Assiniboine River: Across the Watershed

Introduction

The Assiniboine River watershed stretches from its headwaters in eastern Saskatchewan to the City of Winnipeg at the confluence with the Red River. The Assiniboine River basin is approximately 41,500 km² in size (excluding the Qu’Appelle and Souris River basins). About 60% of the basin is located within Manitoba (Figure 1). Land use in the basin is dominated by agriculture. Population in the basin is estimated to be about 100,000 excluding residents of the City of Winnipeg.

Throughout the long period of known history for the region, there has been a close association between the Assiniboine River and the people that live along its banks. The connection between the river and surrounding communities was important for First Nations long before early European settlement, and is no less important today for all residents of the basin. The Assiniboine River was the ancestral boundary between the Cree, who hunted north of the river in the land of small sticks and the Dakota/Assiniboine (Sioux Nation) who hunted south of the river in the land of no sticks, the prairie. In about 1744, the explorer La Verendrye established Fort de la Reine near the site that would eventually become Portage la Prairie. In 1818, the townsite of Brandon was established in the Assiniboine River valley as a major divisional point for the Canadian Pacific Railway. Today, many communities line the Assiniboine River valley.

The Assiniboine river is used for recreational activities such as boating, canoeing, water skiing, fishing, and swimming. Day-use and camping facilities can be found along the length of the river. Excellent campgrounds are located at Lake of the Prairies and Spruce Woods Provincial Park, and angling access is available at a number of locations. The Assiniboine River provides essential habitat for about 40 species of fish, while its shoreline supports numerous plant and animal species. The Assiniboine River serves as the raw water source for the cities of Brandon and Portage la Prairie. Water drawn from the river is also used for irrigation and for facilities such as food processing industries.
Demand for Assiniboine River water continues to increase as the economic, environmental, and social landscape of the region changes. While considerable knowledge is presently available, it is recognized that more detailed, site-specific information on the river's hydrology, biology, and chemistry is required to ensure that future regional economic, environmental, and social changes can occur in a sustainable manner. Several stakeholders within the watershed have joined together to: 1) determine instream flow needs; and 2) develop a water quality model of the Assiniboine River.

**Part One: Determine Instream Flow Needs to Support a Healthy Biological Community**

Like many surface water sources in southern Manitoba, the Assiniboine River may be approaching full allocation. The need to reserve water to sustain aquatic ecosystems is becoming increasingly important. It has been estimated that the Assiniboine River has an annual supply volume of 135.7 million cubic metres of which 86.3 million cubic metres are currently allocated to industrial, municipal, and agricultural needs. An unallocated reserve of 28.4 million cubic metres is held for priority uses including instream flow needs, leaving 21.0 million cubic metres for additional consumption or to meet ecosystem instream flow needs. It is evident that the availability of water may become the most important limiting factor to development along the Assiniboine River.

The Instream Flow Working Committee began the process of developing instream flow recommendations for the Assiniboine River in February 2001. The committee includes Federal Department of Fisheries and Oceans personnel, Manitoba Conservation personnel from several branches and regions, and representation from the University of Manitoba. Available methods to determine instream flow recommendations were assembled in 2001. The necessary data were collected in the fall of 2001. Assessment of this information is on going. It is expected that preliminary recommendations will be available in 2002.

The committee is developing recommendations for managing flows in the Assiniboine River to maintain the biodiversity of native species, sustain the integrity of the natural habitat of the river, and provide support to economic and social activities along the river. The resulting instream flow recommendations for the Assiniboine River will provide flow variability both within and between years.

**Part Two: Develop a Water Quality Model for the Assiniboine River and Derive Total Maximum Daily Loads for Major Pollutants**

Major water quality modelling studies are underway in three distinct reaches of the Assiniboine River. Water quality models are tools used to predict water quality impacts that may occur as a result of changes in land-use activities or changes in the direct discharge of treated liquid effluents.
Reach One (Lake of the Prairies to Brandon): Manitoba Conservation

Manitoba Conservation’s Water Quality Management Section in partnership with Red River College’s Civil Technology Program is developing a water quality model for the Assiniboine River between Lake of the Prairies and the City of Brandon. It is expected that results from this model will provide critical information regarding the upstream portion of the watershed and will be used as input for downstream models generated by the cities of Brandon and Portage la Prairie (see below). The model will also form a part of the Water Quality Management Section’s Nutrient Management Strategy by providing information about the relationship between nutrients and algal growth.

