# MN GreenCorps 2010-2011 Report: Stormwater Management in Crookston, MN By: Michael Knudson 08/19/2011

### Introduction

Non-point source pollution is mostly runoff from rain and snowmelt events referred to as stormwater. Stormwater refers to any water running off the lands surface from a rainfall or snowmelt event. Stormwater is conventionally managed through sewer systems that discharge into a body of water. What many are realizing is that non-point source pollution is not an end of pipe fix like point source pollution was. The root source of non-point source pollution lies within the communities; illegal disposal of materials (hazardous waste), improper disposal of lawn trimmings and other organics, fertilizer, pet waste, and lack of awareness of relationships between communities and water quality.

Most non-point source regulations target urban communities. Many storm sewer systems in Minnesota are now permitted through the Municipal Separate Storm Sewer System (MS4) permit administered by the Minnesota Pollution Control Agency (MPCA). East Grand Forks and Moorhead, MN are MS4 communities. Crookston and Thief River Falls, MN will be MS4 communities after Total Maximum Daily Load (TMDL) studies are completed by the Red Lake Watershed District.

MS4 communities are required to develop and implement a Stormwater Management Program (SWMP) that includes partnerships, regulatory mechanisms, enforcement response procedures, maps and inventory, and summary of Best Management Practices (BMPs), measurable goals, timeline and each individual responsible for each *Minimum Control Measure*. MS4 permits consist of six minimum control measures which are: 1) public education and outreach 2) public participation and involvement 3) illicit discharge detection and elimination 4) construction site stormwater runoff control 5) post construction stormwater management 6) pollution prevention/good housekeeping for municipal operations (MPCA, 2005). The 2010-2011 MN GreenCorps service has focused on minimum control measures 1 and 2 along with developing maps and inventory of stormwater infrastructure. Stormwater management and solutions to poor water quality are growing issues statewide and locally. Rural communities are facing policy requirements and these processes can be expensive and problematic. To learn and adapt to changes communities should take a sustainable approach to managing stormwater and water quality. Building a sustainable mentality and conservation driven ethic within the community towards its water resources will be how rural communities can manage stormwater in a social, economical, and environmental fashion.

### Local Water Management

Crookston is the Polk County seat located in northwest Minnesota. Crookston also lies within the Red Lake Watershed. The Red Lake Watershed is 909,042 acres with land use consisting of row crops (61%), wetlands (17%), forest (10%), grass/pasture/hay (6%), and residential/commercial development (%5).

The Red Lake River flows southwesterly discharging into the Red River at East Grand Forks. The river is an important resource for recreation, wildlife habitat, and drinking water. The Polk County Local Water Management Plan identifies main resource concerns as wind and water erosion, nutrient management, wetland management, surface water quality, flood damage reduction, and wildlife habitat. Priority Concern 1 focuses on surface water quality, maintaining and improving water quality for the Red Lake River is essential because East Grand Forks, MN and some extent of Grand Forks, ND utilize the Red Lake River as a potable water source. The Red Lake River is impaired for turbidity and management efforts should focus on sediment loading into the river. This includes rural communities like Crookston that discharge stormwater into the Red Lake River.

A priority concern identified by stakeholders in the Polk County Local Water Management Plan is surface water quality as it pertains to human impacts on a public water supply source. Three areas of interest within this concern were participation and outreach throughout the TMDL process, surface water database, and stormwater attributing to water quality. Other notable goals and objectives within the plan are cost-share practices, BMP low-interest loan program, and support and participation in current and future Impaired Waters clean-up programs. (Polk County Local Water Management Plan, 2009 and Polk County Local Water Management Plan Update Priority Concerns Scoping Document, 2011).

### **Crookston and UMC Stormwater Infrastructure**

The City of Crookston currently manages their stormwater using storm sewer pipes that convey stormwater to the Red Lake River or natural basin that flows into the Red Lake River (Photo 1 and 2). Figure 1 shows Crookston's stormwater infrastructure including storm sewers, 45 outfalls, four stormwater ponds, and 114 tree trenches. Storm sewers increase flow and pollutant loads in the Red Lake River.

