Manitoba

Hydrology Input for Rat-Marsh River IWMP

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Outline

- Project Scope/Objectives
- Rat River Watershed Overview
- Review of Past Studies
- Field Tour
- Existing Projects
- Potential Water Storage Locations (incomplete)

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Project Scope/Objectives

- Expanded IWMP submission
  - General hydrology information
  - Water retention study
- The goal is to provide a summary of past work and current ideas for water retention
- A place to move forward from to solve surface water issues

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Project Scope/Objectives

- Project Steps:
  - Synthesis of existing documents
  - Field tour and public meeting
  - Establish list of potential sites

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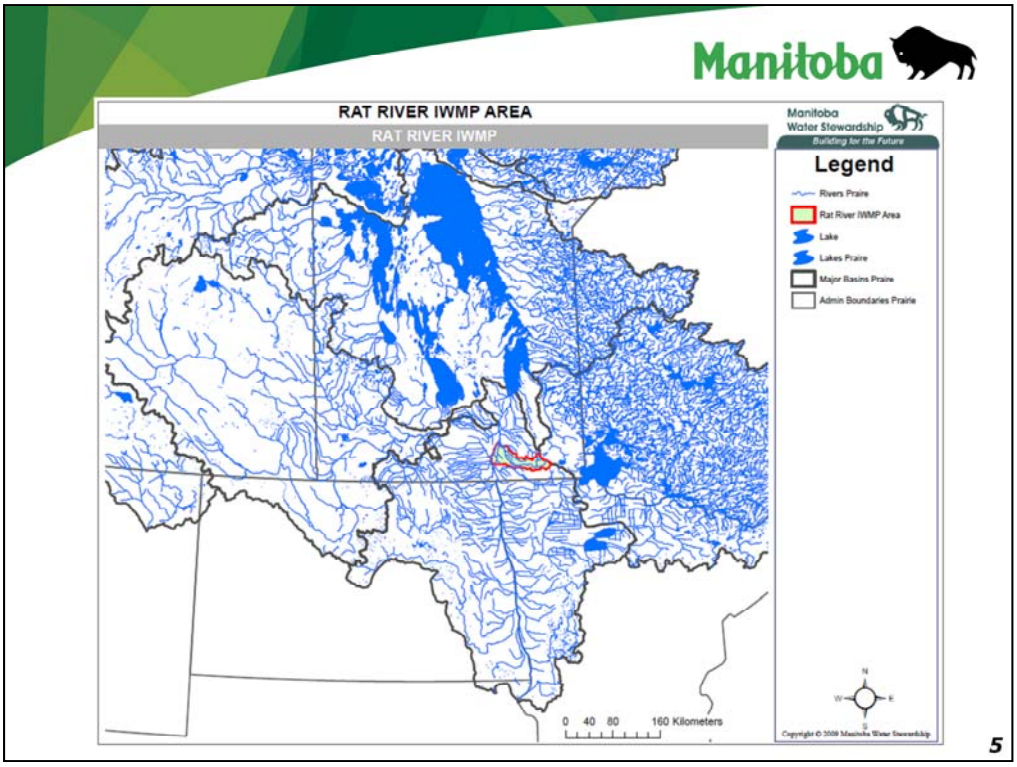
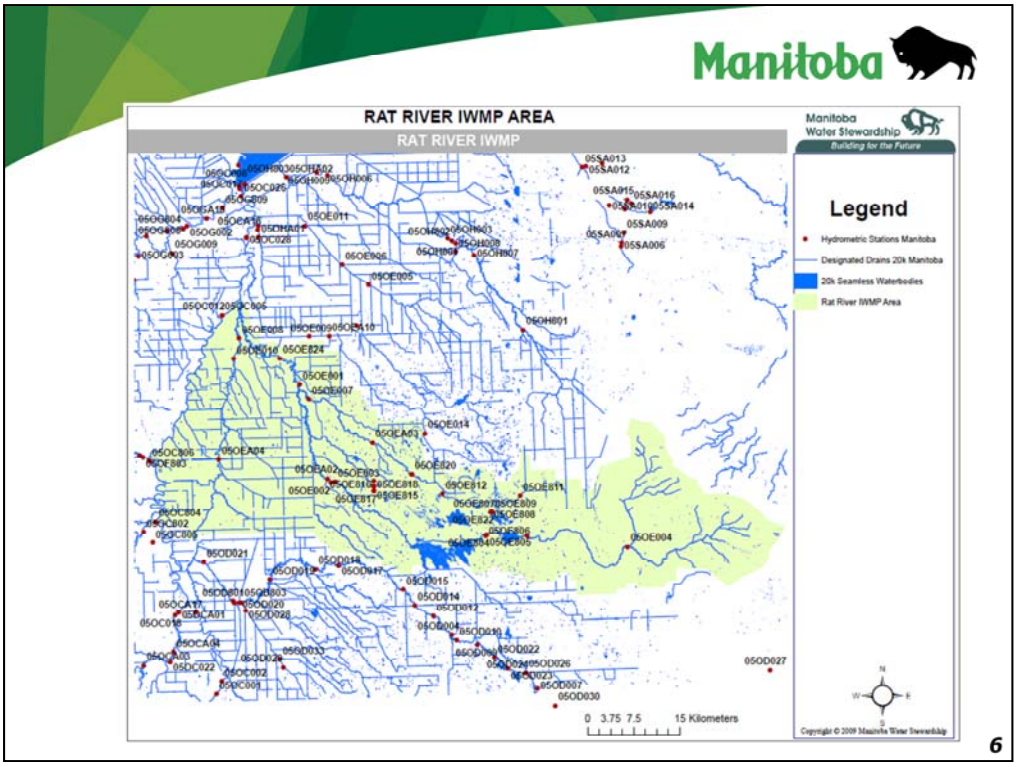


