps for each individual 10-digit hydrologic unit were improved.
    - Civic engagement section
    - Monitoring plan section
    - References
    - Protection considerations
    - Background information about the watershed
    - TMDL summary

- Current water quality conditions
- A draft Red Lake River WRAPS document was completed on 12/29/16, but it still needed some additional touch-up work before it was completely ready for a review the MPCA and Technical Advisory Committee.
- MPCA comments on the restoration and protection strategy tables were received on 12/30/16. Some of those comments were incorporated into the document, as time allowed on 12/30/16.
- The RLWD Administrator reviewed the Red Lake River Total Maximum Daily Load Report and those comments were incorporated into the TMDL document.
- Stephanie Klamm of the MN DNR reviewed and commented on the Red Lake River Watershed TMDL document. Those comments were incorporated into the document.
- The Red Lake River WRAPS report was reviewed and edited.
- An updated draft of the Red Lake River WRAPS was uploaded to the RLWD FTP site and a link was shared with the MPCA and the Red Lake River WRAPS technical advisory committee.
- Stream Power Index maps for unimpaired portions of the watershed
- Revised subwatershed (HUC10) maps

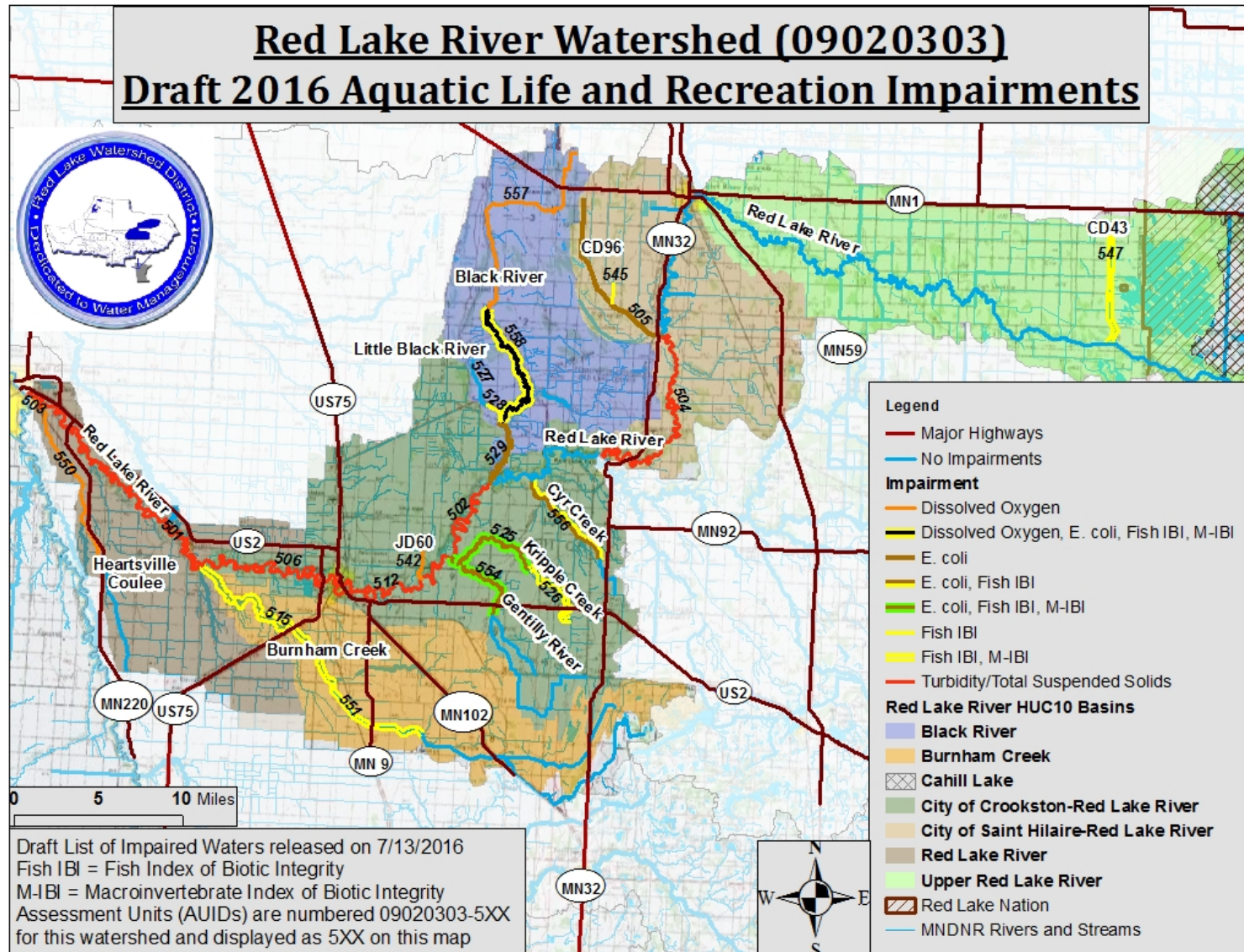
# RED LAKE WATERSHED DISTRICT MONTHLY WATER QUALITY REPORT

December 2016





## Red Lake River Watershed (09020303) Draft 2016 Aquatic Life and Recreation Impairments

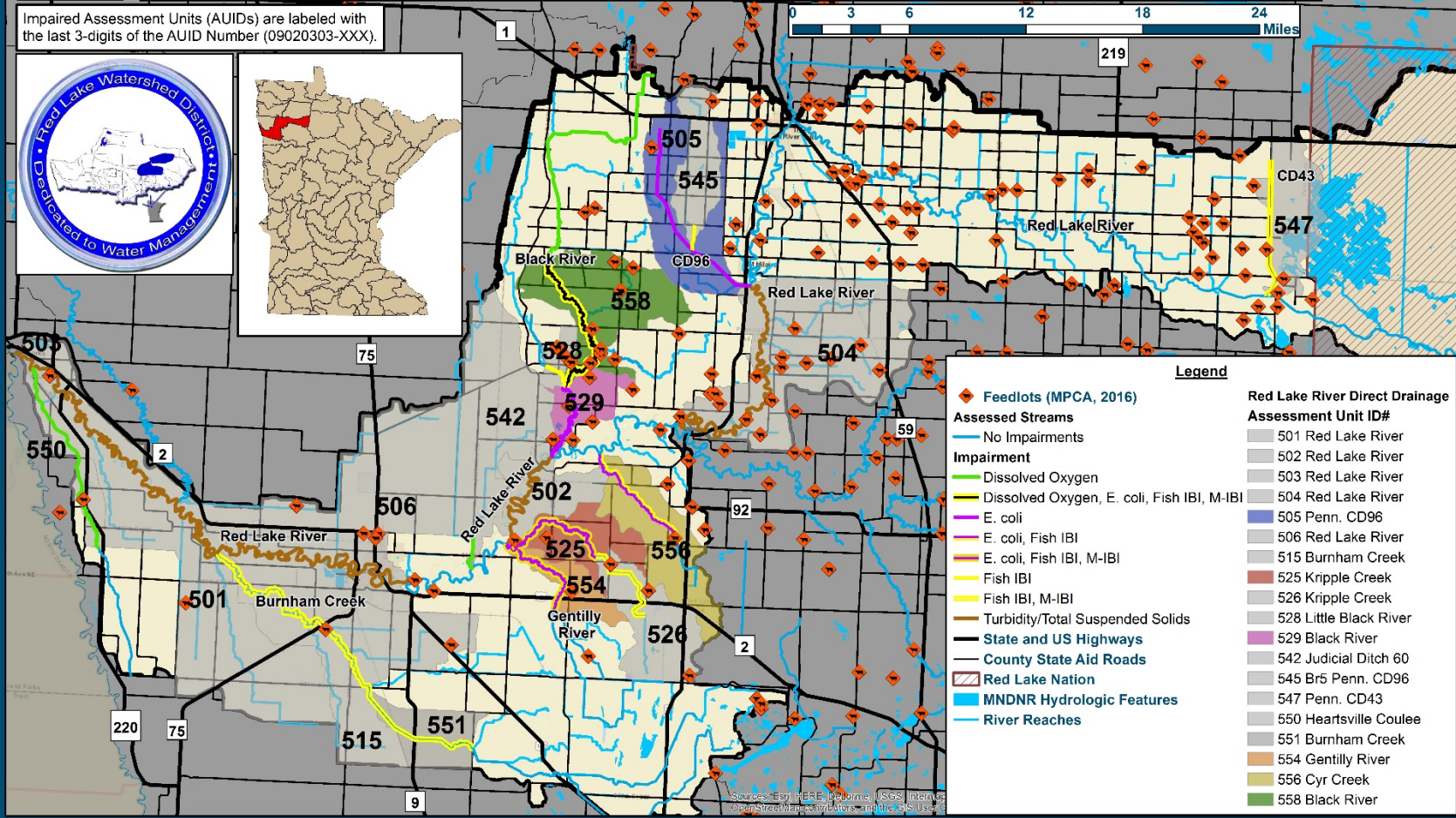
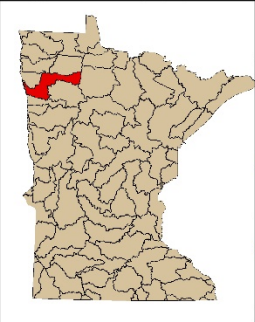
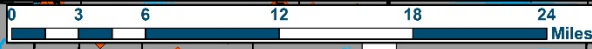




# Animal Feedlot Facilities in the Red Lake River Watershed (Minnesota Pollution Control Agency, 7/5/2016)



Impaired Assessment Units (AUIDs) are labeled with the last 3-digits of the AUID Number (09020303-XXX).



**Legend**

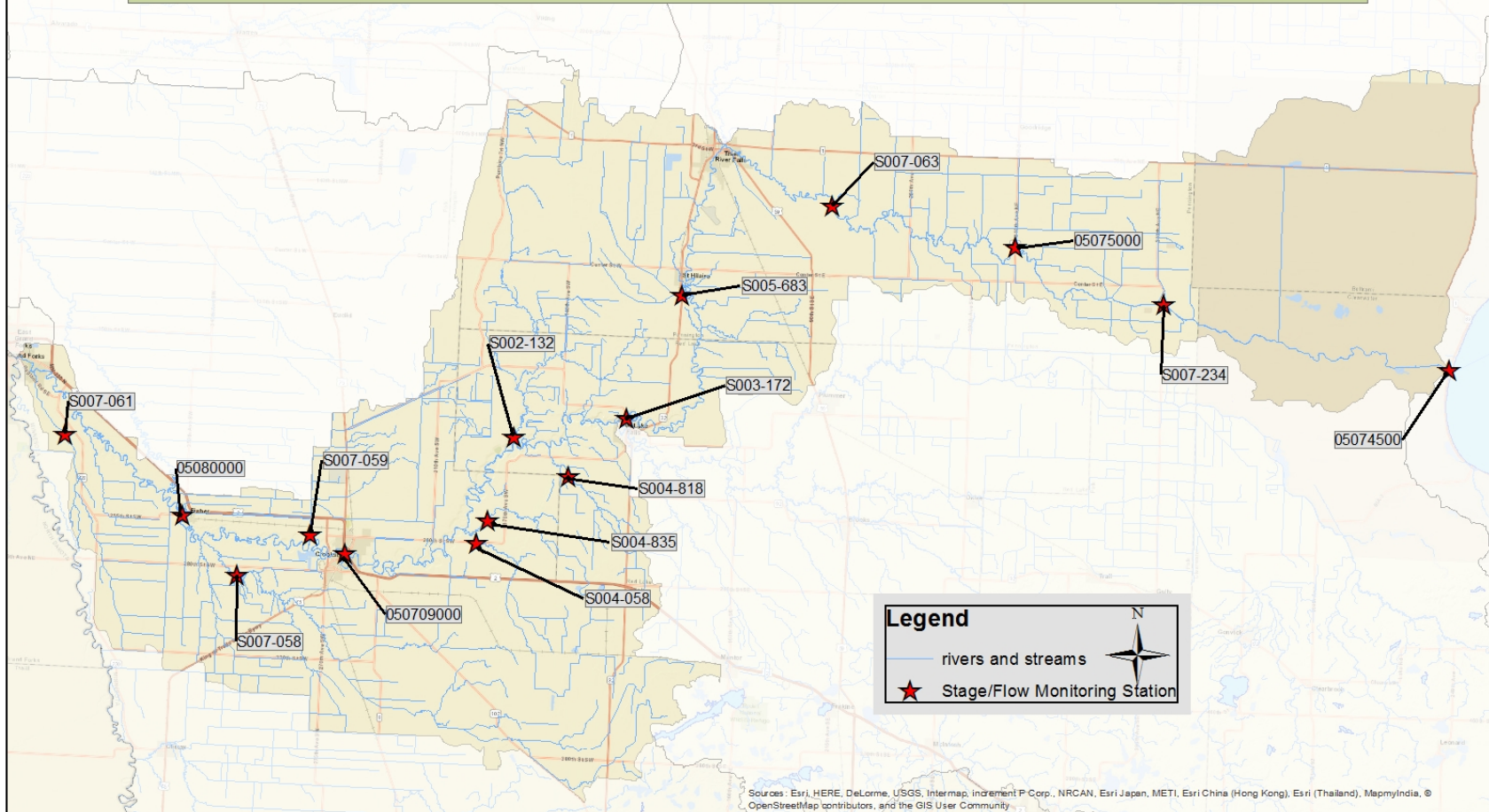
- ◆ Feedlots (MPCA, 2016)
- Assessed Streams**
- No Impairments
- Impairment**
- Dissolved Oxygen
- Dissolved Oxygen, E. coli, Fish IBI, M-IBI
- E. coli
- E. coli, Fish IBI
- E. coli, Fish IBI, M-IBI
- Fish IBI
- Fish IBI, M-IBI
- Turbidity/Total Suspended Solids
- State and US Highways
- County State Aid Roads
- ▨ Red Lake Nation
- MNDNR Hydrologic Features
- River Reaches