Crookston is growing and developments are being proposed and constructed. There is also a downtown revitalization project underway. These pose great opportunities to build a stronger, healthier, and more active community. By proactively taking the time to educate and involve community members in how it grows and how to embrace and connect to the Red Lake River, Crookston will have an easier time defining barriers and identifying solutions to meeting MS4 requirements and water quality standards. This can be done through developing a conservation ethic towards the Red Lake River and water quality within the community.

An asset to the Crookston community is the University of Minnesota, Crookston (UMC) located just north of town. UMC has participated in building a more sustainable community through establishing the Center for Sustainability and building the LEED (Leadership in Energy and Environmental Design) Silver Evergreen dormitory. Water management is an issue to be explored at UMC and MN GreenCorps 2010-2011 service has assisted in their exploration. Stormwater management at UMC consists of the Nature Nook. A diverse natural system on campus encompassing what is outside our engineered communities. The Nature Nook provides a place for the community to interact and embrace water, vegetation, wildlife and more. Beyond the Nature Nook stormwater management consists of storm sewers at UMC which discharges into the Red Lake River (Photo 1) and there is a need and desire to explore other options.

UMC consist of 50.19 acres of impervious surfaces and increasing with another dormitory being constructed summer 2012. Figure 2 shows UMC's storm sewer system and the 133 storm drain inlets on campus. UMC has raised awareness of stormwater through the 2010-2011 MN GreenCorps service and the UMC Natural Resources Club Storm-drain Marking event held April, 18 2011 (Photo 3).

### **Identifying Barriers in Crookston**

Throughout the 2010-2011 MN GreenCorps Service a focus was to identify barriers to stormwater management in Crookston and raise awareness of stormwater and water quality issues in the community. Stormwater and water quality awareness has been identified as a barrier to stormwater management. The Crookston community is just unaware of stormwater pollution and preventative practices. Although through community presentations and stormwater education by MN GreenCorps member, Crookston has been identified as a community that cares about water quality. They want to know where their water comes from and who is drinking the water downstream. Most community members want to learn preventative practices to reduce the source of pollution. This is a positive observation and can be used to build capacity toward managing stormwater in Crookston.

The City of Crookston is another barrier to stormwater management. Mainly due to budget restrictions and that the city is currently in the flood business. This is not a bad thing, Crookston needs flood protection but also needs to be mindful of water quality. The issue identified within the City of Crookston operations is snow removal. In winter 2010-2011 the City of Crookston stored snowed

removed from streets on the Red Lake River. When spring came this once massive pile of snow melted into the Red Lake River taking with it sediment, trash, and other pollutants (Photo 4). A snow removal strategy and training for city operators is a starting point in developing a plan for managing stormwater.

Other barriers identified are erosion, litter, and disposal of materials. Erosion problems exist throughout the Red Lake Watershed (Photo 5). Erosion issues located in Crookston are most visible to the community at the new sports arena where runoff from the parking lot is eroding the landscape (Photo 6). Litter is a barrier for all communities. Crookston has a litter problem because people litter. It has become a common behavior in all communities. MN GreenCorps members and UMC students have been very instrumental in organizing community clean-ups on campus and in Crookston. It would be great to see the Crookston community become more involved in community clean-ups and be more aware of their littering behavior. Proper disposal of materials in Crookston is a hard concept to grasp when there is no standard or leadership in sustainable behavior. The sports arena in Crookston disposed of tape and paint from the ice rinks by dumping it in the eroded ditch next to their parking lot (Photo 7). Most Crookston citizens that live on the Red Lake River throw their grass clippings and other organics in the river.

These issues all lead up to the Crookston community's ability to embrace the Red Lake River. This great Minnesota resource flows through the heart of Crookston and many community members view it as a hazard of flooding or drowning. Although these hazards are very true the Red Lake River does flood and people have died in the river, the river is still a great resource and recreational asset to the community and building an ethic towards the river and embracing it as a community is where Crookston can start in managing stormwater and water quality.