The Rat River planning area is located in southeast Manitoba. The Rat River confluences with the Red River approximately 20 km south of Winnipeg, MB, or approximately 4 km northeast of the Village of Ste. Agathe. The planning area includes the areas draining into the Rat River, Marsh River and Joubert Creek. The popular recreation Lake St. Malo is also included in the planning area.

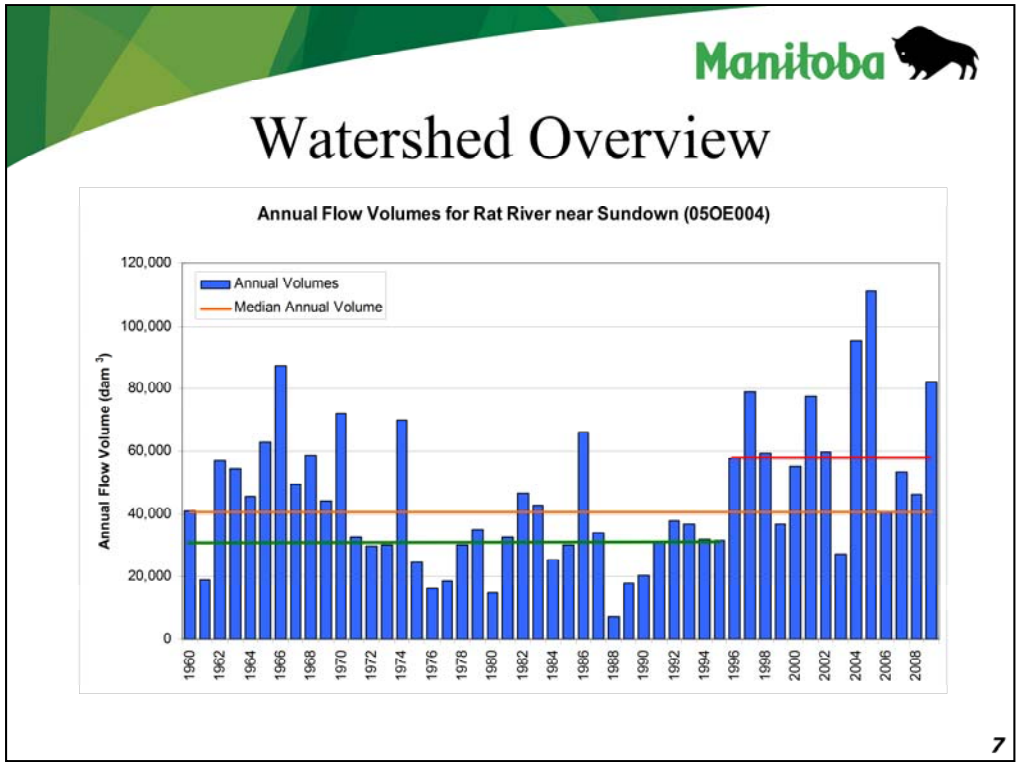
The planning area in this case is a watershed, but is made up of a number of sub-watersheds including Joubert Creek, Rat River, and Marsh River. By definition, a watershed is the land area that contributes surface water runoff to a common point. It is separated from adjacent watersheds by a land ridge or divide. Watersheds can vary in size, from a few acres to thousands of square kilometers. A larger watershed can contain many smaller sub-watersheds which are defined in the same manner as a watershed. On a larger scale, a basin is defined as a collection of watersheds that feed into a common main tributary or large body of water (e.g. the Red River Basin). A sub-basin is a division of a basin and will be made up of multiple watersheds.



