

Wetland Creation/Restoration – Upstream of Monks Avenue

The existing drainage patterns and agricultural land use provide an opportunity for wetland restoration along a former wetland that was converted to a drainage ditch at the upstream area of the Indian Creek Watershed. Bioreactors at tile and surface water discharge points can increase nitrate removal. Coupled with a properly designed and constructed wetland in this area, additional sediment and phosphorus reductions can be achieved. This would have a direct impact on the surface water entering the City of Mankato and ultimately discharging into the Minnesota River. Storage of stormwater within the wetland would reduce erosion in the downstream channel enhancing the effects of the Ravine Stream Bank Stabilization improvements in phase 1.

Land acquisition: \$1 million
 Bioreactor construction: \$0.75 million
 Wetland restoration: \$6.85 million

Estimated construction cost: \$7.6 million

Total phase cost: \$8.7 million

Estimated load reduction: 150 pounds (68kg)/year total phosphorous reduction; 2,000 pound (909 kg)/year Nitrogen reduction

Summary

State bonding request	\$6.875 million	Total phosphorus reduction	388 kg/year
Local investment match	<u>\$6.875 million</u>	Low flow daily phosphorus reduction	1.43 kg/day
Total project cost	\$13.75 million	Percent reduction of wastewater treatment facility discharge	12%
		Capital cost per kg removal Non-point	\$35,400
		Capital Cost per kg removal point	\$137,802

For more information contact Mankato City Manager Patrick Hentges at 507-387-8695 or phentges@mankatomn.gov.

mankatomn.gov

GREATER MANKATO WATER QUALITY MITIGATION DEMONSTRATION PROJECT

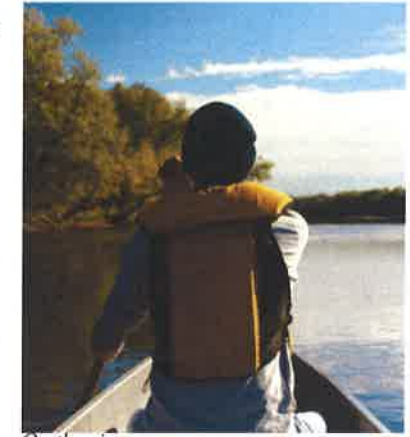


The City of Mankato seeks a **\$6.875 million** bonding appropriation (H.F. 1593) to fund a portion of the **\$13.75 million** total project cost.

Mankato's Phosphorous Trading Program

The City of Mankato currently conducts a phosphorus point-source trading program. The program utilizes the excess treatment credits from the City's wastewater treatment process that reduces the discharge concentration below the 1mg/L requirement.

The 1,930 kg of excess phosphorus that is removed is traded with municipal and agricultural facilities along the Minnesota River to achieve the overall goal of improving water quality.



On the river.

Proposed Minnesota River Point-NonPoint Source Phosphorous Trading Concept

The Minnesota Pollution Control Agency (MPCA) is proposing to reduce the City of Mankato's total phosphorous discharge limit from 1 mg/L to 0.3 mg/L, which is expected to significantly limit the City's ability to trade with other cities and industrial facilities. The City of Mankato has identified the need to develop a point-nonpoint source total phosphorous trading program. While the point-nonpoint trading concept would be similar to the program employed by the City of Princeton, it would differ in that it could encompass the entire Minnesota River watershed.

The concept could be transformed into a trading program by completing a study which would focus on:

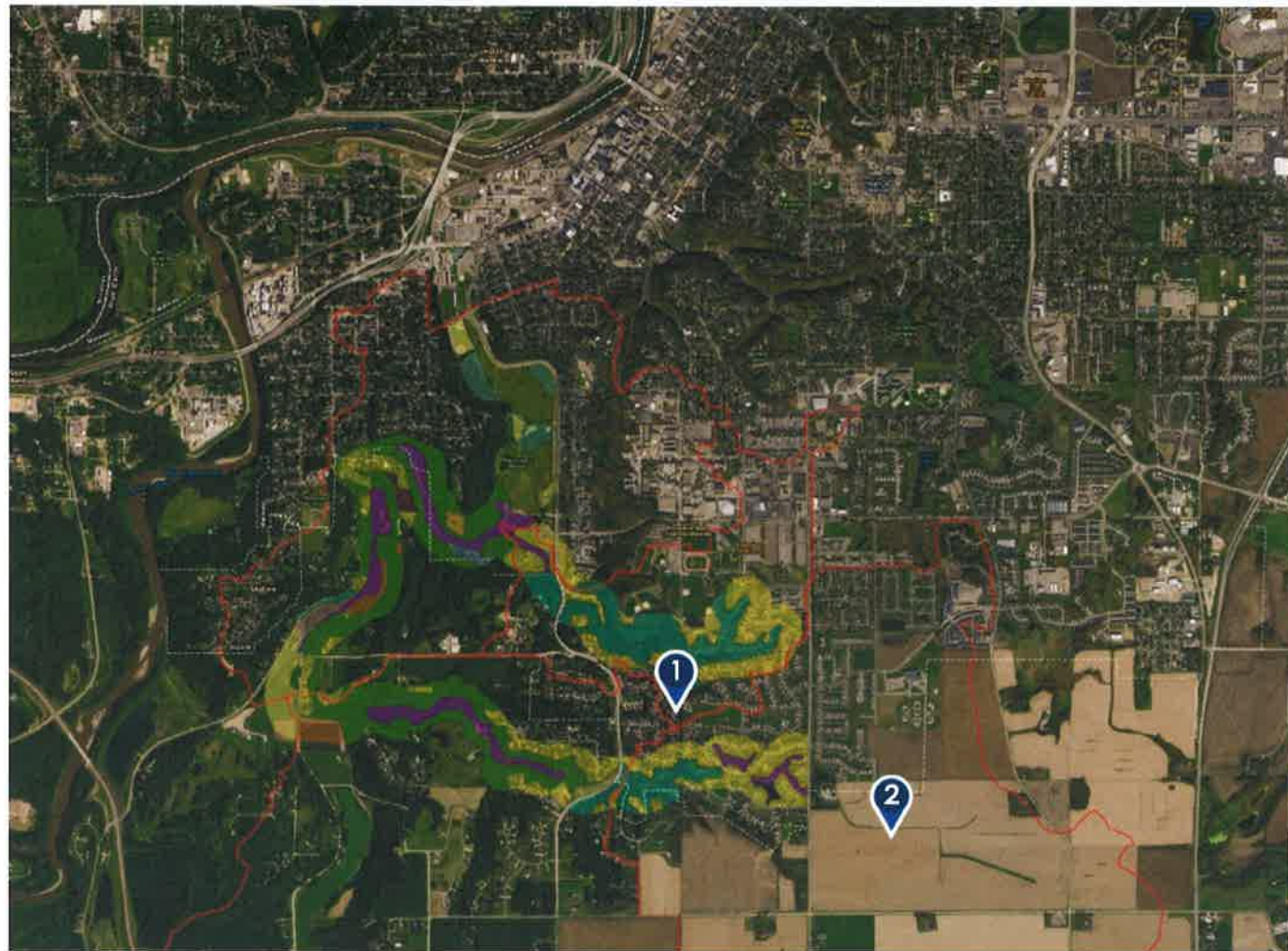
- Identifying opportunities to optimize total phosphorous reduction at existing point source discharge locations.
- Comparing total phosphorous loads from point sources to established discharge limits to determine additional total phosphorous reduction needs and reserve capacity.
- Identifying feasible, beneficial projects which can be completed to achieve additional total phosphorous reductions in accordance with MPCA criteria.



Source of Minnesota River Watershed map: 2001 Minnesota River Basin Plan by the Minnesota Pollution Control Agency.

Princeton's Point-NonPoint Source Trading Program

The MPCA authorized the City of Princeton to offset the total phosphorous pollutant loading from its wastewater treatment facility to the Rum River with upstream nonpoint source pollutant loading reductions achieved through stream bank stabilization and sediment reduction projects. This program led the MPCA to develop criteria for restoration projects which may be applicable to other watersheds. The MPCA is requiring long-term monitoring and maintenance of the project sites as a condition of the City's National Pollutant Discharge Elimination System (NPDES) permit for the wastewater treatment facility.