#### Stormwater Management Approaches for Crookston

Non-structural stormwater management produces responses like social action, public education, partnership development, regulation and enforcement, and planning (Ryan and Brown, 2000). Stormwater management in Crookston has the highest potential in non-structural practices. Since Crookston is not MS4 regulated and there is no opportunity within the community to implement sometimes expensive structural practices there is an opportunity to focus on engaging the community, incorporating community input, and fostering ownership towards local stormwater and water quality issues. This approach requires partnerships and capacity building which involves the transfer of knowledge, skills, and resources to the community. This process is time consuming and resource intensive but Crookston wants to build awareness and connect the community to the Red Lake River and this is how they can build capacity in the community and meet stormwater permit requirements in the future (Department of Environment and Swan River Trust, 2005).

Non-structural stormwater management for Crookston include a commitment to the community through education campaigns, community clean-ups, trainings and workshops, collaborative process of developing regulations, and development of a community driven committee whose mission is to embrace the Red Lake River. To begin this non-structural approach social research including community surveys, quantifying public participation in community clean-up events, and interviewing agencies and public entities will provide Crookston with data to begin planning and developing non-structural stormwater management.

Structural stormwater management produces responses that can be physically seen on the ground including rain barrels, infiltration practices (raingardens), detention ponds, street sweeping, and tree plantings. These practices become the second phase of building capacity in Crookston. Practices like rain barrels can be developed and promoted in the community through workshops and education

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campaigns. Another structural practice could be infiltration basins in old home foundations that are purchased and demolished due its proximity to the river and flood plain (Photo 8).

The adoption and effects of these practices can be documented and provide information and guidance for other communities. Information that can be documented from structural practices currently implemented in Crookston includes quantifying what Crookston is removing from the streets through street sweeping. Another is to start documenting by weight the litter that is collected every year by UMC students and community members. This will allow for better planning and provide information to the community to raise their awareness.

### Conclusion

Traditional approaches to stormwater management no longer reflect the environmental values of our communities. Improving the social, health, and economic well-being of our communities through building community knowledge and participation will allow communities to prosper, grow sustainably, and improve ecosystem health. There are value transformations that occur among organizations, businesses, and the community for results to develop (Brown, Sharp, and Ashley, 2005). It has been observed in Crookston that the community deeply cares about water quality and the Red Lake River and involving the community will be a positive step forward in developing a successful program.

A community-based approach to stormwater management offers opportunities for groups of interested and affected people, not always involved in decision-making processes, to be incorporated as key stakeholders. This approach builds knowledge across the community, develops participation and leadership, forms networks of resources, and facilitates people working together and reflecting on efficiency (Greenway et. al., 2006). Many stormwater related barriers and issues have been identified throughout the 2010-2011 MN GreenCorps service. Crookston and the University of Minnesota, Crookston have the opportunity to be proactive and build a conservation driven community focusing on embracing the Red Lake River and building an ethic towards water quality.

## **Figures and Photos**



Figure 1: Crookston Stormwater Infrastructure



Figure 2: UMC Stormwater Infrastructure



Photo 2: Oxbow, a natural basin receiving a large amount of Crookston's storm sewer discharge.



Photo 1: Storm sewer outfall in Red Lake River. This is University of Minnesota, Crookston's outfall.



Photo 3: Storm-drain marker at UMC installed April 18, 2011 by Natural Resources Club

Photo 4: Snow dumping site winter 2010-2011 for City of Crookston on the Red Lake River





Photo 5: Erosion along Red Lake River on County Rd. 11 between Crookston and Gentilly, MN

Photo 6: Erosion from parking lot runoff at Crookston Sports Arena





Photo 7: Illegal disposal of paint and tape from ice rinks at Crookston Sports Arena

Photo 8: Home Removal Sites can be locations for underground infiltration systems