The collection of hydrometric data is critical to the understanding of the availability, variability and distribution of water resources and provides the basis for responsible decision making on the management of this resource. Historic hydrometric data provides the basis for understanding the potential extent and limitation of the resource. Water level and stream flow data collected under the Canada-Manitoba Hydrometric Agreement, which is part of a National Hydrometric Program, supports activities such as policy development, operation of water control works, flow forecasting, water rights licensing, water management investigations and hydrologic studies, ecosystem protection and scientific studies. Environment Canada, the Province of Manitoba and Manitoba Hydro operate 143 discharge and 133 water-level gauging stations under this Agreement.

Streamflow or water level data have been collected at hydrometric gauging stations within the planning area since 1912. The locations of hydrometric stations are shown on the slide.

The Rat River, Marsh River, and Joubert Creek all have long records of 40 years or more of data, up to and including 2010 flows.



The daily discharge data the Rat River were statistically analyzed. Annual flow data are shown in the slide above. During the recorded data there is a large inter-annual variability as large flow years have more than ten times the volume of low flow years. The lines on the graph represent the median flow volume for the length of the line. It is clear that from 1996, the flows have been much larger than the previous 35 years.

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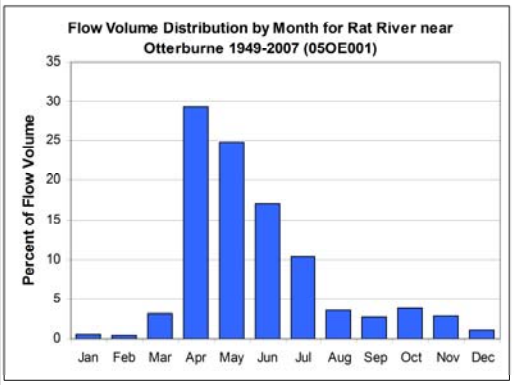
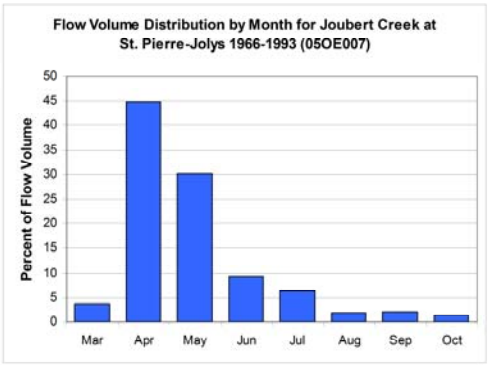
Watershed Overview





