

# **A Review of Water Management Institutions in The Red River of the North Basin**

Robert R. Hearne

Department of Agribusiness and Applied Economics  
North Dakota State University

Charles Fritz

International Water Institute

paper presented at the

2006 National Monitoring Conference

**National Water Quality Monitoring Council**

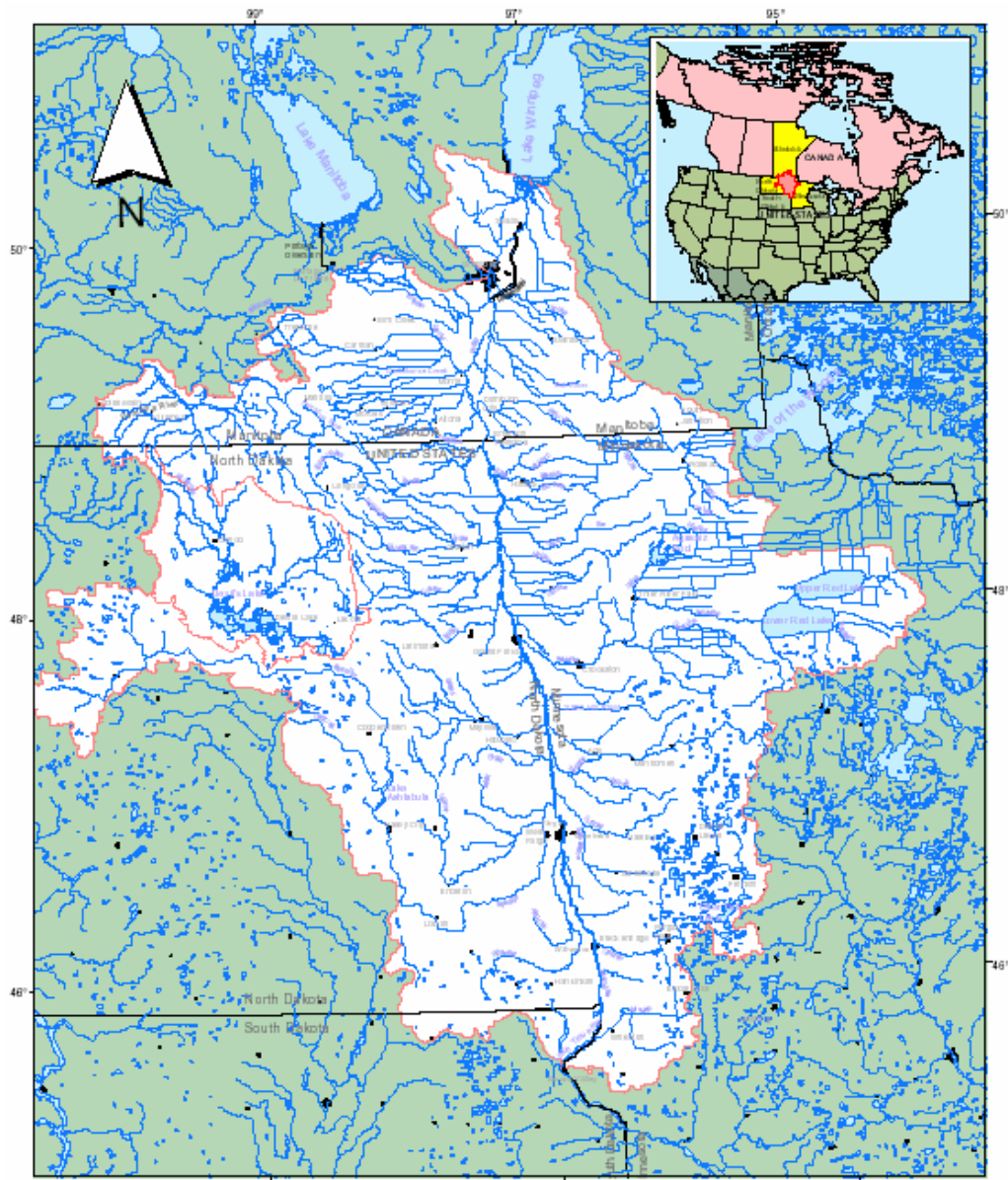
San Jose, California

May 10 2006

# Red River of the North Basin

An interesting case study of water management institutions:

