

By Corey Hanson, Red Lake Watershed District Water Quality Coordinator. 2/6/2020.

River Watch

District staff met with the Red Lake County Central River Watch group to plan public education projects. District staff met with the Win-E-Mac River Watch team to review data. District staff and International Water Institute staff met in Crookston to plan the 2020 River Watch Forum and discuss River of Dreams program.

Bartlett Lake Management Plan

District staff and the City Clerk for Northome worked on publicizing a December public open house meeting for the Bartlett Lake Management Plan. An open house style meeting was held on December 5, 2019 at the Northome Community Center. MPCA staff brought posters about the studies that have been completed on the lake. DNR staff brought information about the fishery and waterfowl. Red Lake DNR staff attended and provided information about the upcoming Upper/Lower Red Lakes WRAPS meeting. District staff put together a water quality summary handout for the meeting. The city of Northome and the District provided a variety of snacks and beverages for attendees.



Red Lake River Watershed Restoration and Protection Strategy (WRAPS)

The MPCA received approval documents from the EPA for the Red Lake River TMDL, notifying the MPCA that the EPA has approved the TMDLs.

Thief River One Watershed One Plan (1W1P)

District staff updated the Thief River 1W1P website, including a link to the new revised plan:

<http://www.redlakewatershed.org/1W1P/Thief-River-1W1P.pdf>.

A public hearing for the Thief River 1W1P was held on December 2, 2019. A video of the hearing is posted online: <https://youtu.be/QGqyteE4EcA>

The remaining steps in the 1W1P approval process include:

1. Each LGU Board approves this document for filing to BWSR.
2. If all LGU Boards approve, send to BWSR for approval or not.
3. If approved, we are good to submit finalized workplan to Policy Committee.
4. Approved workplan will then be submitted to BWSR for approval at which time we should be able to receive 50% of the appropriated funds to start implementing the plan.

Clearwater River Watershed Total Maximum Daily Load and Watershed Restoration and Protection Strategy

District staff worked on a detailed review and revision of the Clearwater River Watershed Total Maximum Daily Load document. There was a relatively small amount of information about Beau Gerlot Creek *E. coli* sources, so aerial photos were re-examined to find additional sources. No obvious sources of *E. coli* were found, but the aerial photos showed that a portion of the natural channel (public waters, not part of a ditch system) had been dredged and trees had been removed along the channel. A number of small text edits were found during the review of Sections 8 and 9 and applied to improve the document.

Multiple revisions to the BATHTUB models for impaired lakes:

- Evaporation rates were changed so that they were equal to the precipitation numbers. In the first draft, evaporation rates were based on data collected at the Minnesota State Climatology Office.
- All the BATHTUB models for the impaired lakes were re-run to verify inputs and results.
- Phosphorus sedimentation models were tested to see which predicts a total phosphorus concentration that was closest to observed concentrations. The default model had been used for the first draft's BATHTUB models, but a different one was used for the revised draft.
- Land use areas for Cameron Lake were revised – the geometry needed to be recalculated in ArcGIS.
- Inflow rates were re-calculated using the simulated land uses that were simulated in the "restored" iterations of the BATHTUB water quality models.
- Revised models by subtracting lake area from the open water land use areas in each lake's drainage area. The model calculates atmospheric deposition over the surface area of the lake separately, so atmospheric deposition on the lake was being double counted in previous iterations of the model.
- Methods for estimating the square kilometers of feedlots in each lake's drainage area were reviewed.

- Lake TMDLs were recalculated using the mass balance numbers (total inflow, tributary inflow, atmospheric deposition, internal loading) that were generated by the revised BATHTUB models.
- Some rounding errors were found (where numbers don't appear to add-up to the total in a table due to digits that are hidden by rounding). The models were re-run using the rounded/adjusted values.

After the detailed text and table edits had been completed, the final step of the TMDL editing involved skimming through the document and making changes to the arrangement of text and figures to make sure that space was used efficiently and other issues.