Indian Creek Watershed

Phosphorus removal strategy

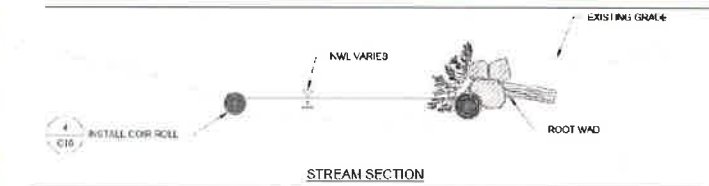
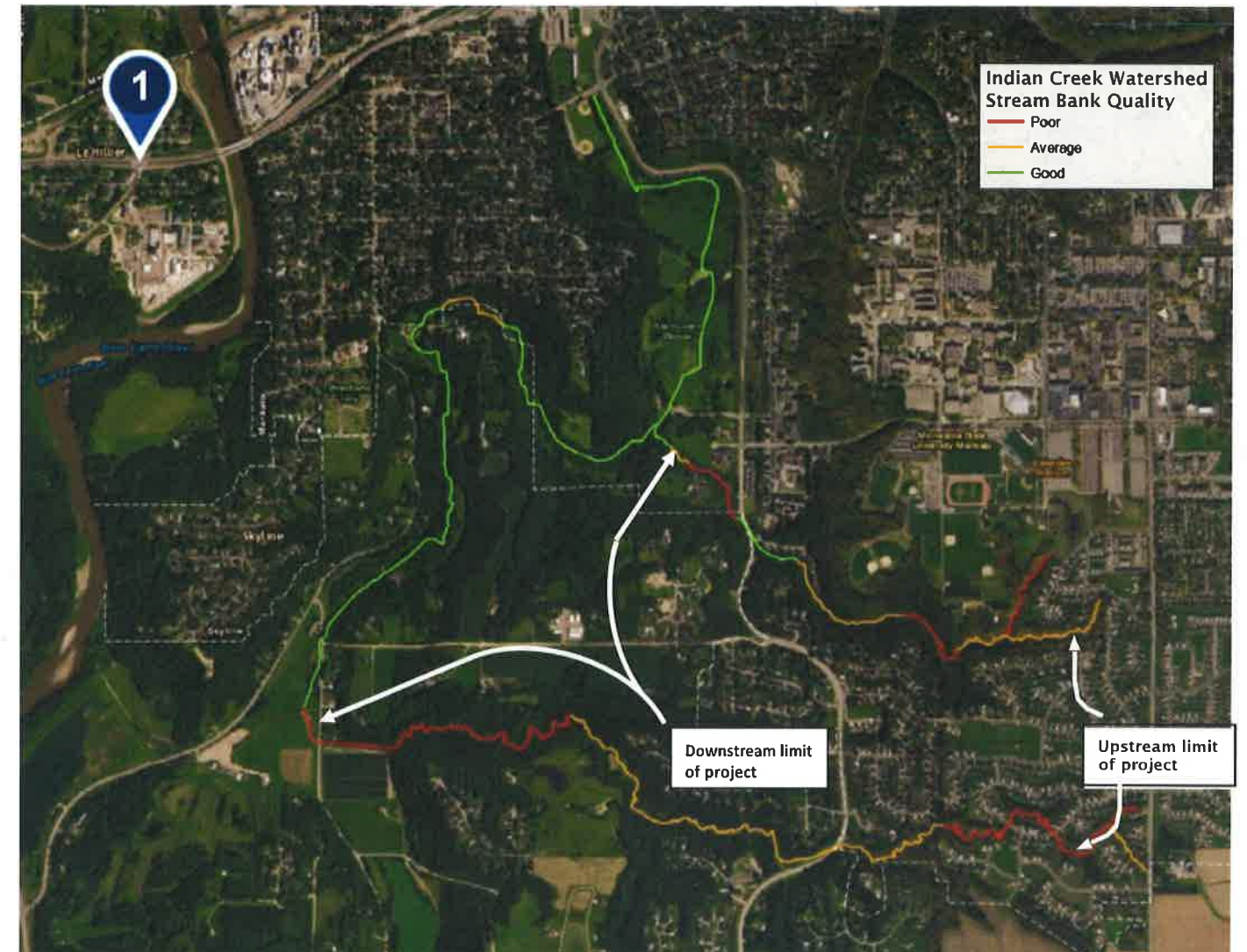
Step 1 : Development of water quality - erosion management plan

- Hydrologic and hydraulic analysis of watershed
- Field investigation and documentation of current conditions on ravines and waterways
- Site condition assessment of urgent slope stabilization areas
- GIS database development
- Sediment and pollutant loading assessment
- Watershed Erosion Management Plan
- Preliminary design of watershed improvements

Step 2: Phased improvement construction

- Phase **1** Ravine and stream bank stabilization
- Phase **2** Wetland creation/restoration

Step 3: Monitoring and sampling to sustain results



Ravine Stream Bank Stabilization

As part of the recently completed Indian Creek Watershed Study, numerous slope failure locations along Indian Creek and Viking Ravine were identified and analyzed in order to prioritize stabilization projects. One of the highest priority areas was identified along Indian Creek between Monks Avenue and Stoltzman Road. Proposed stabilization measures include a combination of root wads, coir rolls, erosion control blankets, Fabric Encapsulated Soil (FES), gabion baskets, willow cutting plantings and riprap.

Channel realignment/floodplain improvements:	\$538,000
Natural material stream bank stabilization:	\$592,000
Structural stream bank stabilization:	\$3,920,000
Estimated construction cost:	\$5.05 Million
Estimated load reduction:	320 pounds (145 kg)/year total phosphorus reduction