**Red Lake River Direct Drainage Assessment Unit ID#**

- 501 Red Lake River
- 502 Red Lake River
- 503 Red Lake River
- 504 Red Lake River
- 505 Penn. CD96
- 506 Red Lake River
- 515 Burnham Creek
- 525 Kripple Creek
- 526 Kripple Creek
- 528 Little Black River
- 529 Black River
- 542 Judicial Ditch 60
- 545 Br5 Penn. CD96
- 547 Penn. CD43
- 550 Heartsville Coulee
- 551 Burnham Creek
- 554 Gentilly River
- 556 Cyr Creek
- 558 Black River

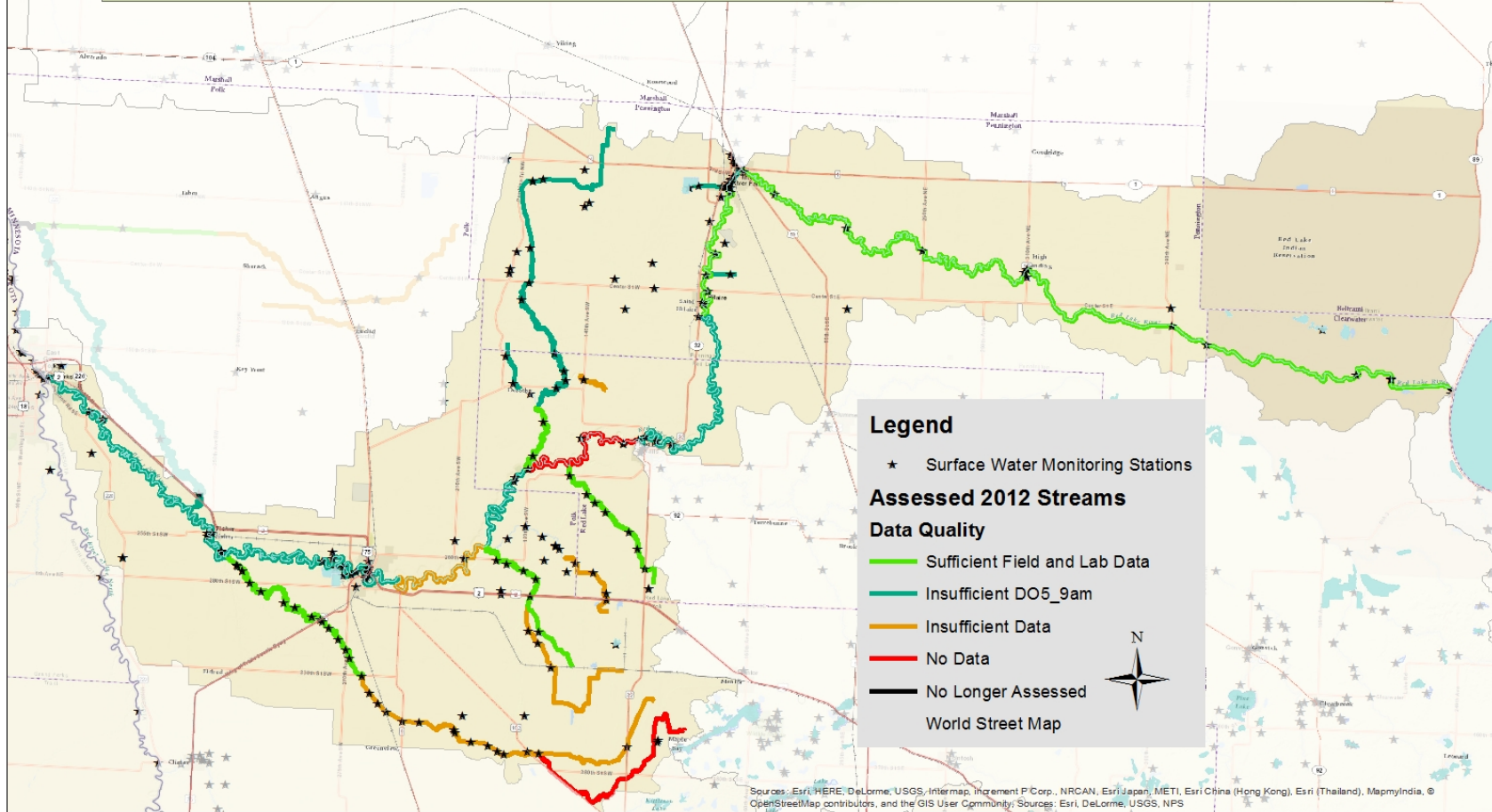
Sources: Esri, HERE, DeLorme, USGS, Intermap, iGeographics, Swatch Networks, and the GIS User Community

## Red Lake River Watershed (09020303) 2015 USGS, State, and Local Stage/Flow Monitoring Sites



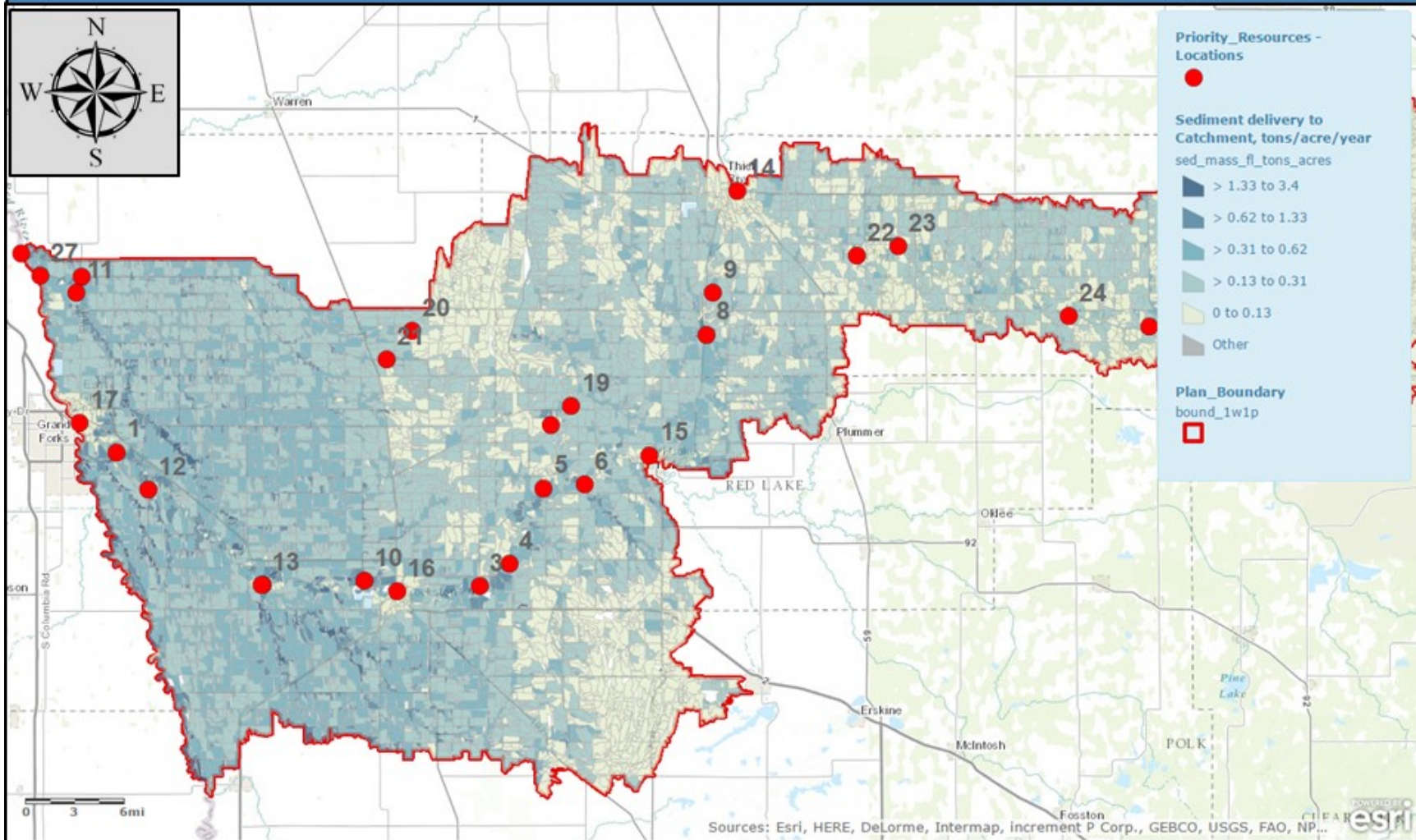


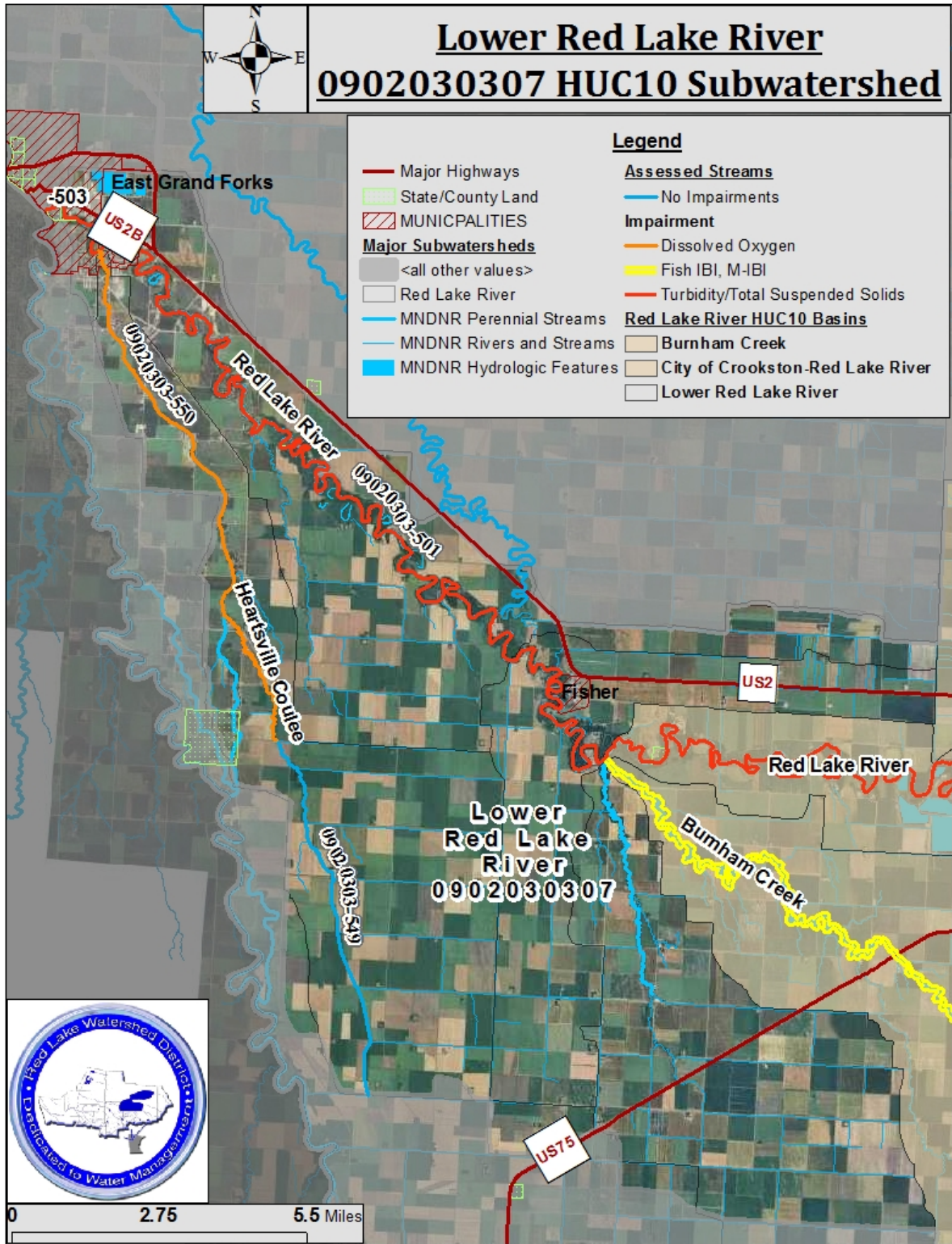
## Red Lake River Data Quality for Water Quality Assessments 2004-2014 Data