- Two federal governments: US and Canada
- Two States and a Province: Minnesota, ND, Manitoba
- Three systems of water law:
  - riparian rights, Minnesota
  - prior appropriation, North Dakota
  - state control, Manitoba
- Many local jurisdictions, watershed districts, water boards, conservations districts etc.
- A fairly homogenous physical geography, but a variety of institutions, as a factor of different state/provincial priorities



**Red River Basin**  
(excluding Assiniboine River)

Map Projection - Lambert Equal Area  
 Central Meridian 100 degrees West  
 Reference Latitude 50 degrees North

Produced by:  
 Ryan Schmalzer, GIS Section  
 Biological Resources Division  
 Environment Canada  
 Scale 1:2,000,000  
 April 5, 1999  
 Version 2.0

**DATA SOURCES**

Land Use Characteristics Database  
 ESR: Digital Chart of the World  
 United States Geological Survey Database:  
 North Dakota, South Dakota, Minnesota

Water Survey of Canada  
 HYDAT and HYDEX Databases

Basin Boundary Data:  
 Canada: PFA Watershed Basin  
 United States: USGS 1:500,000 Hydrologic  
 Unit Boundaries

U.S.A. Gaging Stations / Canadian Hydrometric Stations		
Water Quantity	Water Quality	Water Quantity and Water Quality
● Active	● Active	● Active
○ Discontinued	○ Discontinued	○ Discontinued

— Red River Basin	— Devils Lake Basin (non-contributing)
■ Urban Area	Elevation of Devil's Lake 1445 ft = 440.44 m (NAVD 88)

2.5 0 25 50 75 100 Miles

40 0 40 80 120 Kilometers

## **Red River of the North Basin**

Located near the geographic center of North America  
45,000 square miles, about a third in Manitoba.

Population of 1.3 million

670,000 in Winnipeg

145,000 in Fargo – Moorhead

57,000 in Grand Forks – East Grand Forks

The land area is the remains of giant Glacial Lake Agassiz, and has excellent soils.

84% of land area is dedicated towards agricultural production.

Principal crops – wheat and sugarbeets

# Water Quality Monitoring

Water quality monitoring is conducted for:

Describing status and trends.

Describing and ranking existing and emerging problems.

Designing management and regulatory programs.

Evaluating program effectiveness.

Responding to emergencies (USGS 1995).

In the United States water quality policy has required water quality monitoring for listing impairments to established beneficial uses (section 305b report). Manitoba's Nutrient Management Strategy also includes monitoring as a crucial first step toward assessment and improvement.

# Water Quality Monitoring

A wide variety of Federal State, and local agencies monitor water quality.

The USGS maintains a data base of water quality indicators which can be accessed in real time.

In North Dakota and Minnesota both states monitor water quality through state agencies

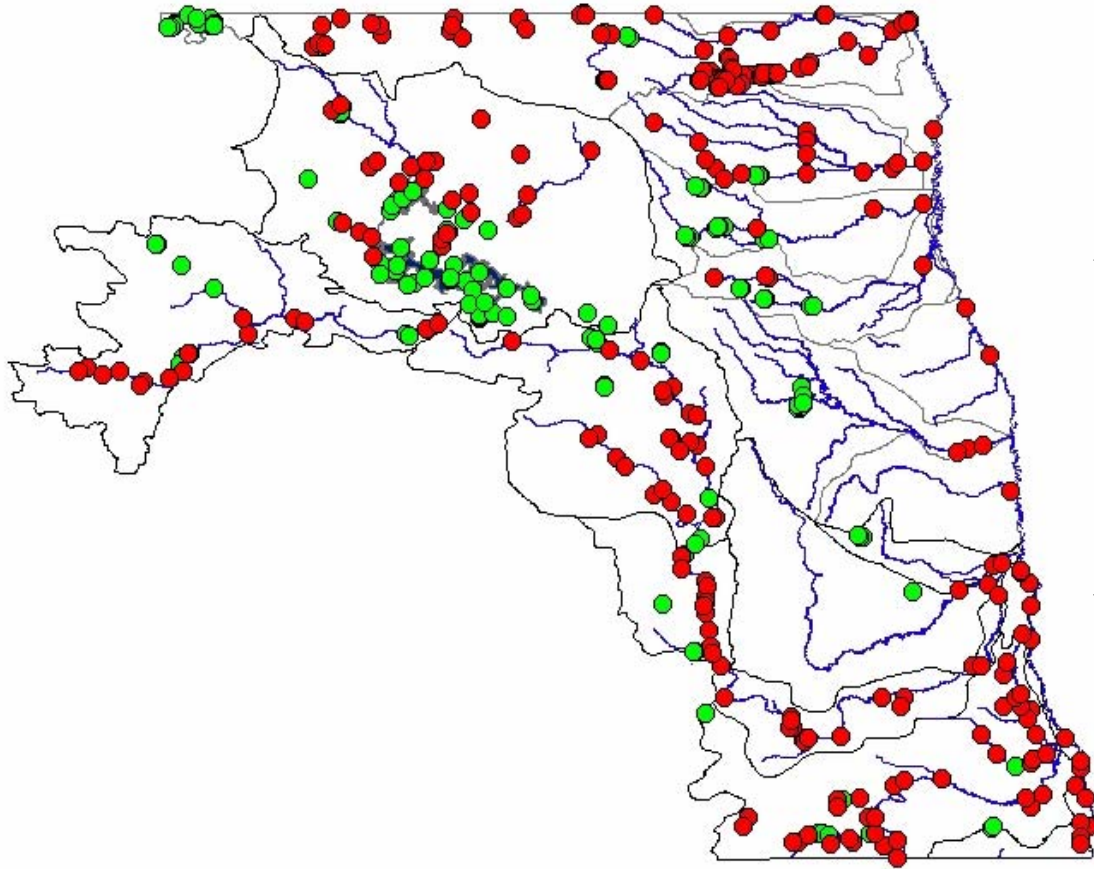
Minnesota Pollution Control Agency (MPCA)

