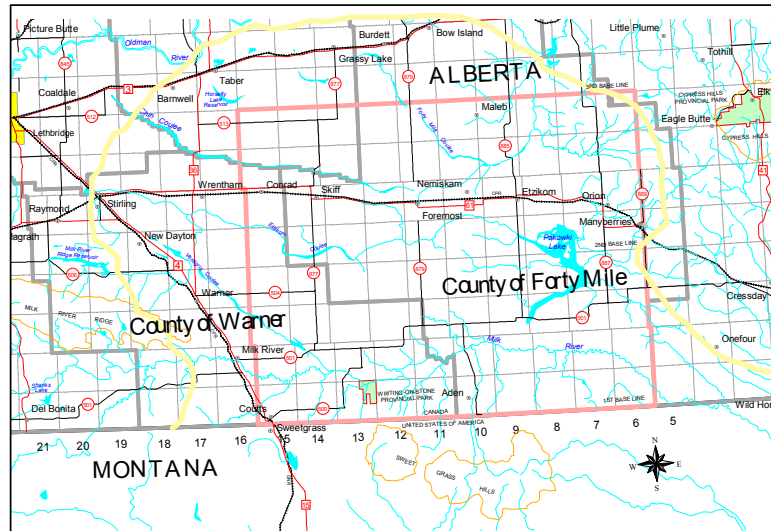


EVALUATING MILK RIVER AQUIFER DEPLETION IN THE COUNTIES OF FORTY MILE AND WARNER, ALBERTA

The Milk River Aquifer

The Milk River Aquifer is a regional sandstone aquifer that underlies a large area of southern Alberta (see Figure). Depth to the aquifer varies across the area: the aquifer crops out along the Milk River in the vicinity of Writing on Stone Park and lies as deep as 150 to 300 m or more in other areas. Falling water levels in the aquifer have been noted by some well owners for over 40 years. This fact sheet summarizes the key findings presented in a recently completed study carried out to assess the degree of depletion within the Milk River Aquifer. The study area, within which more severe aquifer depletion was suspected, is shown on the Figure to the right.



Background - Previous Studies on the Aquifer Depletion Issue

In 1960, Peter Meyboom of the Research Council of Alberta published a comprehensive report on the geology and groundwater resources of the Milk River Sandstone in Southern Alberta. Meyboom wrote that:

“There has been depletion of the aquifer since development began.... On the average, the piezometric surface has been lowered 20 feet since 1937. In some areas of heavy withdrawal (Pakowki Lake, Foremost) this value is as high as 100 feet..... At the present rate of withdrawal from storage and with very careful development, this reserve should last 200 years. In local cases, depletion will be reached sooner..... the present situation justifies an extensive conservation program.”

In response to Meyboom’s findings, in the early 1960's Alberta Environment started to monitor water levels near Foremost. In addition, as recommended by Meyboom, a pilot program of well control and abandonment (reclamation) was undertaken in 1961 by the Oil and Gas Conservation Board of Alberta.

By the mid-1980's, Alberta Environment recognized that a review of the Milk River Aquifer depletion issue was required and steps were undertaken to gather more data. Several additional observation wells were installed into the aquifer in the mid-1980's and, in 1989, water level data from over 500 water wells was collected. Additional pump testing and water quality sampling and testing was also carried out at that time to verify aquifer conditions and to determine if any changes in water quality had occurred since the Meyboom samples were taken. Analysis of this data, including the development of a computer model of the aquifer occurred during the early 1990's. No formal report was ever finalized.

Formation of the County Task Force

In 1992, in response to chronic water shortages in some areas of the County of Forty Mile and the recognized need for orderly water development planning across the County of Forty Mile, “the County of Forty Mile Rural Water Development Task Force” was formed. The importance of the Milk River Aquifer as a regional water supply source was recognized by the Task Force, and one of their goals was to work with the provincial and federal governments in ensuring that the Milk River Aquifer is managed for the benefit of all current users as well as for future generations. A first step was seen to be completion of a report on the state of depletion within the aquifer.