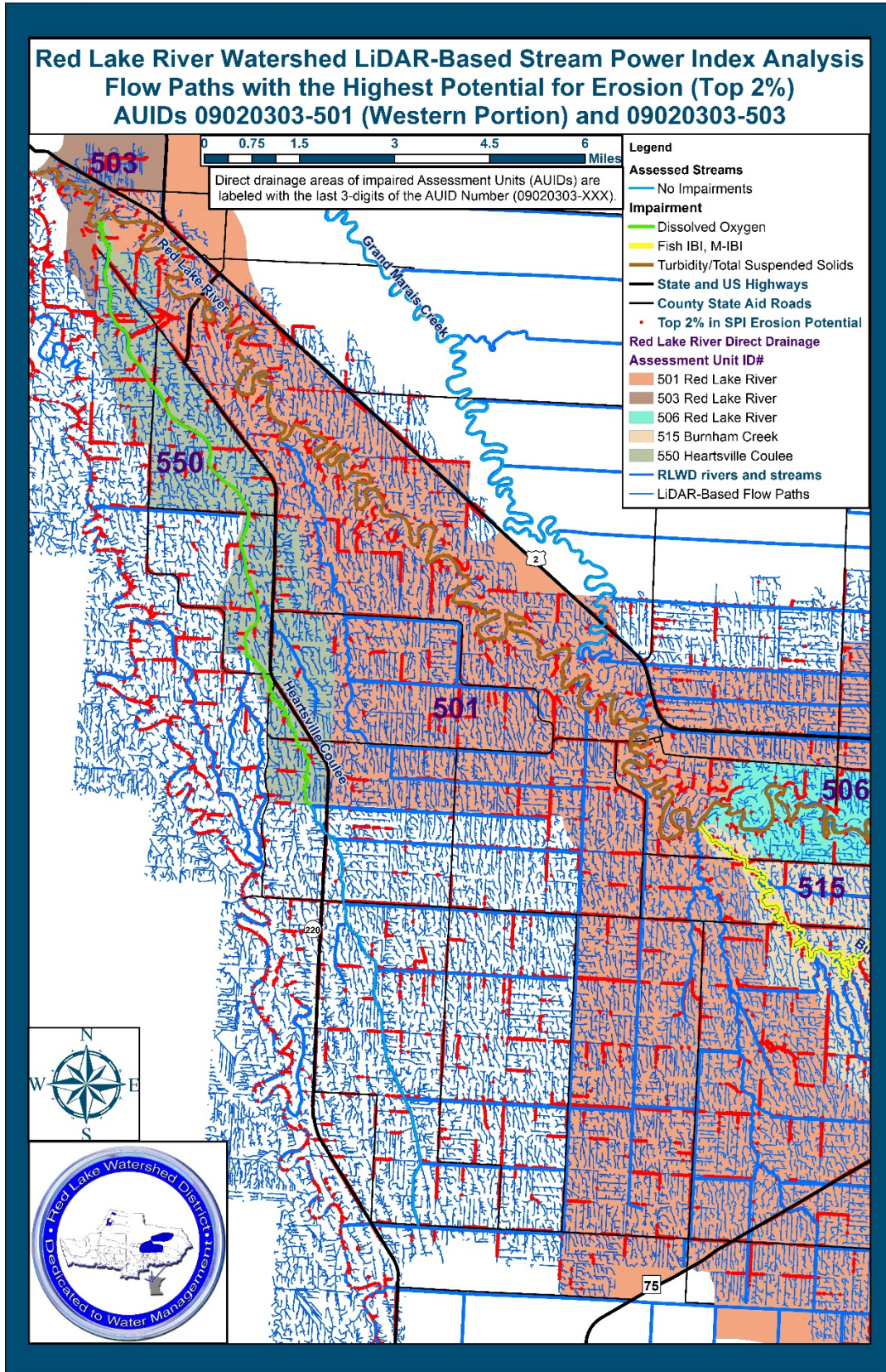


# Red Lake River Watershed PTMApp Estimated Sediment Yields (Tons/Acre/Year)



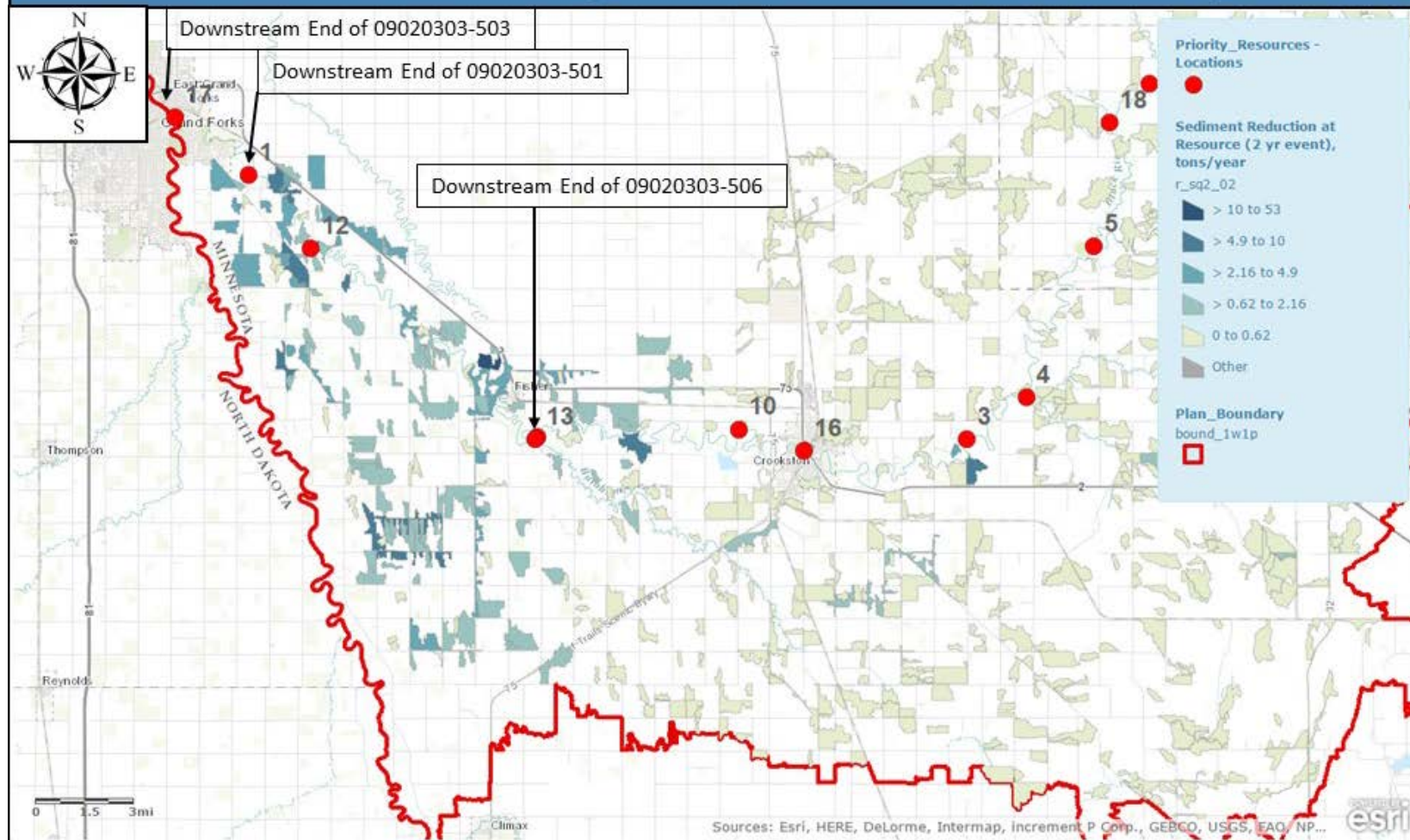








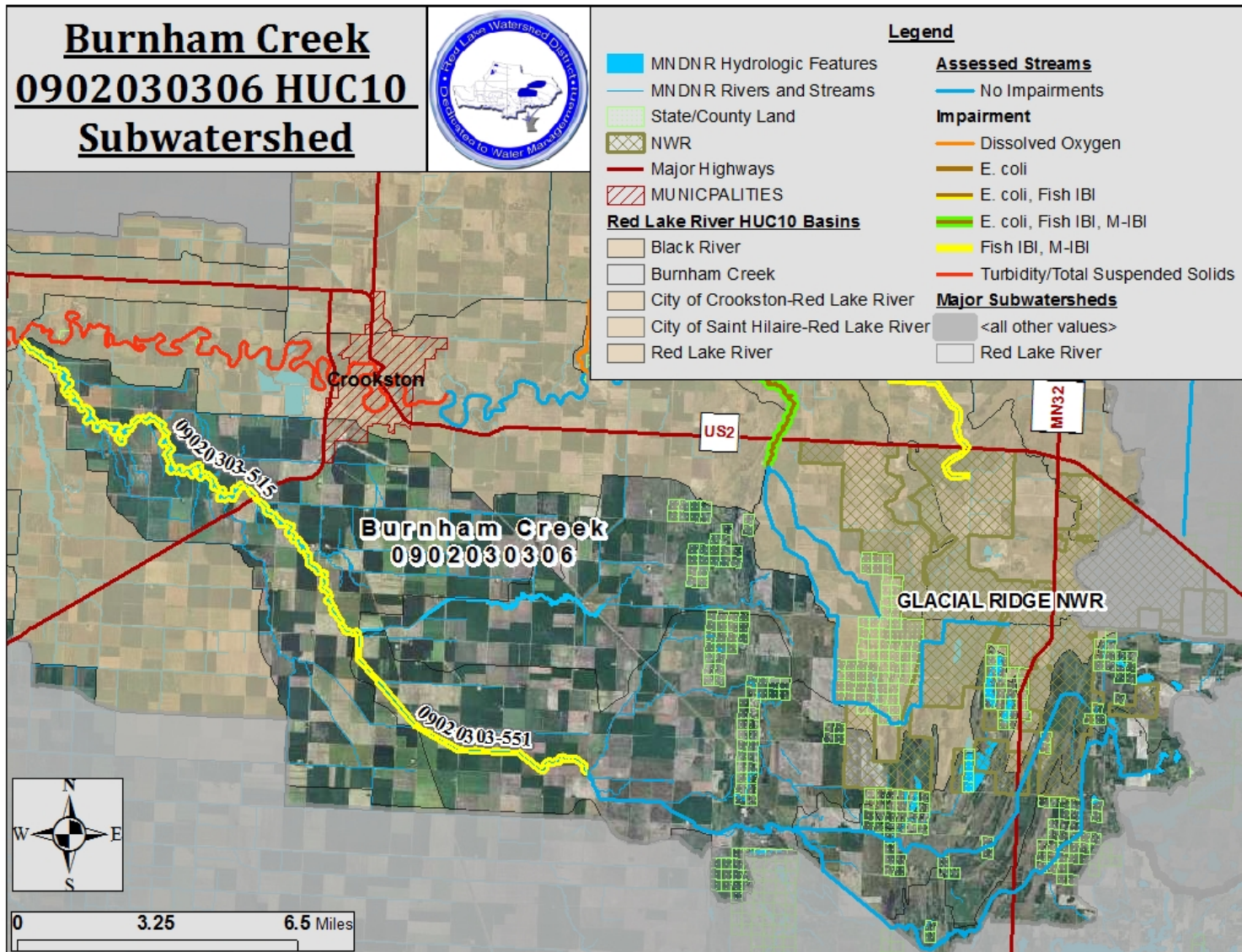
# Sediment Reduction Potential for Lower Reaches of the Red Lake River Using Filtration BMPs and Projects