Minnesota Department of Natural Resources (MDNR)

North Dakota Department of Health (NDDH)

Watershed Districts, water supply and wastewater treatment plants monitor water quality as well as a variety of volunteer and school programs.

# Water Quality Monitoring: North Dakota



North Dakota  
Department of Health's  
Water Quality  
Monitoring Sites in Red  
River Basin.  
Department of Health  
boasts a state-of-the-art  
lab.

Red rivers: green lakes

## North Dakota Water Monitoring Parameters

<b>Trace Elements</b>	<b>General Chemistry</b>	<b>Nutrients</b>	<b>Physical</b>	<b>Biological</b>
Aluminum	Sodium	Ammonia	Temperature	Bacteria
Barium	Magnesium	Nitrate-Nitrogen	Dissolved O2	Fecal Coliform
Arsenic	Potassium	Nitrogen	pH	Streptococcus
Antimony	Calcium	Total Kjeldahl		
Boron	Manganese	Total Phosphorous		
Cadmium	Iron			
Chromium	Chloride			
Copper	Sulfate			
Lead	Carbonate			
Nickel	Hydroxide			
Selenium	Alkalinity			
Silver	Hardness			
Thallium	Total Dissolved Solids			
Zinc	Total Suspended Solids			

# Water Quality Monitoring: Minnesota

Minnesota currently monitor water of the state to accomplish three main objectives.