Intensive monitoring of the Thief River and Red Lake River Upstream of Thief River Falls

Continuous water quality data from deployed multi-parameter sondes was compiled, drift corrections were applied to the data, and the data was sent to MDH staff. Discrete water quality measurements were also entered into a spreadsheet and sent to MDH staff.

Red Lake River Watershed One Watershed One Plan

The Planning Work Group and MPCA staff reviewed comments from the EPA on the Red Lake River 319 Small Watersheds Focus grant work plan.

Other Notes

- District staff discussed possible projects for a No Child Left Inside grant application
 - Pollinators with scouts? Nature play area in Thief River Falls?
- District staff started working on the entry of 2019 water quality monitoring data.
- Thief River turbidity measurements on December 9, 2019 due to reports of high turbidity on December 5, 2019.
- District staff provided some instruction to Pelican River Watershed District staff on how to use HOBO water level loggers and how to process the data.
- Data from the Hydrolab HL4 multiparameter sonde that was deployed in the Thief River near Thief River Falls and Eureka Manta sondes that were deployed in the Red Lake River near LaFave Park during the fall of 2019 was compiled, corrected, and analyzed. Discrete monitoring data from 2019 monitoring of the Thief River, Mud River, and Red Lake River was compiled and sent to MDH staff along with the data that was collected with deployed water quality loggers.

Water quality related notes and minutes from the December 12, 2019 Red Lake Watershed District Board of Managers meeting.

- Darren Carlson, Marshall County SWCD, stated that in 2018 the SWCD installed side water inlet (SWI) culverts within the District's boundary which were in part, funded with the assistance from the District's Erosion Control Funds, RLWD Project No. 164. Carlson requested additional funding from the 2019 Erosion Control Funds, RLWD Project No. 164, in the amount of \$12,500 to assist in the design of the structures and installation of SWI culverts located within the District's boundary. Motion by Ose, seconded by Tiedemann, to approve cost share in the amount of \$12,500 to assist in the design and installation of side water inlet culverts for the Marshall County SWCD from the 2019 Erosion Control Funds, RLWD 164. Motion carried.

- Engineer Nate Dalager, HDR Engineering, Inc., discussed the U.S. Army Corps of Engineers (Corps) permit for the Thief River Falls Westside FDR Project, RLWD Project No. 178. Dalager noted that the Corps is not regulating the outlet as a wetland, rather they are regulating it as a stream since they state it is a tributary to the Red Lake River. There was discussion concerning the channel in reference as an outlet to Pennington County Ditch #1 and would it have other regulatory rules if the Corps recognized the channel as a legal drainage system? Dalager indicated that the Corp is also regulating the portion of Pennington County Ditch #1 west of TH #32 as a stream so he doubted that would matter. Dalager discussed the Corps' concern with stabilization of the bank of the outlet. Dalager and Administrator Jesme will work with staff from the Corps to ensure that all information is provided in hopes of a timely and positive determination for receipt of the permit.
- The Upper/Lower Red Lake WRAPS public meeting will be held on December 12th, from 4:00-6:00 p.m. at the North Beltrami County Community Center in Kelliher, MN.
- Staff member Hanson participated in a Public Open House for Bartlett Lake on December 5th in the Northhome City Hall. The next meeting will be held on January 22, 2020 at 10:00 a.m. at the Northhome City Hall. Notes from the meeting were included in the packet.
- Manager Dwight commented on a discussion he had with MnDNR Staff regarding alternatives for the Pine Lake Project, RLWD Project No. 26.
- The District received word of the passing of former Board Member, Vernon Johnson. Mr. Johnson served on the District Board for 21 years. He also served on the RRWMB Board.
<https://www.ceasefuneralhome.com/obituaries/Vernon-E-Johnson?obId=9474009#/celebrationWall>

Water quality related notes and minutes from the December 30, 2019 Red Lake Watershed District Board of Managers meeting.