The Task Force also made efforts to promote the proper decommissioning of inactive or abandoned wells. This effort was assisted financially by the federal government, through the Prairie Farm Rehabilitation Administration (PFRA). Since 1997, PFRA has had in place a program to assist well owners in properly abandoning unused wells.

In the spring of 1998, the County Task Force was successful in obtaining sufficient funding to hire a Consultant to review all available historical well data, collect new data as required, and prepare an assessment report that answered the following key questions:

- Is the Milk River Aquifer being depleted?
- If so, how significant is the depletion? where are the most critical areas? at what rate is depletion occurring in different areas?
- What are the causes of the aquifer depletion and what can be done now and in the future to prevent the aquifer from being further depleted?

Funding partners for the study included the County of Forty Mile, the County of Warner and the federal and provincial governments. All partners were committed to meeting the goal of responsible aquifer management. The study was carried out by Agra Earth and Environmental Limited of Edmonton and the key study results and recommendations are summarized below.

Results of the 1998 study

Water wells in the aquifer

The earliest recorded wells installed into the Milk River Aquifer were in 1910. Most of the older wells have been abandoned or are unused due to corroded well casings, sand pumping and other reasons. Proper decommissioning of unused wells has rarely been done.

Within the study area, the precise number of wells completed into the Aquifer is unknown but the current best estimate is 1041 wells. Of this total, about 681 wells appear to be in active use, 88 are not in use (but can be located for proper abandonment), 14 have had the casing pulled and been ploughed over, and 9 have been cemented off. The status of 249 other wells is unknown.