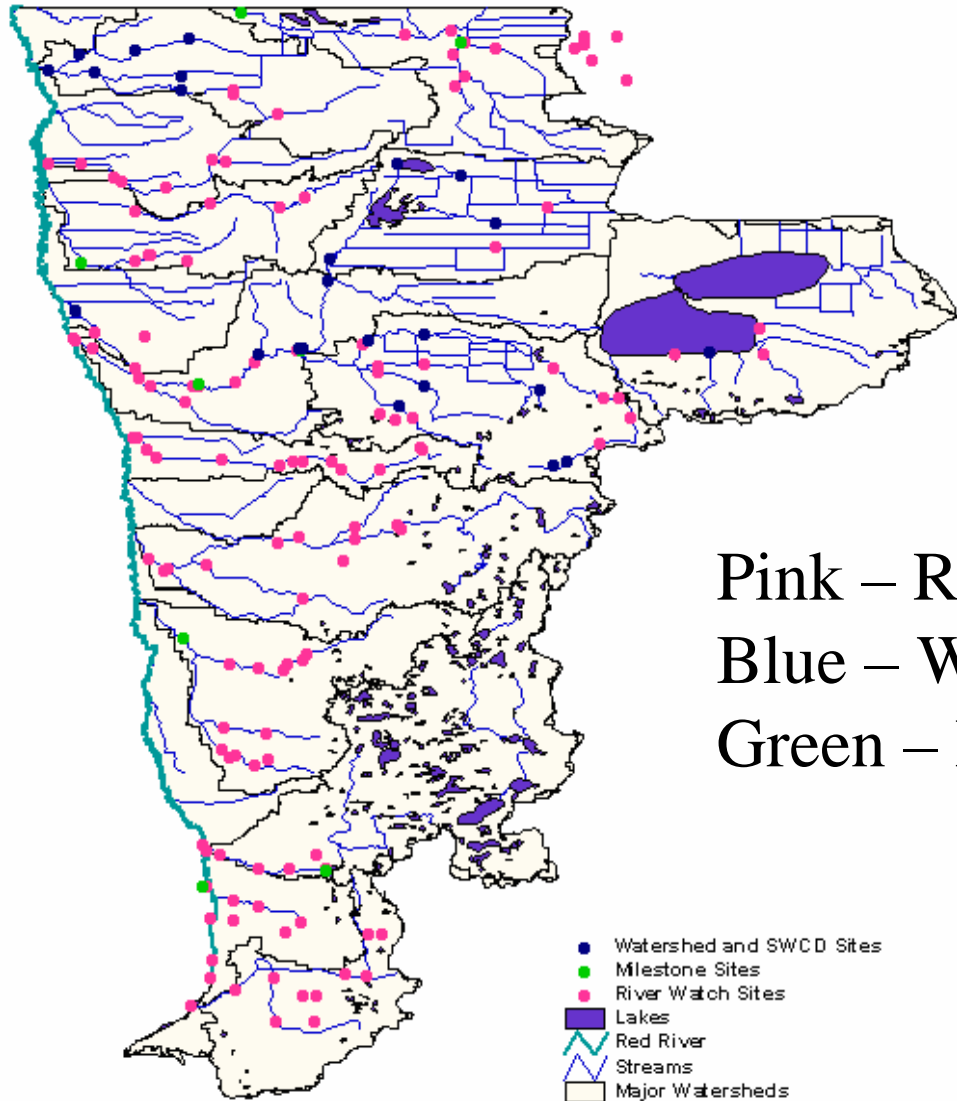
1. Condition Monitoring – used to identify the overall environmental status and trends (chemical, physical, and biological)
2. Problem Investigation Monitoring – investigating specific problems to determine actions necessary to return the resource to a condition that meets standards (i.e. TMDL).
3. Effectiveness Monitoring – determine the effectiveness of specific management actions.

# Water Quality Monitoring: Minnesota

In Minnesota, the MPCA maintains a number of water quality monitoring stations. In addition the MPCA has collaborated with volunteer and high school based monitoring network “River Watch.” River Watch has 160 schools. A larger network of monitoring efforts includes watershed districts, state agencies, and universities. These efforts were initially funded through state and Federal grants with support of state agencies and universities.

However for regulatory needs, such as establishing TMDLs, MPCA only recognizes data generated by certified labs. Thus all samples are brought to the MPCA lab.

# Minnesota's network of monitoring efforts



Pink – River Watch

Blue – Watershed Districts

Green – MPCA Milestone sites

# Water Quality Monitoring : Minnesota

## Minnesota's Water Quality Parameters

<b>Physical</b>	<b>Nutrients</b>	<b>General Chemistry</b>
Temperature	Total Phosphorous	Chloride
Dissolved Oxygen	Nitrate - Nitrite	Total Suspended Solids
pH		
Conductivity		

## **Water Quality Monitoring : Minnesota**

A MPCA assessment of the quality of information received from watershed districts' monitoring efforts showed poor reporting and data storage protocols. Training needs were identified for district personnel and training was offered.

The River Watch school program has achieved trust within the state. Methods have been standardized across schools. River Watch has expanded, slowly, into North Dakota.

In the Fargo Moorhead boundary area a voluntary program "River Keepers" produces samples that when analyzed in official labs can be used for TMDL monitoring.

# Water Quality Monitoring : Minnesota and North Dakota

A comparison of the US Red River Basin's impaired waters found at the US EPA's web site <http://cfpub.epa.gov/surf/> found some interesting similarities and differences.

Because of local input into the beneficial use and standard setting process North Dakota and Minnesota use different terms for the same water quality indicators

<b>Minnesota</b>	<b>North Dakota</b>
TURBIDITY	SEDIMENTATION/SILTATION
FCA (MERCURY)	MERCURY (FISH TISSUE)
LOW OXYGEN	DISSOLVED OXYGEN

# Water Quality Monitoring : Minnesota and North Dakota

In all segments of the bordering Red River impairments were almost identical.

Minnesota does have a greater range of biological indicators with 31 incidences of fish consumption advisories (FCA) for PCBs and 11 incidences of FISH COMMUNITY RATED POOR in 125 reporting river segments.