## Storm Sewer Sampling Data

Date	Location	Collected	Analyzed	Turbidity (NTU)	Precipitation in/day	Flow
					NWROC N: 5/30 = 0.57;	
31-May-11	Industrial	19:25	20:52	76	5/31 = 0.05	Low
					NWROC W: 5/30 = 0.04;	
	UMC	19:40	20:54	18	5/31 = 0.08	Low
	Park W	19:50	20:55	32		Low
	Park E	19:55	20:56	45		Low
	Riverside	20:10	20:58	52		Low
12-Jun-11	Industrial	15:35	17:20	5.53	NWROC N: 0	Low
	UMC	15:50	17:23	0.54	NWROC W: 0.03	Low
	Park W	16:10	17:25	109		Low
	Park E	16:15	17:26	124		Low
	Riverside	16:25	17:27	11.9		Low
	Highland	16:55	17:29	23.5		Low
					NWROC N: 6/14 = 0.05;	
15-Jun-11	Industrial	10:15	11:47	12.3	6/15 = 0.16	Low
	UMC	10:45	11:48	7.16	NWROC W: 6/15 = 0.1	Low
	Park W	11:00	11:49	13.9		Low
	Park E	11:05	11:50	10.7		Low
	Riverside	11:15	11:51	3.19		Low
	Highland	11:25	11:53	2.34		Low
21-Jun-11	Highland	15:43	16:55	33.4	NWROC N: 0.65	High
	Riverside	15:56	16:58	39.4	NWROC W: 0.62008	High
	Industrial	16:15	17:01	249		High
	Park W	16:30	17:03	48.4		High
	Park E	16:35	17:05	53.2		High
	UMC	0:00	0:00	0		
22-Jun-11	Industrial	11:10	12:50	447	NWROC N: 0.43	High
	Highland	11:30	12:52	53.1	NWROC W: 0.02	High
	Riverside	11:36	12:53	69.1		High
	Park W	11:45	12:54	28.5		High
	Park E	11:50	12:55	69.2		High
	UMC	12:00	12:56	29.3		High
					NWROC N: 6/26 = 0.35;	0
27-Jun-11	Highland	11:32	13:17	41.3; Dup. 40.5	6/27 = 0.22	High
					NWROC W: 6/26 = 0.4299;	
	Riverside	11:44	13:19	85.0; Dup. 80.6	6/27 = 0.24	High
	Industrial	11:58	13:22	354; Dup. 350		High
	Park W	12:09	13:24	62.9		High
	Park E	12:14	13:25	72.3		High
	UMC	12:35	13:26	26.3		High

### **Ideas from Stakeholders**

Collect field measurements from "Library Bridge" and "Hwy75 Bypass Bridge"

- Upstream and downstream of much but not all of Crookston Stormwater
- Does water quality change within City?

## **Community-Based Products**

- Surveys on water conservation, water ethics, stormwater knowledge, views of new flood control work (aesthetics and effects of removing dam), suggestions for downtown revitalization project, and willingness to participate
- 2. Rainwater Harvesting Workshops (rain barrel workshops)
- Develop community based Storm-Drain Marking/Stenciling program in cooperation with Red Lake Watershed District and River Watch
- Host water conservation and ethics events that connect community and river (Community Clean-up for Clean Water events where the community cleans up a stretch of River and/or storm drain inlets)
- Utilize conservation and aesthetic dimensions to expose community to various projects and businesses that bring attention to the Red Lake River
  - Flood control work (give community tours of the new flood control work and get feedback)
  - Downtown Revitalization (Focus on Red Lake River and community involvement)
  - Castle Park Project (Promote recreation and aesthetics of Red Lake River)
  - Riverview Health logo and its proximity to Red Lake River (Profile Riverview Health as an institution of healthy living and their connectedness to the Red Lake River). Could be a location for implementation of a Best Management Practice (green roof)

- 6. Connecting economic dimensions to the change in water conservation and ethics (water treatment for downstream communities and reduced maintenance and cost to city).
- 7. Connecting science and attitudes to increase "I want to" rather than "I have to."

### Management Practices/Actions

- 1. Infiltration trenches installed when houses are bought and demolished due to proximity to River
- 2. Rainwater harvesting by city for watering purposes (hanging baskets in town)
- 3. Use of green infrastructure in new developments and retrofits
- 4. Data collection of street sweeping how much is the street sweeper removing and what's in it?
- 5. Snow removal and disposal strategy that is focused on conservation of Red Lake River
- 6. Street sweeping and monitoring the contents

#### References

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