Water sampling, surveying and modelling began in May 2001 and will continue through 2002. Twenty-four water quality stations have been established on the Assiniboine River and five of its tributaries (Qu’Appelle River, Little Saskatchewan River, Birdtail Creek, Gopher Creek, and Arrow River). Existing water quality and hydrology data have been compiled. A computer-generated model of the land surface (triangulated irregular network - TIN model) has been developed for the main stem of the Assiniboine River between Shellmouth and Brandon. The TIN model will be linked with the water quality model, aerial photographs, soil classification, and land use to aid in identifying non-point source inputs to the Assiniboine River.

Through Manitoba Conservation’s partnership with Red River College, much of the work on Reach One is being done by students employed through co-operative education programs. In addition, students in the Civil Technology Program will contribute to modelling Reach One through Geographical Information Systems (GIS) and hydrology course work.

Reach Two (Brandon to Portage la Prairie): The City of Brandon

The City of Brandon has been studying the Assiniboine River between Brandon and Portage La Prairie since the fall of 1998. The study is addressing two issues: 1) the effect of effluent addition on the aquatic environment at and downstream of the City of Brandon waste water treatment facility, with particular focus on ammonia and dissolved oxygen; and 2) the effect of nitrogen and phosphorus inputs on the growth of algae and the effects that this may have on downstream water uses.

Water quality models have been developed for both winter and summer conditions. Winter model results indicate that ammonia inputs at Brandon should not cause levels in the river to rise above guideline levels, based on predicted ammonia loadings. Model results suggest that, under extensive ice cover, oxygen levels may drop below guidelines. Many factors besides ice cover affect oxygen levels downstream of Brandon, including the concentration of oxygen in water upstream of Brandon, the amount of oxygen used by bacteria breaking down organic material in the river bottom and water, and the amount of organic material in the effluent discharged at Brandon.

Summer data were collected during high flow conditions in 1999 and lower flows in May and June 2000. Accurate calibration of the models for low flow conditions (when problems associated with
several water quality parameters would be most likely) is dependent on collection of additional samples during low flow periods. Intensive water quality sampling for model validation will be resumed when low flow conditions occur.

Model results indicate that the algae attached to rocks (periphyton) play a critical role in nutrient cycling in the Assiniboine River immediately downstream of Brandon. While free-floating algae (phytoplankton) form a main component of most water quality models, periphyton is not currently included in widely used water quality models. Attempts are currently underway to modify these models to include periphyton and future work on this section of the Assiniboine will consider use of these modified models.

Reach Three (Portage la Prairie to Headingley): The City and Rural Municipality of Portage la Prairie

The City of Portage la Prairie has recently launched a study of the Assiniboine River between Portage la Prairie and Headingley. Following a preliminary site assessment in late fall 2001, intensive data collection began in late February 2002. The study is projected to continue over a three-year period. A water quality model will be developed for this reach to address issues associated with dissolved oxygen, nutrients and algae, and ammonia. A detailed workplan is underway and the first progress report is expected in late fall 2002.

Working Towards a Single Water Quality Model for the Assiniboine River

Water quality models generated for each reach will be combined to produce a single, comprehensive model of the Assiniboine River. The resulting model will be available to assist in estimating the capacity of the Assiniboine River to assimilate discharges of treated waste waters from municipal and industrial facilities and run-off from land-use activities while functioning as part of a healthy ecosystem and providing clean, safe water to residents of the basin. The model will serve as a useful planning tool to guide economic, environmental, and social development along the Assiniboine River.

Please watch for future updates on the Assiniboine River study.

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