- The District was informed that a Conservation Partners Legacy (CPL) Grant in the amount of \$168,420 was received for the Burnham Creek Wildlife Habitat Structure Repair, RWLD Project No. 43A, which is adjacent to the BR 6 structure. Administrator Jesme stated, that a requirement of the grant is to give an opportunity to the Conservation Corps to see if there is any work, they may be able to complete. Jesme will work with staff from the MnDNR and HDR Engineering, Inc., to review the Work Plan for submittal to CPL
- Manager Dwight discussed the Pine Lake Project, RLWD Project No. 26 and conversations he has had with several agency personnel. Discussion was held on the replacement of the outlet structure which would allow for better winter drawdown to hold additional spring floodwaters, as well as incorporating fish passage, and would also help with less ice damage to the shore bank due to a lower water level. MnDNR Fisheries has indicated that by lowering the water in the fall thus minimizing the area to aerate is better for fisheries as it takes the water out of the vegetated areas. Administrator Jesme stated that CPL grants could be applied for as there would be Natural



Vernon Johnson was an advocate of water quality projects, especially in the Clearwater River Watershed. He was supportive of staff. He had a calm, wise demeanor which made it easy to respect him and view him as a role model. His success in life, in general, was also admirable. He was a landowner in Clearwater County and had a cabin on Clearwater Lake, one of the most beautiful lakes in the area.

Resource Enhancement (NRE) benefits on the project, plus Flood Damage Reduction funding. Manager Torgerson inquired on the possibility of diverting water around the lake in an emergency. Engineer Nate Dalager stated that they have not looked at that possibility.

Meetings and Events from December 2019

- **December 2, 2019** – Thief River One Watershed One Plan Public Hearing
- **December 2, 2019** – Thief River 1WIP Planning Work Group Meeting to discuss a work plan for the first round of funding
- **December 5, 2019** – Bartlett Lake Management Planning Kick-Off Open House
- **December 5-7, 2019** - Minnesota Association of Watershed Districts 2019 Annual Meeting and Trade Show
- **December 11, 2019** – Red Lake River One Watershed One Plan Planning Work Group conference call
- **December 12, 2019** – Upper/Lower Red Lakes Public Open House event at Kelliher
 - District staff put together a display with information about projects and monitoring in the Upper/Lower Red Lakes watershed. The following photos include some of the other informational displays that were at the event.



Upper/Lower Red Lake Watershed Restoration and Protection Strategy

Stream Bacteria Impairments

What is the PROBLEM?

- Bacteria levels in the streams are too high for safe contact (wading, swimming, or boating)
- Bacteria levels which exceed 126 organisms per 100 mL




WHERE is the problem?



What is the CAUSE?

Fecal pollution from:

- Humans, Livestock, Wildlife, and Pets



Source Molecular
Leader in Molecular Source Tracking

Impaired Stream Reach	Estimated Number of TMDLs	Humans		Livestock		Beaver		Birds	
		MT1 Biomarker	MT2 Biomarker	Acid Feces Antisense	MT1 Biomarker	MT2 Biomarker	MT1 Biomarker	MT2 Biomarker	
Shokey Brook (502)	0 or 1								
Battle River, North Branch (503)	13 or 14			Roughly 800 cattle through drainage area	Moderate				
North Cormorant River (506)	1 or 2			Roughly 100 cattle through drainage area	Moderate				
South Cormorant River (507)	1 or 1			Roughly 1,200 cattle through drainage area					
Darrigan Creek (508)	0	Low		Roughly 800 cattle through drainage area	High				
Blackduck River (510)	0								
Blackduck River (512)	0 or 1								
Hay Creek (518)	0								
Sandy River (522)	1 or 2			Roughly 100 cattle through drainage area	Low				
Mud River (541)	0								
O'Brien Creek (584)	0			Roughly 200 cattle through drainage area	Low				
Unnamed creek (600)	0	Low		Roughly 100 cattle through drainage area	Low				

How do we FIX IT?