RED LAKE WATERSHED DISTRICT  
MONTHLY WATER QUALITY REPORT

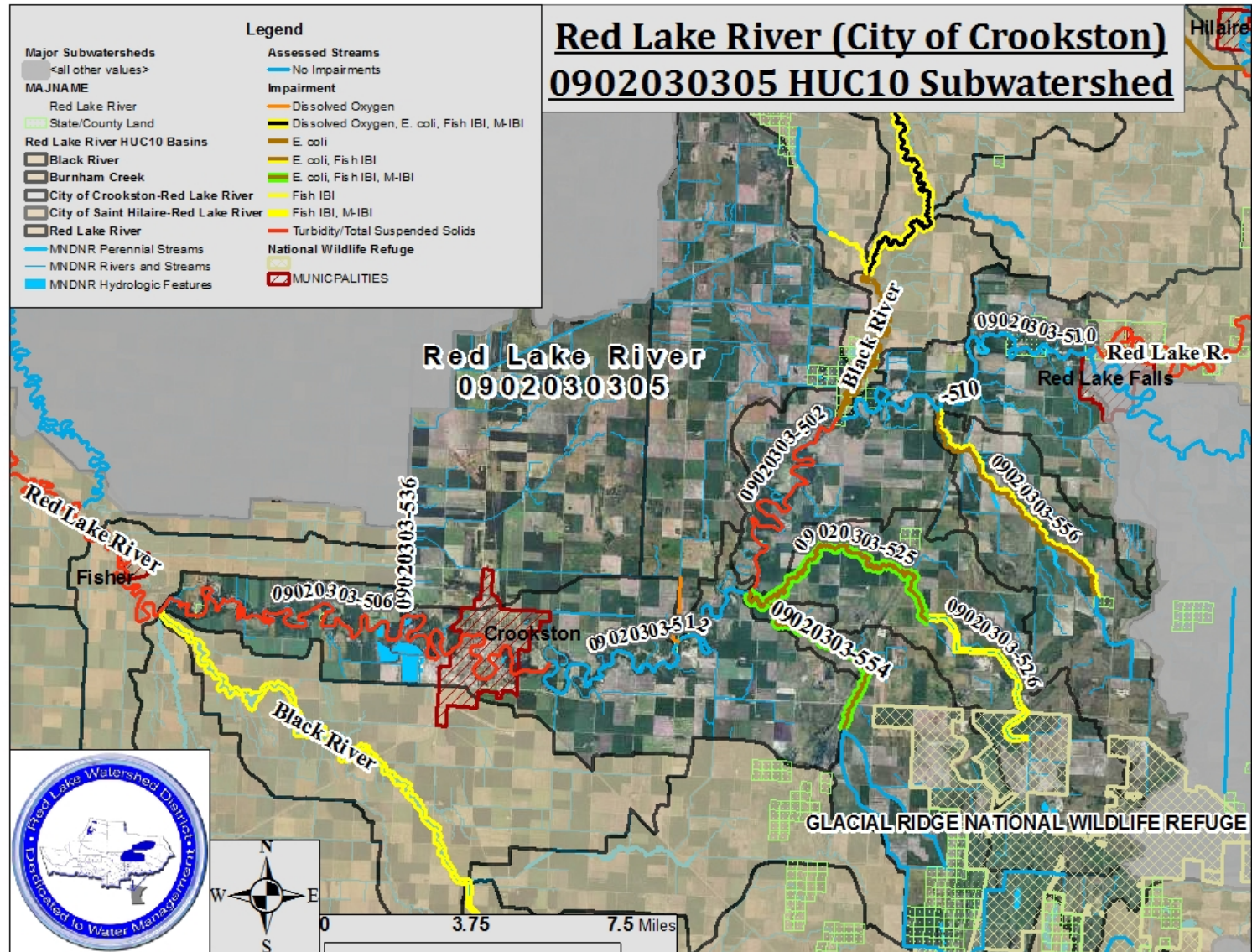
December 2016





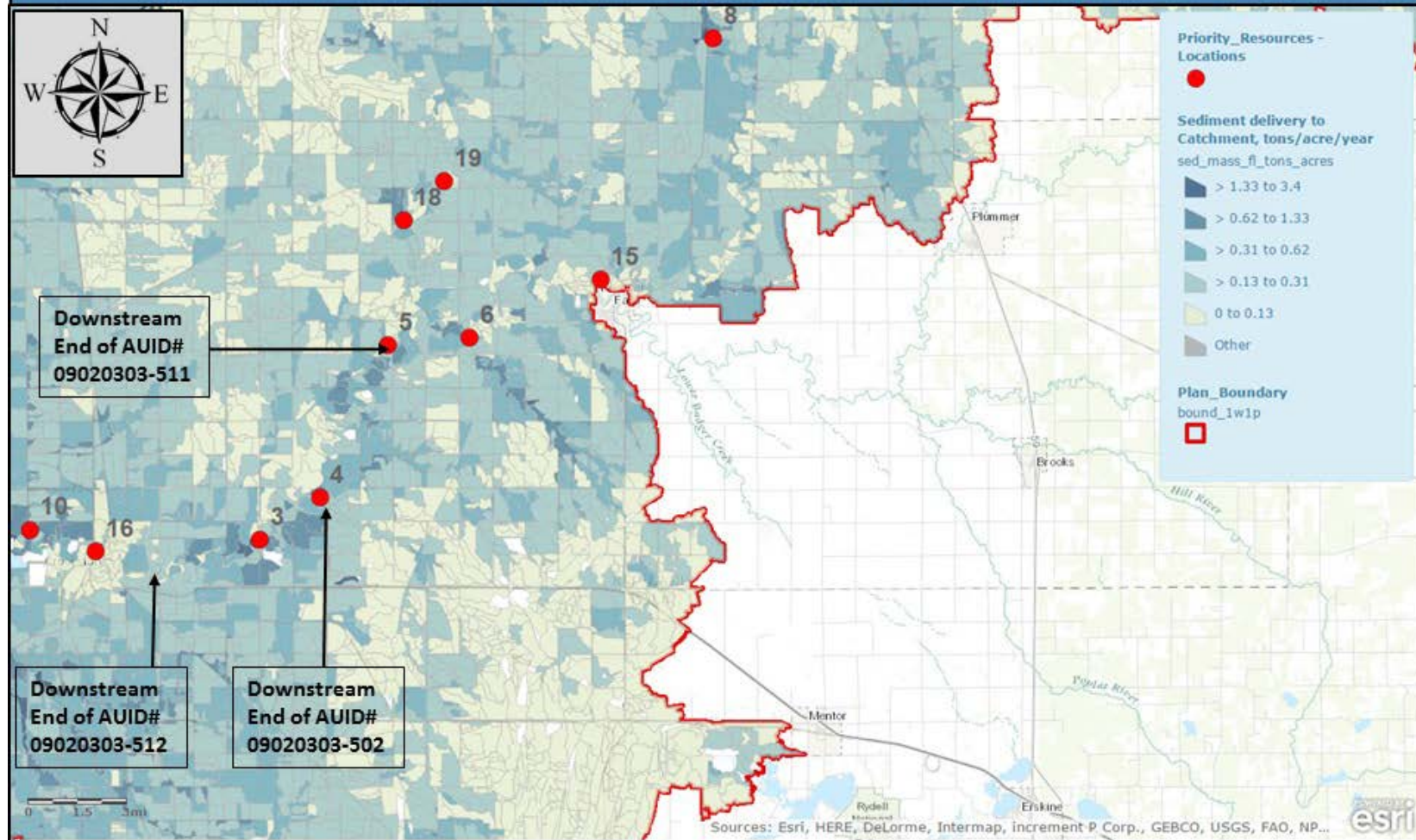
# RED LAKE WATERSHED DISTRICT MONTHLY WATER QUALITY REPORT

December 2016

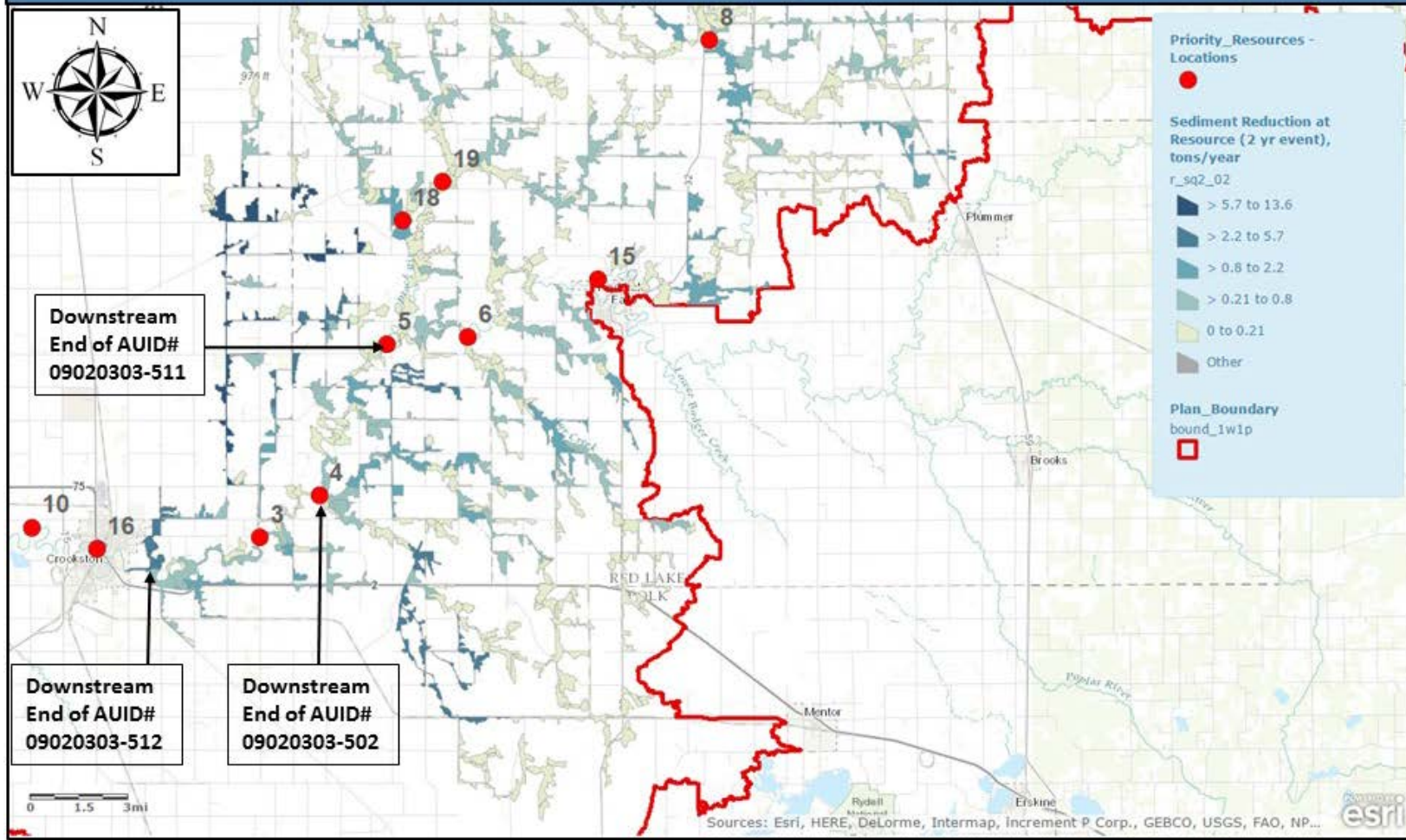




## PTMApp-Estimated Sediment Yields along the Middle Reaches of the Red Lake River (Tons/Acre/Year)

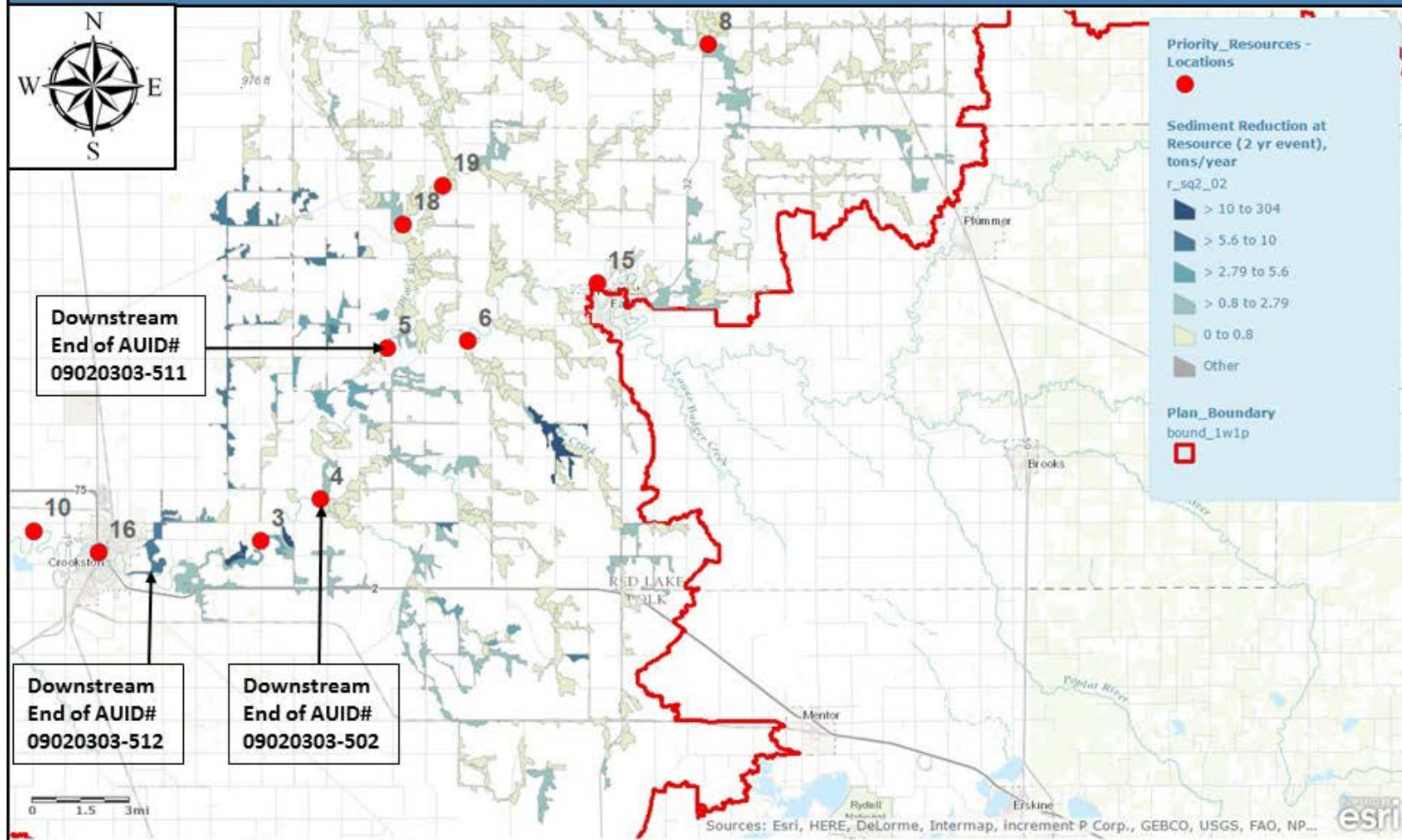


# Sediment Reduction Potential for Middle Reaches of the Red Lake River Using Protection Projects



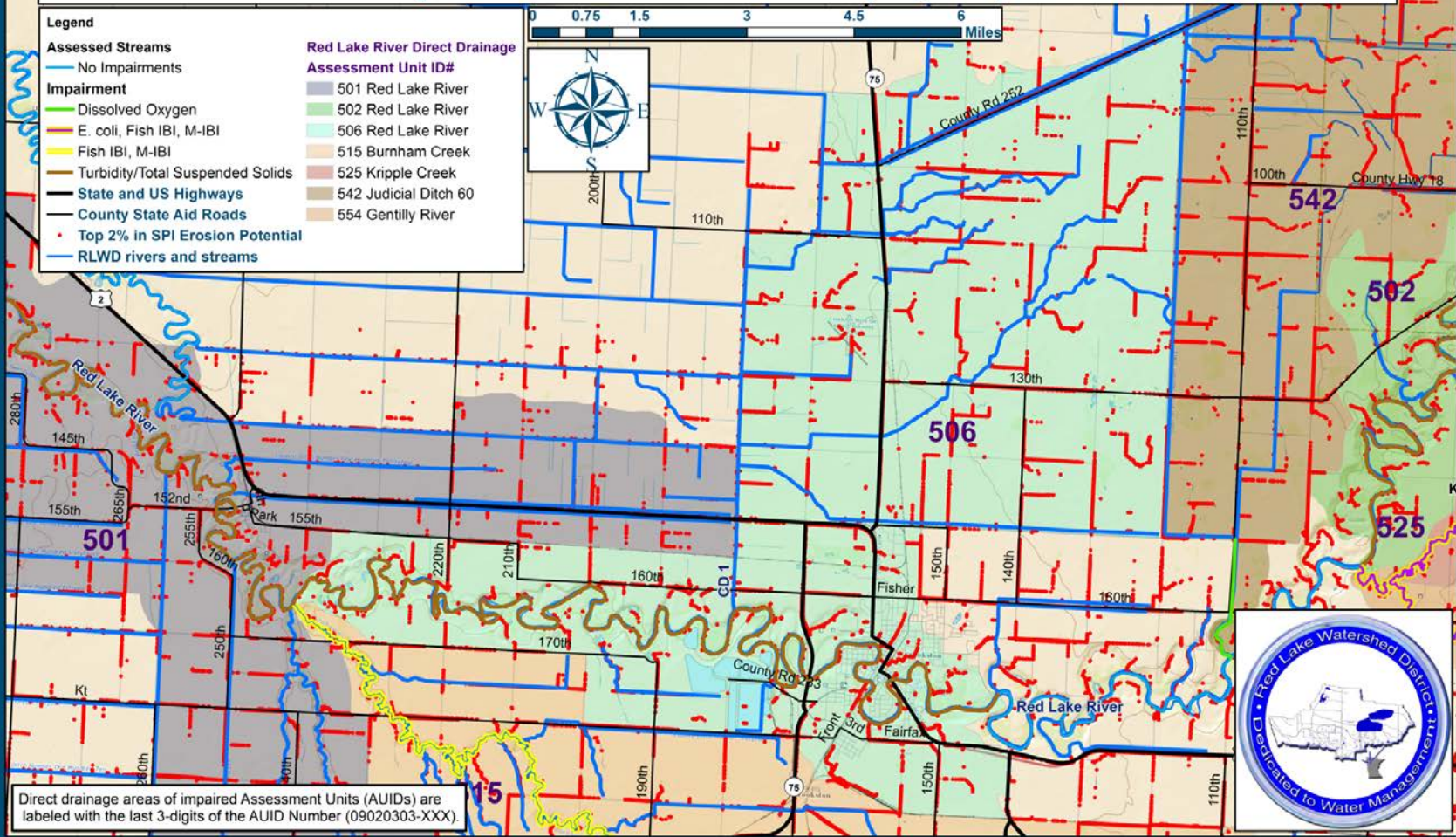


# Sediment Reduction Potential for Middle Reaches of the Red Lake River Using Filtration BMPs





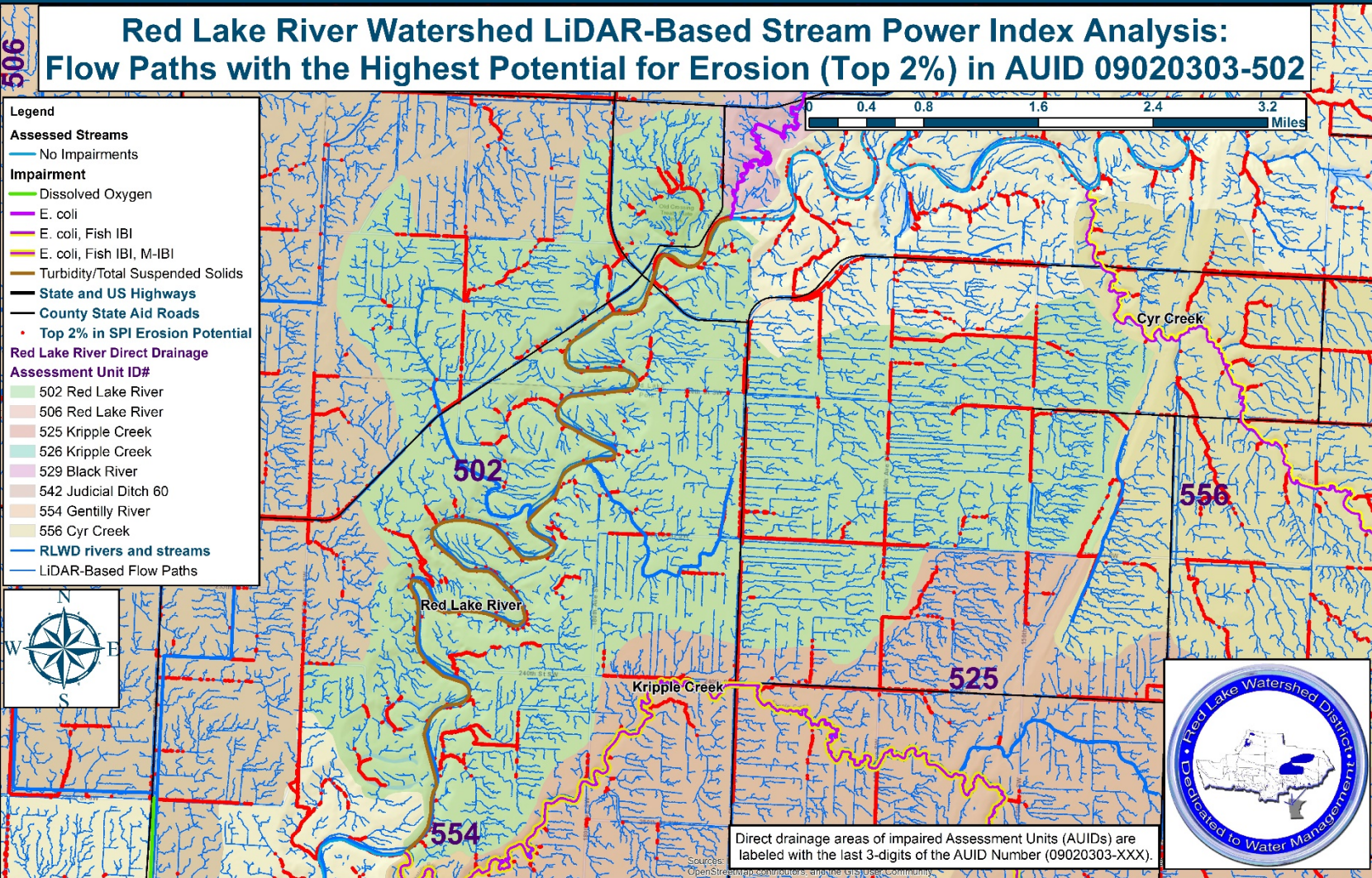
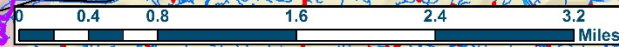
### Red Lake River Watershed LiDAR-Based Stream Power Index Analysis: Flow Paths with the Highest Potential for Erosion (Top 2%) for AUID 09020303-506





## Red Lake River Watershed LiDAR-Based Stream Power Index Analysis: Flow Paths with the Highest Potential for Erosion (Top 2%) in AUID 09020303-502

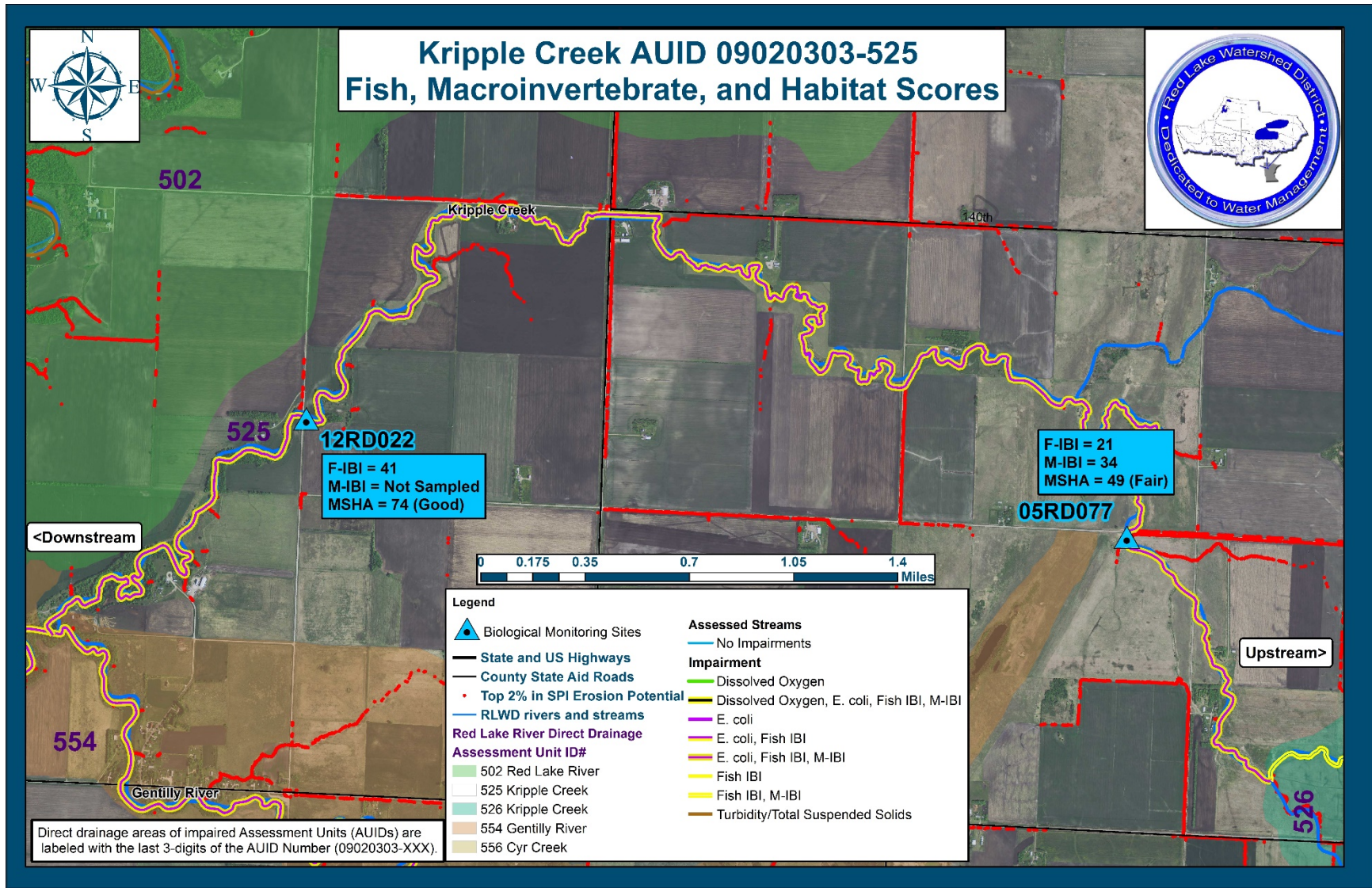