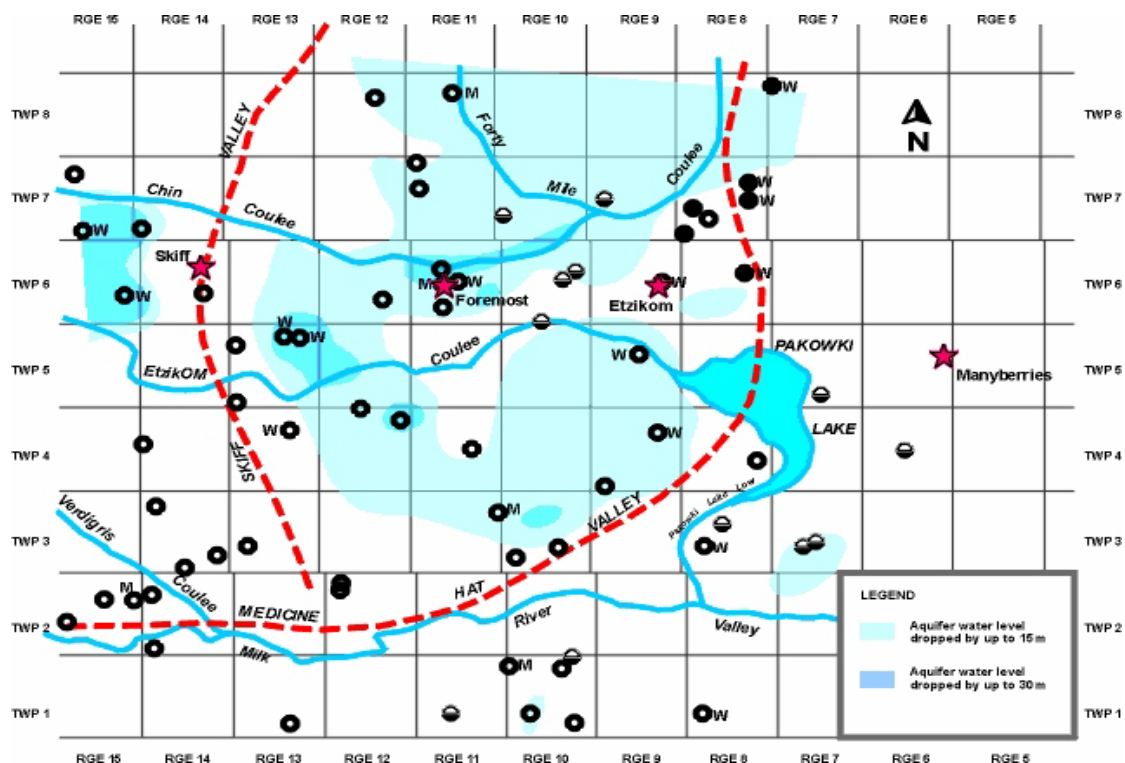


Current status of the Milk River Aquifer

A map of the change in aquifer water levels, between the late 1950's and the 1980's-1990's period was prepared by the Consultant and is shown below. The areas of most severe water level decline are shown hatched. The figure shows that:

- the recent water levels are considerably lower over most of the central and northern parts of the area. This is the area where aquifer depletion is most prominent.
- The greatest water level decline is in the vicinity of some of the high-producing licensed wells. The town of Foremost is the highest known water user in the area and obtains its supply from three wells. At Foremost, there was an approximate 40 m drop in water level between 1957 to 1985 (avg drop of 1.33 m/year) and a lesser rate of decline from 1985 to 1997. The slower water level decline after 1985 may be due to a steadying of water usage by the town.
- Water level declined less in the area around Pakowki Lake and in areas to the south. In some areas to the south and southwest, water levels are relatively unchanged.

The figure does not show total drop in water level since the aquifer was first developed. For example, for the Town of Foremost wells, the total drop in water level since initial well installation in 1923 has been about 90 metres over the last 70 years. The Consultant's assessment is that the aquifer can supply town needs (assuming no increase from current usage) for at least another 70 years. Continued pumping of this well will affect water levels in nearby wells and flow rates of wells in Chin Coulee.



A comparison of water quality samples taken in recent years with those taken in 1937 by the Geological Survey of Canada and in 1958 - 1959 by Meyboom, indicates no significant changes in water quality have occurred within the study area.

Water Use and Water Wastage

Total water usage from 1960 to 1992 approximately doubled, due mainly to a substantial increase in the number of livestock (16,000 head in 1960; an estimated 100,000 head in 1992).

Water use (or wastage) from individual flowing wells in many cases exceeds 4.5 million litres per year, but the vast majority are unlicensed. For the study area, total water wastage, represented by unused water flowing to waste from flowing wells was estimated to be about 288 million litres per year (508 L/min or 112 igpm) in 1992. This volume is estimated to be about 10% less than that being wasted in the early 1960's.

Although flow rates in many wells have diminished since the early 1960's there are still many wells flowing at rates over 45 L/min (10 igpm).

Groundwater Conservation - The Next Steps

The following mitigation options or strategies were recommended in the Consultant's study to reduce or halt aquifer depletion:

1. **Establish a Groundwater Management Committee** to promote good, sound management of the Milk River Aquifer. The Committee make up should include single representatives from the County, the Province and PFRA, with the balance (up to 7 of 10) of the positions to be filled by local stakeholders: the Town of Foremost, major water co-operatives, ranchers, farmers, etc.
 2. Through the Groundwater Management Committee, **establish a public education and awareness program** to educate/inform the community about the need for water conservation from the Milk River Aquifer.
 3. **Improve and enforce existing water well regulations and water well licensing to control flows from all actively used flowing wells** completed in the Milk River Aquifer. Enforcement should only be required if public education efforts are ineffective. Under the current Water Well Regulation of Alberta's Environmental Protection and Enhancement Act, flowing wells are not allowed to flow at a rate in excess of the lesser of the water requirement of the well owner, and 100,000 litres per week. By this regulation, open flow rates in excess of 10 L/min (2.2 igpm) are not allowed.
 4. **Identify and decommission (reclaim) or cap**, in accordance with the Alberta Water Well Regulation, **all unused flowing and non-flowing wells** completed in the Milk River Aquifer.
 5. **Install additional observation wells** to the existing Alberta Environment monitoring well network. A groundwater monitoring program that would address both changes in aquifer water levels and water quality should be maintained.
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