- Improve livestock and manure management:
 - Horse and livestock exclusions from the streams
 - Manure spreading management
- Improve riparian vegetation:
 - Bank revegetation
 - Riparian buffers
- Address failing septic:
 - Septic system inspections and maintenance education





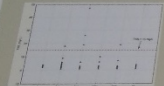
MINNESOTA POLLUTION CONTROL AGENCY

Upper/Lower Red Lake Watershed Restoration & Protection Strategy

Stream Total Suspended Solids Impairments



What is the PROBLEM?

- Too much stream sediment harms fish & macro-invertebrate (bug) habitat & survival
- High TSS = low clarity = poor habitat
- Pike Creek TSS (PIKE-8)
- Mud River TSS (MUDR-1)




What is the CAUSE?

- Channel instability
- Bank erosion
- Altered hydrology

WHERE is the problem?

- North Cormorant
- Pike
- Mud


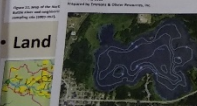

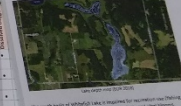



How do we FIX IT?

- Forest protection programs
- Conservation easements
- Drainage water management
- Stream restoration
- Culvert replacements
- Riparian buffers

Land

- Blackduck Lake Total Maximum Daily Load (TMDL) Study Fact Sheet
- Battle Lake Total Maximum Daily Load (TMDL) Study Fact Sheet
- Shokey Brook Total Maximum Daily Load (TMDL) Study Fact Sheet
- Whitefish Lake, South Basin Total Maximum Daily Load (TMDL) Study Fact Sheet
- Crate Lake Total Maximum Daily Load (TMDL) Study Fact Sheet

MINN CONTROL AGENCY

Upper/Lower Red Lake Watershed Restoration and Protection Strategy

Lake Water Quality

**More Phosphorus
= More Algae
= Less Clarity**

- Sources of Phosphorus to Lakes:

- Wetland Water Level Fluctuations:

- Shallow lakes are also influenced by fish and plant dynamics:

Lakes Impaired for Excess Nutrients/Eutrophication

Protection Lakes

Major Watershed Restoration and Protection Strategy

Work Elements and Timeline

Study gets to "core" of water quality history in Bartlett lake

Stewards record WQ history back to pre-settlement days

The MPCA is working with scientists from the St. Croix Watershed Research Station to study sediment layers in Bartlett Lake's located just outside of Nordmead. It's over 300 acres with a maximum depth of 16 ft. It's a long history of environmental stress resulting in frequent blue-green algae blooms and winter fish kills.

Although phosphorus (P) inputs have been curtailed, the lake still has high levels and poor water quality. High P inputs likely occurred from lumber mills and a creamery that were located on the shore. The lake's history has led to several questions:

- How has Bartlett Lake changed over time and what was the natural (historical) condition of the lake?
- What goals and water quality targets should be set for this valuable, regional resource?

Understanding Bartlett Lake's past key to planning its future

Knowledge of the natural state of a lake and understanding the timing and magnitude of historical changes is critical for developing a management and restoration plan. The primary goal of this project is to increase public awareness/knowledge of WQ management options to improve WQ in the Upper and Lower Red Lake Watershed.

Filling "BATHTUB" to keep lake water qu...

Questions that arise when making pl...

- what are the various sources of po...
- how would water quality change i...

Computer models or simulation prog...

BATHTUB takes data collected throug...

and use and uses that information to...

such as to the amount of pollutant loa...

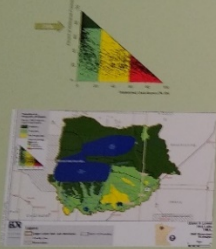
Facts about the BATHTUB model:

- developed by William Mallin, Jr. (MPC...
- a steady-state lake model (that is, n...
- model inputs include: lake morpho...

Upper/Lower Red Lake Watershed Restoration and Protection Strategy

Forest Protection Programs

Goal: Protect 75% of Lakeshed



How we can keep forestlands healthy and forested...