- Legend**
- Assessed Streams**
    - No Impairments
  - Impairment**
    - Dissolved Oxygen
    - E. coli
    - E. coli, Fish IBI
    - E. coli, Fish IBI, M-IBI
    - Turbidity/Total Suspended Solids
  - State and US Highways
  - County State Aid Roads
  - Top 2% in SPI Erosion Potential
  - Red Lake River Direct Drainage**
  - Assessment Unit ID#**
    - 502 Red Lake River
    - 506 Red Lake River
    - 525 Kripple Creek
    - 526 Kripple Creek
    - 529 Black River
    - 542 Judicial Ditch 60
    - 554 Gently River
    - 556 Cyr Creek
  - RLWD rivers and streams
  - LiDAR-Based Flow Paths



Direct drainage areas of impaired Assessment Units (AUIDs) are labeled with the last 3-digits of the AUID Number (09020303-XXX).











# Black River 0902030304 HUC10 Subwatershed



**Legend**

**Assessed Streams**

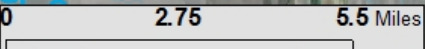
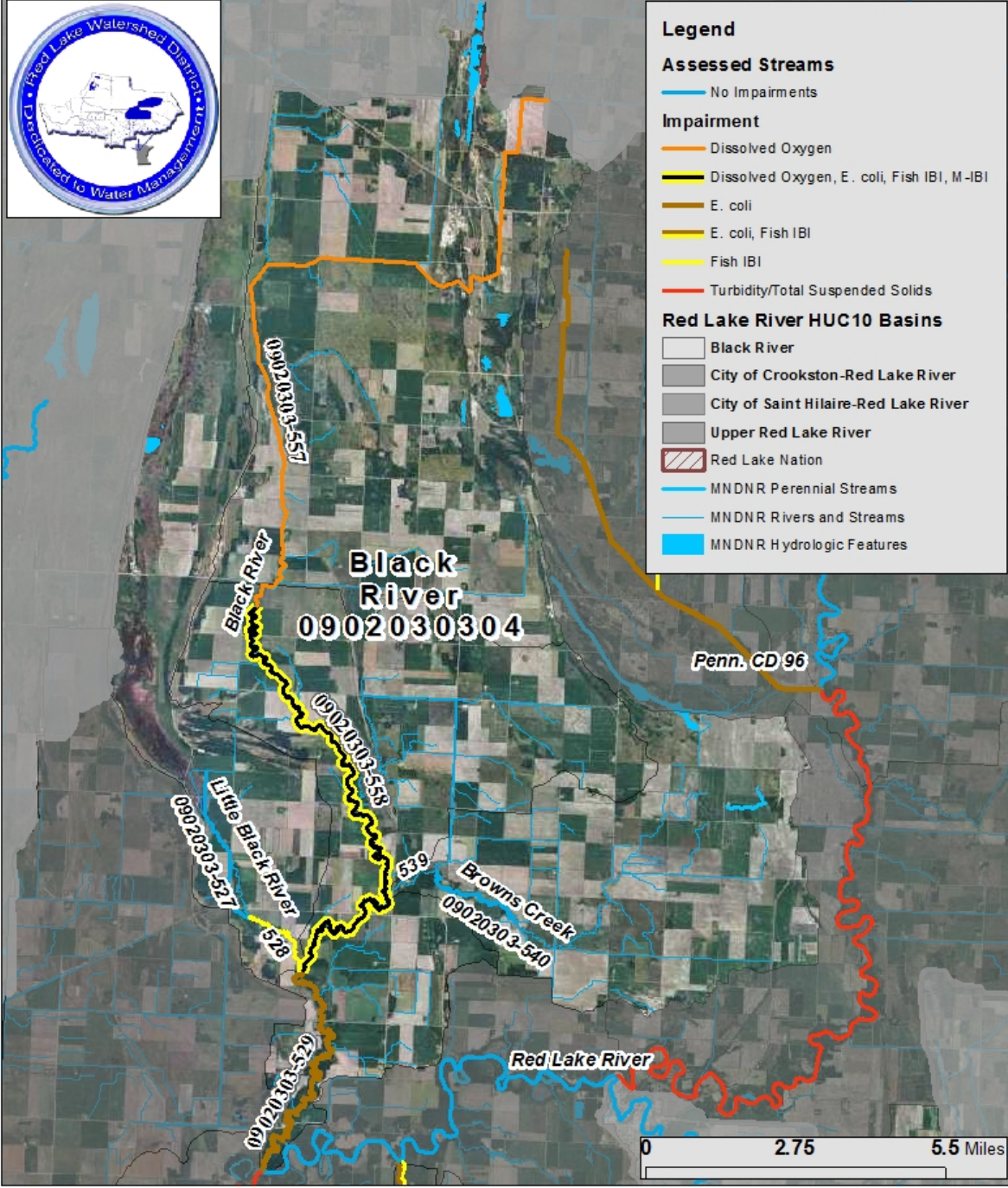
- No Impairments