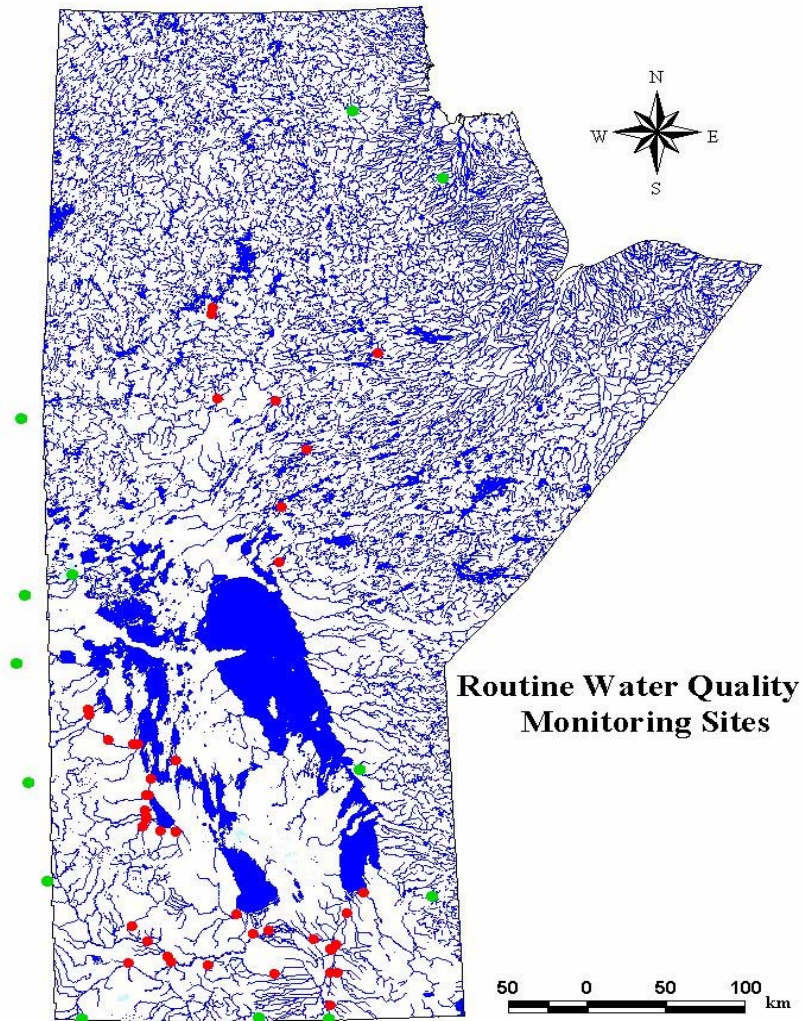
However the principle difference in official water quality monitoring is Minnesota's wider acceptance of monitoring information from non-state agency sources. Problem Investigation Monitoring such as TMDL establishment requires official certified laboratories. But samples can come form a variety of sources

## **Water Quality Monitoring : Manitoba**

Federal and Provincial agencies monitor water quality in Manitoba but new regulation will establish the need for increased monitoring.

Current algae blooms in Lake Winnipeg has led to increased concern for water quality and nutrient loading in Manitoba. Studies show that the leading input of nutrients into Lake Winnipeg is from the US portion of the Red River, with 32% of phosphorus and 22% of nitrogen intake.

New regulations, under the 2005 Water Protection Act will establish the need for increased water quality monitoring. Decentralized watershed management is stressed. Public consultation is ongoing.



Manitoba's network of monitoring efforts.

Red sties -  
Environment Canada

Green sites – Manitoba  
Water Conservation

## **Conclusions and Observations**

Despite the Manitoba's concern for nutrients, primarily phosphorus, Minnesota and North Dakota do not have listed impairments for phosphorus. Each river segment would need to have its own phosphorus standard, since naturally occurring levels of phosphorous are heterogeneous.

The Red Rive Basin Commission, a semi-governmental collaboration, has established a goal of 10% reduction of phosphorus in the US portion of the Red River. This will require increased monitoring and beneficial use standards.

## **Conclusions and Observations**

Minnesota and North Dakota conduct water quality monitoring in accordance with the Clean Water Act.

Volunteer, high school, and community monitoring is well established in Minnesota and is spreading into North Dakota. These efforts serve the needs of Condition monitoring and environmental education. Regulator monitoring to improve impaired waters needs the quality control of official monitoring efforts.

Manitoba's new legislation and regulations will expand the need for monitoring.