- Forest Stewardship Plans
- Sustainable Forest Incentive Act (SFIA)
- Conservation Easements
- Land Acquisition

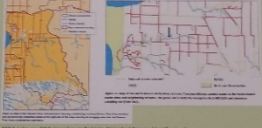
Stream Restoration

Background:

- Trenches were dug through peat soils in the early 1900s in an attempt to dry them out for cropland


Impacts:

- Increase in peak flows
- Channel instability and erosion
- Increased phosphorus export to lakes



Culvert Replacement

- Replace old failing culverts that are undersized and perched




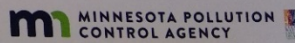
Other Management Strategies

- Drainage water management
- Stormwater management
- Pasture management
- Wetland banking
- In-lake management

Shoreland Protection

Minnesota Buffer Law:

- Buffers help filter out phosphorus, nitrogen and sediment
- Maintain a 50 foot wide buffer along lakes, rivers and streams
- Maintain a 16.5 foot wide buffer along public ditches




Table 1. Summary of Lake Characteristics

Characteristic	Upper Red Lake	Lower Red Lake	Source
Surface area (km ²)	481	667	Minnesota Pollution Control Agency (MPCA)
Mean depth (m)	3.81	7.56	Red Lake Basin lake bathymetry and Respec depth charts
Maximum depth (m)	9.538	9.445	Red Lake Basin lake bathymetry and Respec depth charts
Estimated water residence time (yr)	18.8	13.7	BATHTUB
Maximum basin length (km)	38	46	Measured in GoogleEarth
Volume (km ³)	1,830	4,772	Calculated
Outlet ratio	0.17	0.28	Calculated
Lake geometry ratio	0.28	0.22	Calculated
Total watershed area (km ²)	5,114		MPCA
Watershed to lake area ratio	1.45 (watershed area includes lake surface area)		Calculated

Table 2. Summary of NLCD Land Uses in the Upper and Lower Red Lake Watersheds

Land Use	Land Use Area (km ²) by Watershed	
	Upper Red Lake	Lower Red Lake
Wetland	1,606	2,383
Open Water	491	1,217
Forest	121	907
Developed	14	77
Agricultural	29	322
Grassland	7	67

Data from the lakes in blue at left were used in the BATHTUB model. The model uses additional watershed information such as shown in the tables above. Using all this information, BATHTUB can, for example, show what impact making a pollutant load change in one part of the watershed can have on a lake or reservoir.

Filling "BATHTUB" model with good data helps planners keep lake water quality from going down the drain

Questions that arise when making plans to improve water quality in a specific lake or lakes include:

- what are the various sources of pollution that are causing problems, and
- how would water quality change in these lakes if we increase or decrease the pollutant loads coming from the various sources we have identified?

Computer models or simulation programs like the BATHTUB model help us answer these questions. BATHTUB takes data collected through monitoring efforts and other watershed information such as land use and uses that information to show what the affect will be in lakes if we make changes, such as to the amount of pollutant loads coming from various sources.

Facts about the BATHTUB model:

- developed by William Walker, Jr, PhD, for the US Army Corp of Engineers in the 1980s
- a steady-state lake model that has been used by the MPCA since the 1980s
- model inputs include lake morphometry, water budget data, and phosphorus budget data
- model can assess the impacts of changes in water or nutrient loading to lakes/reservoirs
- has been used for a number of lake TMDLs in Minnesota
- The Red Lakes watershed BATHTUB model uses output from the watershed HSPF model

RED LAKE WATERSHED DISTRICT
MONTHLY WATER QUALITY REPORT

December 2019

- **December 16, 2019** - Red Lake River 319 Small Watersheds Focus Grant conference call (MPCA staff and the Red Lake River 1W1P Planning Work Group) to discuss estimates of pollutant reductions.
- **December 23, 2019** – BWSR Grant Reporting Training/Refresher at the RLWD office

Red Lake Watershed District Monthly Water Quality Reports are available online:

<http://www.redlakewatershed.org/monthwg.html>.

Learn more about the Red Lake Watershed District at 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.

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