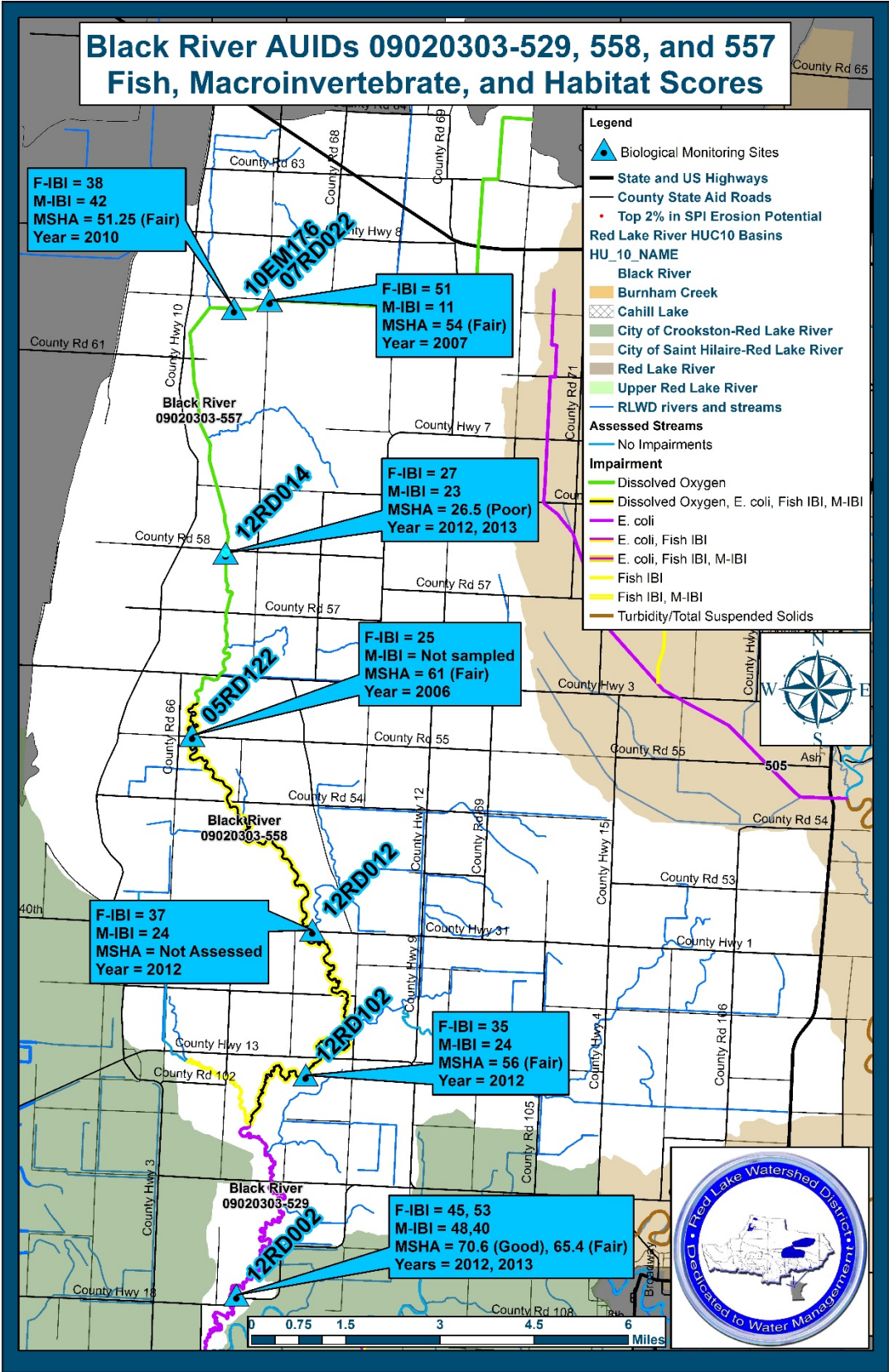
**Impairment**

- Dissolved Oxygen
- Dissolved Oxygen, E. coli, Fish IBI, M-IBI
- E. coli
- E. coli, Fish IBI
- Fish IBI
- Turbidity/Total Suspended Solids

**Red Lake River HUC10 Basins**

- Black River
- City of Crookston-Red Lake River
- City of Saint Hilaire-Red Lake River
- Upper Red Lake River
- Red Lake Nation
- MNDNR Perennial Streams
- MNDNR Rivers and Streams
- MNDNR Hydrologic Features



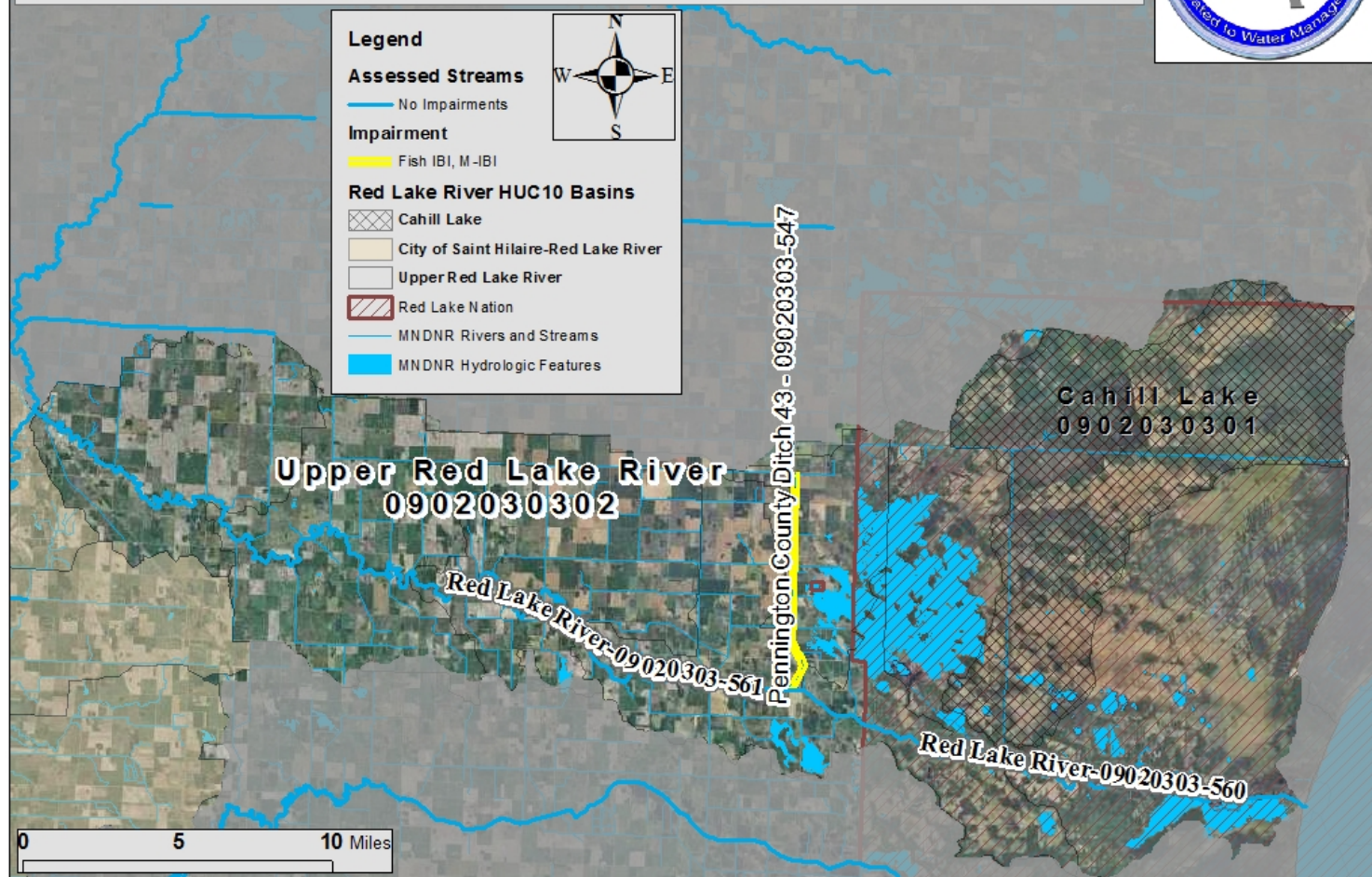






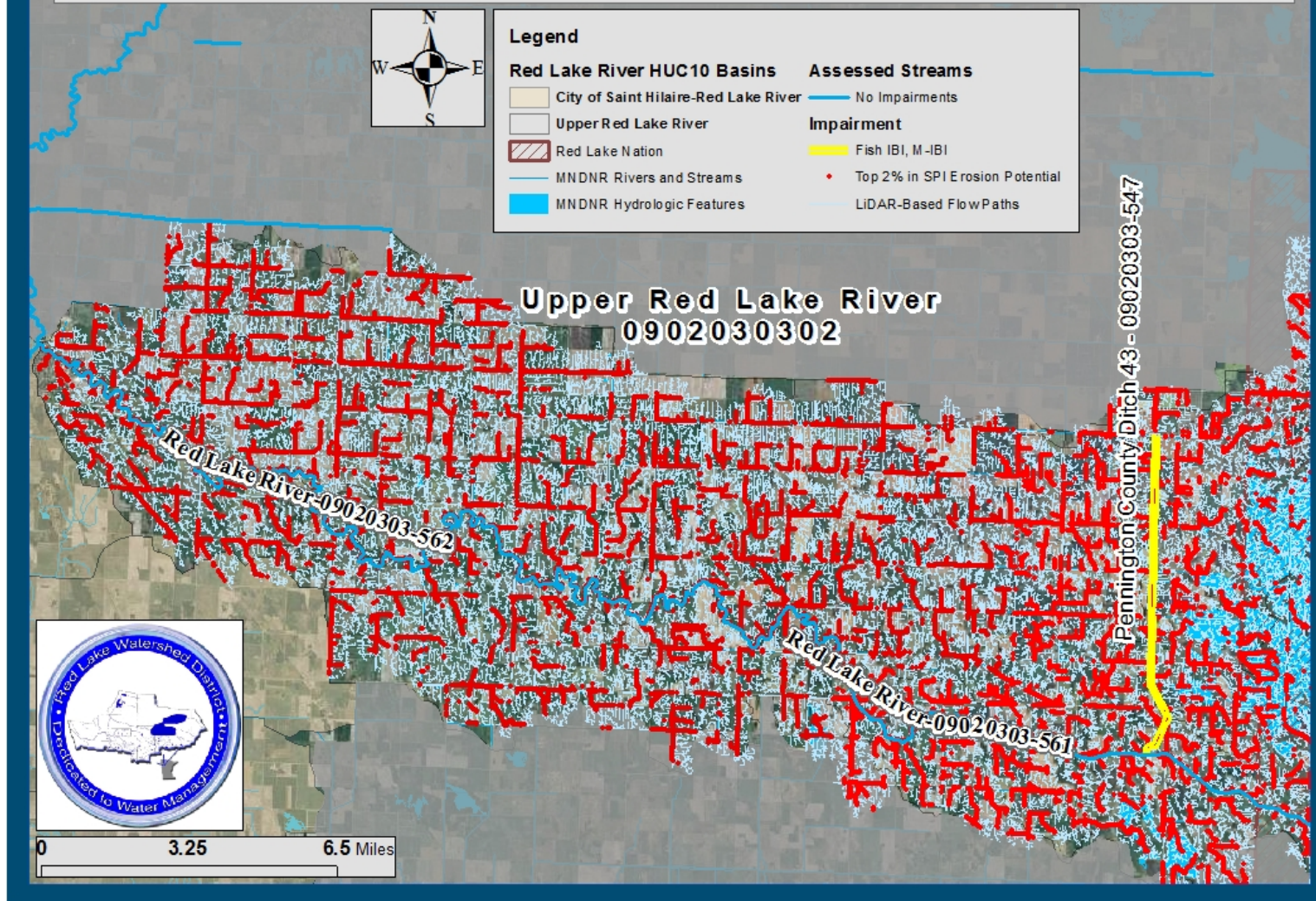


# Upper Red Lake River (0902030302) HUC10 Subwatershed



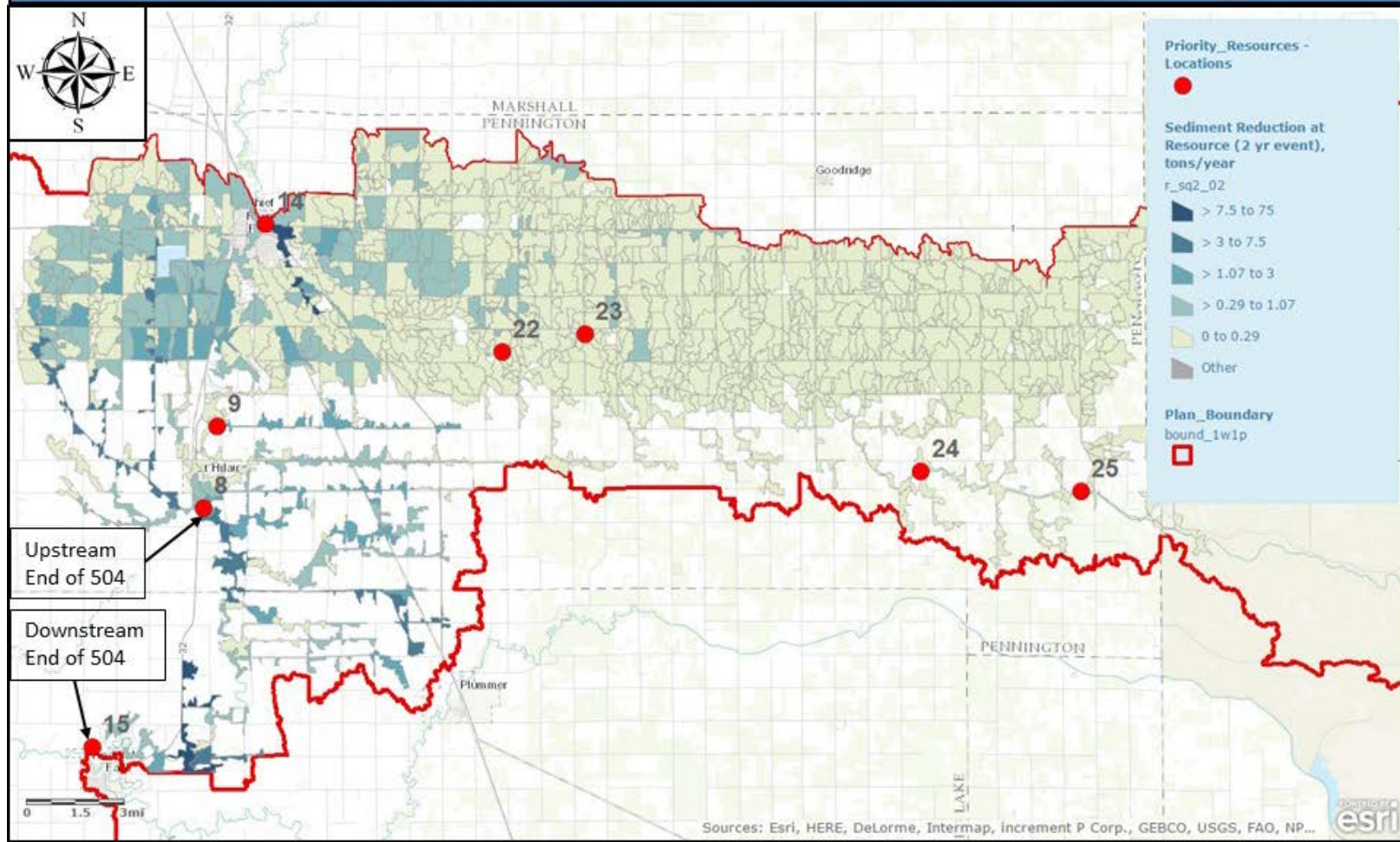


**Red Lake River Watershed LiDAR-Based Stream Power Index Analysis:  
Flow Paths with the Highest Potential for Erosion (Top 2%) in HUC 0902030302**



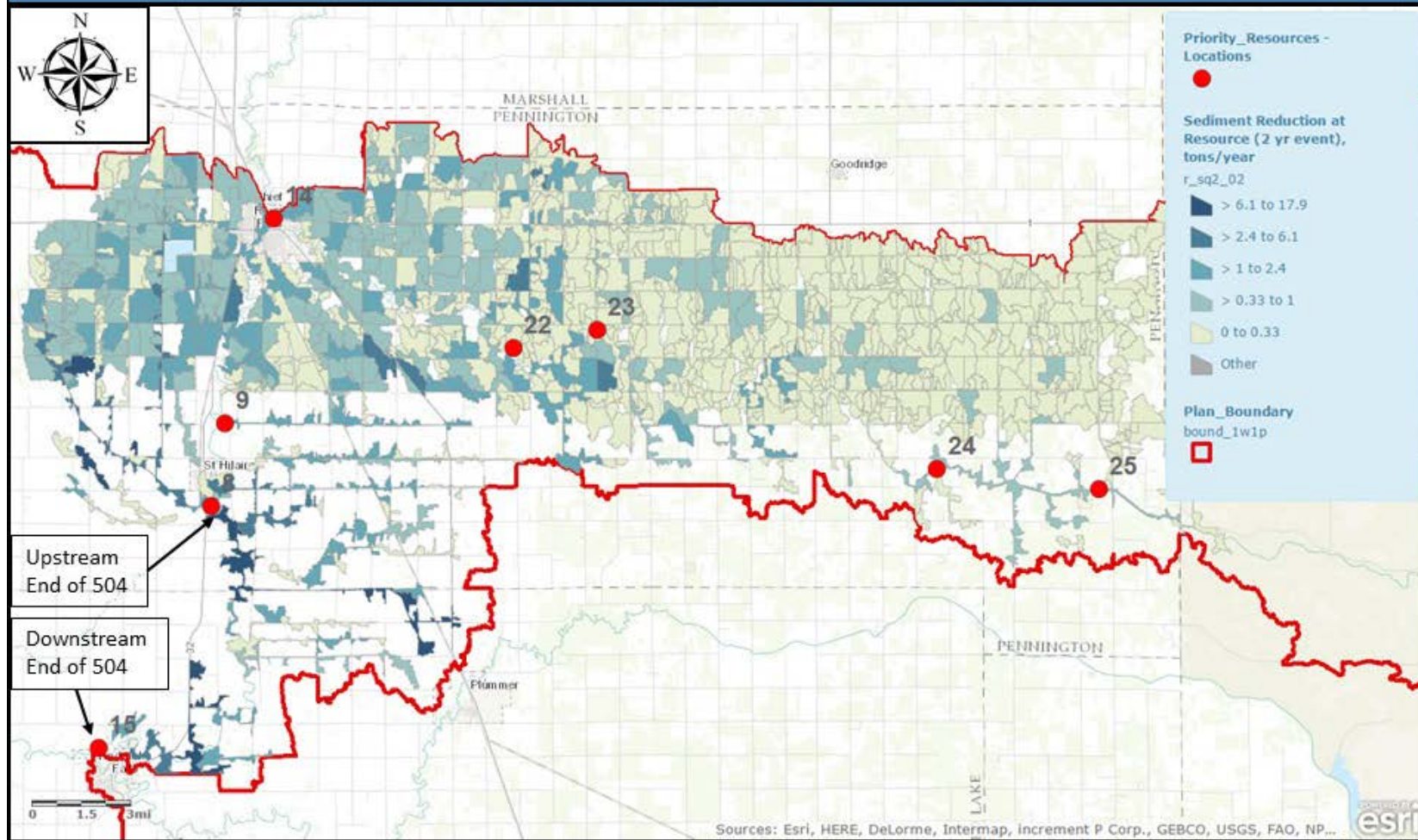


# Sediment Reduction Potential for Red Lake River Reach 09020303-504 Using Protection BMPs and Projects





# Sediment Reduction Potential for Red Lake River Reach 09020303-504 Using Filtration BMPs



### Grand Marais Creek Watershed Restoration and Protection Project

The timeline of the project was extended to June 30, 2017 through a work plan amendment.

### Other Notes

- Water level loggers were retrieved from Thief River watershed monitoring sites in early December, as the weather was finally cold enough for the water in stream to begin freezing.
- The RLWD Water Quality Coordinator provided information for final edits to the Red Lake River One Watershed One Plan document.
- SWCD staff shared the results of 2016 Northwest Minnesota Water Festival Evaluations and the Water Quality station at the Rydell National Wildlife Refuge Water Festival (run by RLWD and International Water Institute staff) received 5 out of 5 stars on all of the evaluations!

### December 2016 Meetings and Events

- **December 8, 2016** – RLWD Board of Managers meeting. Water quality related items from the agenda and minutes:
  - Staff member Nick Olson reviewed the buffer strip establishment requirements as it relates to the District's legal drainage system. The District has 33 drainage systems of which eight systems are not in compliance. Olson requested direction from the Board on how they wish to proceed with buffer strip establishment. The Board voted to authorize District staff to determine the required right-of-way area that is needed for establishment of buffer strips on all non-compliant drainage systems under the jurisdiction of the District and report back to the Board.
  - The Board congratulated Administrator Jesme on receiving the Watershed Employee of the Year Award at the MAWD convention.
- **December 12, 2016** – Pennington County Water Resources Advisory Committee meeting
  - The City of Thief River Falls and the Pennington SWCD were interested in getting help from the RLWD with additional stormwater sampling.
  - The fieldwork for the Pennington County Ditch Inventory project is done. Levy will be working on making maps. Leftover money from this project will be used by the West Polk SWCD to complete a similar inventory. With the Pennington and Red Lake County ditch inventories mostly complete, the West Polk ditch inventory will result in a complete coverage of the Red Lake River major watershed by ditch inventories. This is a great example of cooperation among county agencies on a watershed scale. This is the spirit of the One Watershed One Plan process in action! After the fieldwork is completed, SWCD staff will be examining the results of the fieldwork to identify...
    - Potential quantities of side water inlets that can be installed
    - Buffer compliance
    - Number of potential projects



- A licensed inspector has been assessing and inspecting septic systems in the Chief's Coulee drainage area in northern Thief River Falls. All but three of the systems in the drainage area have been inspected. Three systems failed to pass the inspection process and are deemed public health threats. Letters were sent out to landowners whose systems were not public health threats.
- A low-income septic system upgrade project was completed.
- A second well water-testing clinic was held due to a shipping error during the previous attempt earlier in the year. There were 32 participants. Five tested positive for coliform bacteria. One well water sample revealed an elevated level of nitrates but still met drinking water standards.
- Since the last meeting in September, SWCD staff have completed surveying for the installation of side water inlets for seven landowners.
- Tree plans were developed for three landowners.
- The Pennington SWCD has successfully acquired funding to develop PTMApp for the Thief River watershed and for drone-assisted erosion assessments.
- The SWCD reported that 11,000 trees have been ordered for 2017.
- The Thief River meander cutoff stabilization project was constructed.
- Grazing is working well for controlling cattails within Agassiz National Wildlife Refuge.
- Next meeting: March 13, 2016
- **December 16, 2016** – Red River Basin Monitoring Advisory Committee meeting at the Sand Hill Watershed District in Fertile
  - River Watch database
  - Identifying the Cause of Exceptionally High Mercury in Fish LCCMR project – Bruce Monson
  - Planning the annual Red River Basin Water Quality Monitoring Training Session
    - February 15<sup>th</sup>, 2017
- **December 21, 2016** – Red Lake River One Watershed One Plan Technical Advisory Committee meeting
- **December 22, 2016** – RLWD Board of Managers meeting. Water quality related items from the agenda and minutes:
  - The District was notified that the West Polk SWCD received a \$103,000 Clean Water Legacy Fiscal Year 2017 Project and Practices Grant through the Board of Water and Soil Resources (BWSR) for repairs to the outlet of Polk County Ditch 63, RLWD Project No. 134. Final engineering and construction will proceed this summer.
  - The Board reviewed correspondence from the Minnesota Department of Commerce Environmental Impact Statement Prepared Notice for Enbridge Energy Line 3 Pipeline Replacement Project.
  - Staff member Corey Hanson reviewed the Red Lake River Watershed Restoration and Protection (WRAP) Project Update Newsletter that was sent out to approximately 440 landowners and various agencies.
  - Staff member Ashley Hitt presented a quote in the amount of \$1,970 for repairs to the water quality sonde. Hitt stated that replacement parts for the sonde (YSI 600QS) will soon be discontinued as the equipment is nearing the end of life span.

The Board voted to approve the request for repairs to the water quality sonde in the amount of \$1,970.

**Quotes of the Month:**

“Stay afraid, but do it anyway. What’s important is the action. You don’t have to wait to be confident. Just do it and eventually the confidence will follow.”

- Carrie Fisher

“Resentment is like drinking poison and waiting for the other person to die.”

- Carrie Fisher

“If there is one thing I’ve learned in my years on this planet, it’s that the happiest and most fulfilled people I’ve known are those who devoted themselves to something bigger and more profound than merely their own self interest.”

- John Glenn

Red Lake Watershed District Monthly Water Quality Reports are available online at:  
<http://www.redlakewatershed.org/monthwq.html>.

Learn more about the Red Lake Watershed District at [www.redlakewatershed.org](http://www.redlakewatershed.org).

Learn more about the watershed in which you live (Red Lake River, Thief River, Clearwater River, Grand Marais Creek, or Upper/Lower Red Lakes) at [www.rlwdwatersheds.org](http://www.rlwdwatersheds.org).

“Like” the Red Lake Watershed District on [Facebook](#) to stay up-to-date on RLWD reports and activities.



# RED LAKE WATERSHED DISTRICT MONTHLY WATER QUALITY REPORT

December 2016

## YOU CAN HELP RESTORE THE RED LAKE RIVER WATERSHED!

Shoreline Restoration  
Stream Bank Stabilization  
Wetland Restoration  
Rain Gardens  
Sediment Ponds



## CONTACT

Red Lake Watershed District: 218-681-5800

Pennington County Soil & Water Conservation District: 218-681-3259

West Polk County Soil & Water Conservation District: 218-281-6070

Red Lake County Soil & Water Conservation District: 218-253-2593

For detailed information about the watersheds in the Red Lake Watershed District, visit:  
[www.rlwdwatersheds.org](http://www.rlwdwatersheds.org)



Red Lake Watershed District  
1000 Pennington Ave  
Thief River Falls, MN 56701  
Email: [coreyh@wiktel.com](mailto:coreyh@wiktel.com)

## JOIN THE CONVERSATION

[www.rlwdwatersheds.org](http://www.rlwdwatersheds.org)

[www.redlakewatershed.org](http://www.redlakewatershed.org)



## Introduction to the Watershed Restoration and Protection process

The Minnesota Pollution Control Agency (MPCA) employs a watershed approach to restoring and protecting Minnesota's rivers, lakes, and wetlands. During the 10-year cycle, the MPCA and its partner organizations work on each of the state's 80 major watersheds to evaluate water conditions, establish priorities and goals for improvement, and take actions designed to restore or protect water quality. When a watershed's 10-year cycle is completed, a new cycle begins.

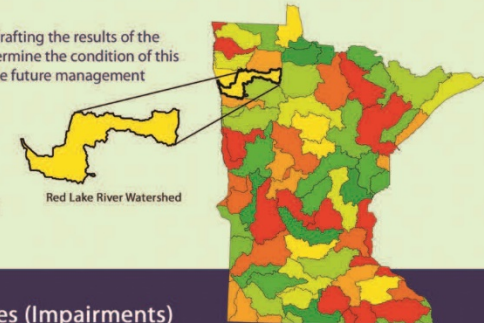
The Red Lake Watershed District is currently drafting the results of the study of the Red Lake River Watershed to determine the condition of this water resource and create plans that will guide future management and work to improve water quality.

### What is the Watershed Approach?



Watch the videos:

<http://www.pca.state.mn.us/ktqhe8a>



## Identified Water Quality Issues (Impairments)

These four water quality issues were found to be the main issues in the Red Lake River Watershed as identified by this intensive watershed study. The short videos below explain these issues in more detail. Restoration and Protection strategies are currently being written to address these issues. For specifics on which problems were issues in which streams, see the inside of this newsletter.

a) **Turbidity** – tells us how cloudy the water is from sediment. Sediment enters the water from soil erosion. Cloudy water can hurt fish, aquatic insects, plant life within rivers, habitat, recreational suitability, drinking water supplies, and more.



Watch the video: <http://youtu.be/EKH3JZvADTk>

b) **Dissolved Oxygen** - Fish, snails, crayfish, insects and other animals that live in the water, need certain levels of oxygen to survive. Waters that have low levels of dissolved oxygen (less than 5 milligrams per liter) are considered unhealthy.



Watch the video: <http://youtu.be/qUq7JFdVo3g>

c) **Bacteria** - Bacteria is everywhere. Some bacteria can be good and is necessary for digestion (think of yogurt). Bad bacteria, however, can make us sick. Some of these bad bacteria, fecal coliform and E. coli, can be found in the water in which we enjoy swimming.



Watch the video: <http://youtu.be/vkYUIJXyqLI>

d) **Water flow** – Water quality flow, or the amount of water flowing in a stream is important for determining erosion potential. Flowing water can have tremendous power. Faster water has more erosive power. Therefore, changes to the landscape that increase the rate of runoff will also increase erosion.

### Watershed Restoration & Protection Plan Progress

#### Official Water Quality Assessment

Water quality monitoring data was compared against state standards to determine which stretches of river had water quality issues (impairments). The results are below and in the map to the right. The resulting plan from this project will determine what actions are necessary to restore water quality with in the impaired streams.

Water body	Official Impairment (2016 Impaired Waters List)
Black River (558)	Dissolved Oxygen, <i>E.coli</i> , Fish IBI, M-IBI
Black River (529)	<i>E.coli</i>
Burnham Creek (515)	M-IBI, Fish-IBI
Burnham Creek (551)	M-IBI, Fish-IBI
County Ditch 43 (547)	M-IBI, Fish-IBI
CyrCreek (556)	Fish-IBI, <i>E.coli</i>
Gentilly River (554)	M-IBI, Fish-IBI, <i>E.coli</i>
Judicial Ditch 60 (542)	Dissolved Oxygen
Kripple Creek (525)	M-IBI, Fish-IBI, <i>E.coli</i>
Kripple Creek (526)	M-IBI, Fish-IBI
Little Black River (528)	Fish-IBI
Penn. Co. Ditch 76 (505)	<i>E.coli</i>
Red Lake River	Turbidity

#### Glossary

M-IBI: Macroinvertebrate Index of Biological Integrity, shows if the stream is healthy for invertebrates (insects, crayfish, etc)

F-IBI: Fish Index of Biological Integrity, shows if the stream is healthy for fish.

Dissolved Oxygen: Fish and other aquatic creatures need oxygen to survive. Low levels of dissolved oxygen are considered unhealthy.

*E.coli*: *E. coli* bacteria comes from warm-blooded animals such as cattle and humans. It can contaminate the water for swimming.

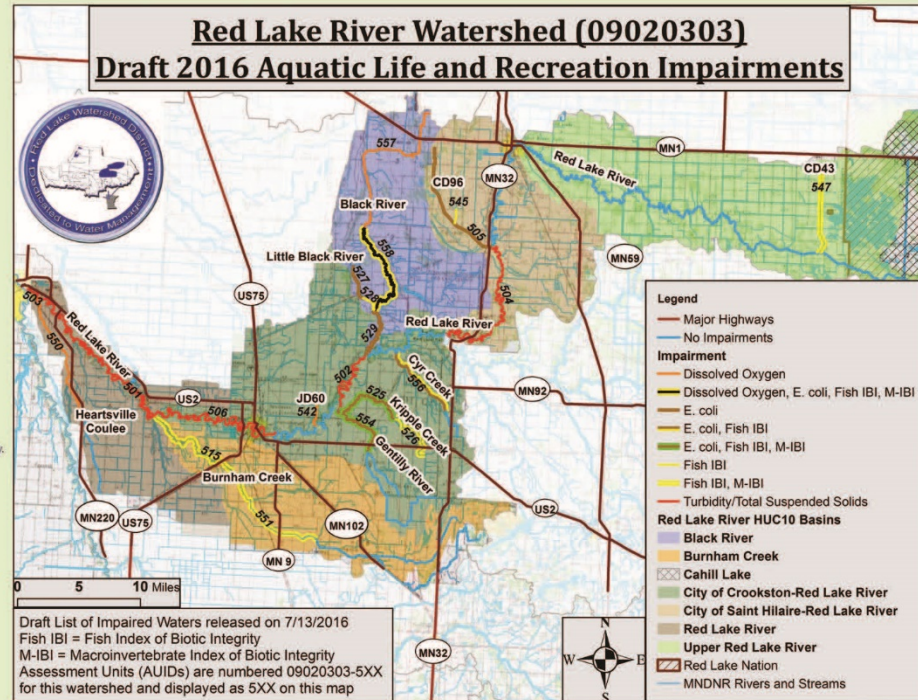
Turbidity: tells us how cloudy the water is from sediment.

~ For further information about dissolved oxygen, *E.coli* and turbidity, see the videos links on the first page of this newsletter. ~

#### Next Steps

These impaired rivers have been studied carefully to determine exactly what is causing impacts to fish and other aquatic organisms (insects, crayfish, etc). This stage of the process is called stressor identification. The stressor identification report is finished for this project and can be found on the MPCA website here: <https://www.pca.state.mn.us/water/watersheds/red-lake-river>.

Currently, restoration and protection strategies for the watershed are being written. In early 2017, these documents will be on public notice for input. If you have any questions, please contact Corey Hanson at the Red Lake Watershed District ([coreyh@wiktel.com](mailto:coreyh@wiktel.com), 218-681-5800).



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1

#### Current Condition

All past data was compiled and used to evaluate the current condition of the Red Lake River Watershed. Gaps in the data were identified for collecting new data.

2011-2014

2

#### Data Collection

New data was collected in 2011 and 2012 and combined with historical data. Water chemistry, stream channel stability, and biological community data was collected to inform this study.

2014-2015

3

#### Model & Map

Use computers to model and map the watershed and set targets for reduction of pollutants in the Thief River Watershed.

WE ARE HERE

2016

4

#### Final Plans

Final management plans will prioritize targeted activities in the watershed that will allow water bodies to safely meet water quality standards. These plans will guide local management of water resources in the Thief River Watershed.



# Red Lake River Watershed Water Quality Problems, Causes, and Sources

Assessment Unit Identification Number (AUIDs are labeled on the impairment map)	River/Stream/Ditch Name	Aquatic Life Impairments and Stressors							Sources of Sediment in Impaired Waters					E. coli Impairments and Sources					
		Poor Fish Index of Biological Integrity Score(s)	Poor Macroinvertebrate Index of Biological Integrity Score(s)	Insufficient Base Flow	Low Dissolved Oxygen (Due to Low Flow)	Fish Passage Barriers	Insufficient In-Stream Habitat	Excess Sedimentation	Total Suspended Solids Concentrations Exceed Standards	Inadequate Riparian Buffers (Affects Erosion and Habitat)	Upland Erosion (Gullies, rills, eroding ditch outlets, etc.)	Stormwater	Wastewater Treatment Facilities	Wind Erosion	Streambank Erosion	E. coli Bacteria Concentrations Exceed Standards	Livestock along Streams	Birds (e.g. Cliff Swallows)	Waterfowl
09020303-501	Red Lake River								•	•	•	•	•	•					
09020303-502	Red Lake River								•	•	•	•	•	•					
09020303-503	Red Lake River								•	•	•	•	•	•					
09020303-504	Red Lake River								•	•	•	•	•	•					
09020303-505	Pennington Co. Ditch 96								•	•	•	•	•	•	•	•	•	•	
09020303-506	Red Lake River								•	•	•	•	•	•					
09020303-515	Burnham Creek	•	•	•	•					•	•								
09020303-525	Kripple Creek	•	•	•						•	•				•	•	•		•
09020303-526	Kripple Creek	•	•	•						•	•								
09020303-528	Little Black River	•		•	•	•	•	•		•	•								
09020303-529	Black River														•	•			•
09020303-542	Judicial Ditch 60			•	•					•	•								
09020303-545	Br 5, Penn. Co. Ditch 96	•		•	•					•	•								
09020303-547	Pennington Co. Ditch 43	•	•	•	•					•	•								
09020303-550	Heartsville Coulee			•	•					•	•								
09020303-551	Burnham Creek	•	•	•	•					•	•			•					
09020303-554	Gentilly River	•	•	•	•					•	•				•	•			•
09020303-556	Cyr Creek	•		•	•					•	•			•	•	•	•		
09020303-558	Black River	•	•	•	•	•	•	•			•				•	•			•

## Red Lake River Watershed water quality/biological issues at a glance

### Aquatic life impairments, stressors

#### Dry Channels and Stagnant Water

A lack of base, or late-summer, flow was the main cause of poor biological integrity scores in this watershed. This stressor leads to dry channels, stagnant water, and low dissolved oxygen levels.



#### Low Dissolved Oxygen

Monitoring data indicates that low dissolved oxygen concentrations in Red Lake River tributaries are most often a result of stagnant water.

#### Fish Passage Barriers

Barriers such as dams, beaver activity, stream crossings, and other structures, can block fish passage and limit the quality of fish populations in upstream reaches.



### Sources of sediment in impaired waters

#### Insufficient In-Stream Habitat

The quality of habitat along the Red Lake River and its tributaries has been assessed using the MPCA Stream Habitat Assessment protocol.

#### Excess Sedimentation

Sediment deposition within streams covers habitat of aquatic insects and fish and negatively affects egg development.

#### Inadequate Riparian Buffers

Riparian buffers are important for protecting streams from pollutant runoff, stabilizing stream banks, habitat, and providing shade.

#### Stormwater

The Red Lake River flows through (or near) the cities of Thief River Falls, St. Hilaire, Red Lake Falls, Crookston, Fisher, and East Grand Forks.

#### Upland and Streambank Erosion

Erosion of sediment from land, usually during snowmelt and large rainfall events (gully, sheet, rill erosion) can result in high sediment concentrations in waterways. Moving water has tremendous power for moving sediment. Without vegetative cover and thick, deep root systems, banks are susceptible to erosion.



### *E. coli* impairments and sources

#### Wastewater Treatment Facilities

Facilities in Thief River Falls, St. Hilaire, Red Lake Falls, Crookston, and Fisher contribute to sediment loads in the Red Lake River, but are required to discharge water at sediment levels that meet water quality standards

#### Wind Erosion

Bare soil is eroded and transported to ditches and streams by wind. Wind erosion is made worse when windbreaks are removed.

#### Livestock along Streams

*E. coli* concentrations are typically high downstream of areas in which livestock have access to a river, stream, or ditch.

#### Waterfowl

A stream reach may be located downstream of an impoundment that attract large numbers of waterfowl. Waterfowl are sometimes noted upstream of the sampling site.

#### Failing Septic Systems

MST analysis has found DNA markers from human waste in water samples collected in some Red Lake River tributaries.

#### Birds (Cliff Swallows)

Cliff swallows or pigeons can live under a bridge and contribute to elevated *E. coli* concentrations. Microbial source tracking (MST) analysis has returned positive results for bird fecal DNA at sites within this watershed.