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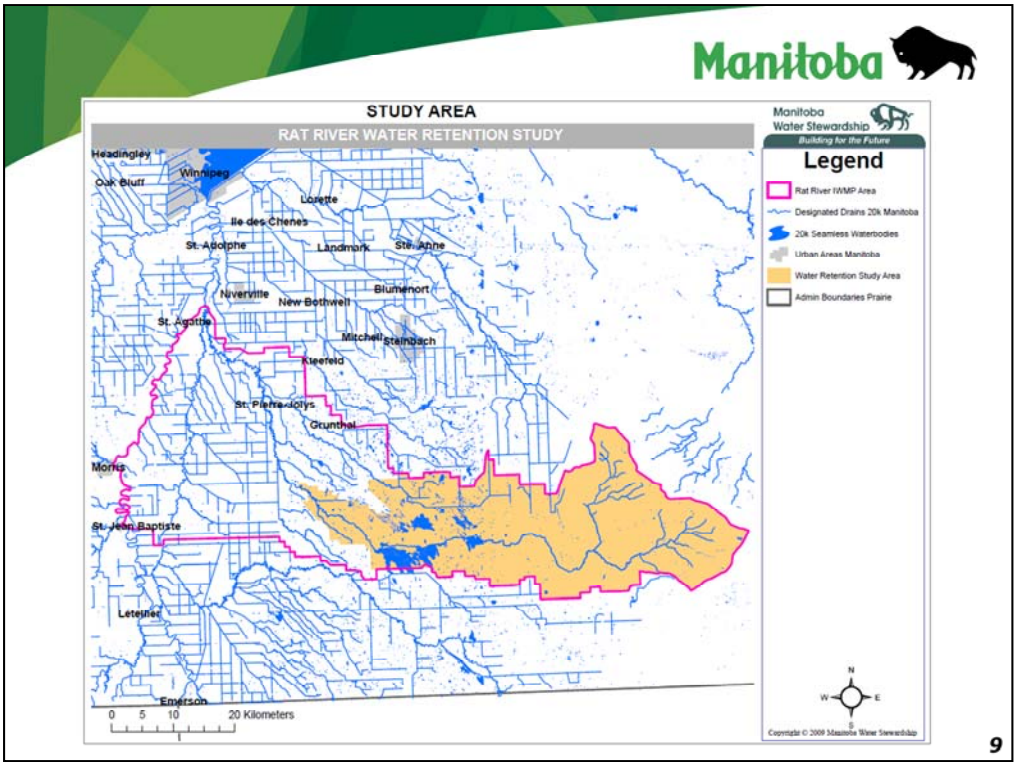
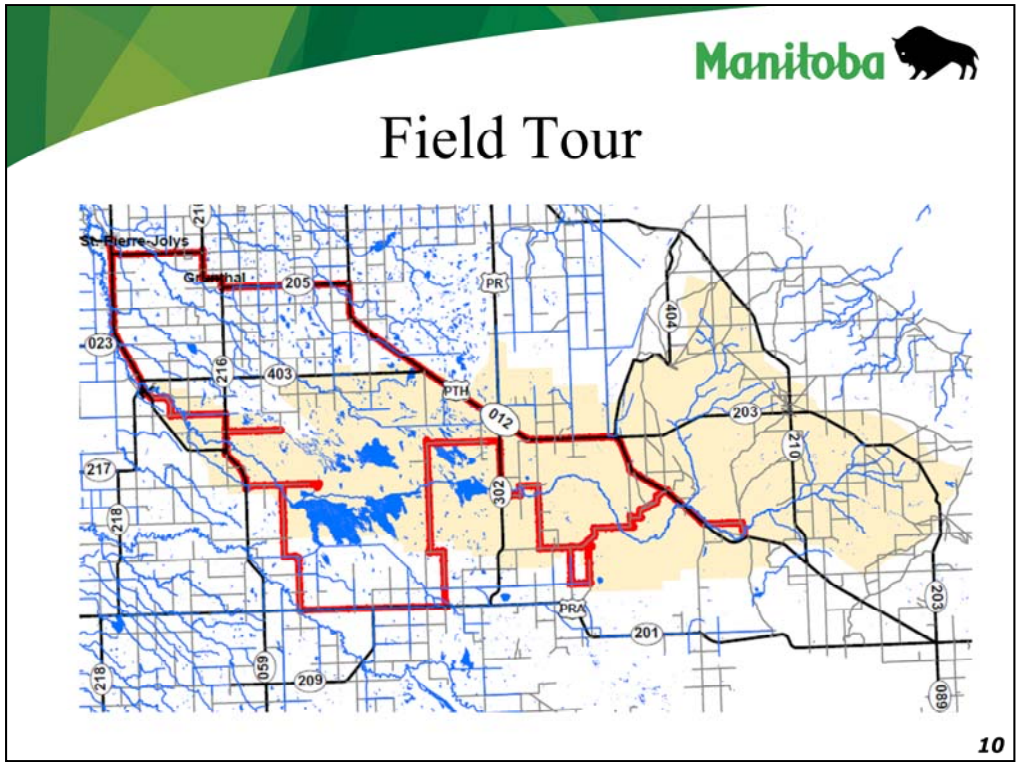
The flow distribution is similar to other streams on the Canadian Prairies. Stream flow is concentrated in the spring months as the snow melt contributes large volumes of flow.



The objective of this portion of the watershed assessment is to identify potential water storage sites in the Upper Rat River Watershed. Projects were identified from previous studies, a field tour in fall 2009, and public input from meetings in 2010.



A field tour of current and potential water retention sites was held on November 30th, 2009. The purpose of the tour was to provide a first hand experience of the watershed to the study including perspectives from people with local knowledge of the sites.

Participants in the tour included:

Mark Lee – Hydrologist, Manitoba Water Stewardship

Duane Kelln – Senior Hydrologic Engineer, Manitoba Water Stewardship

Patrick Watson – Watershed Planner, Manitoba Water Stewardship

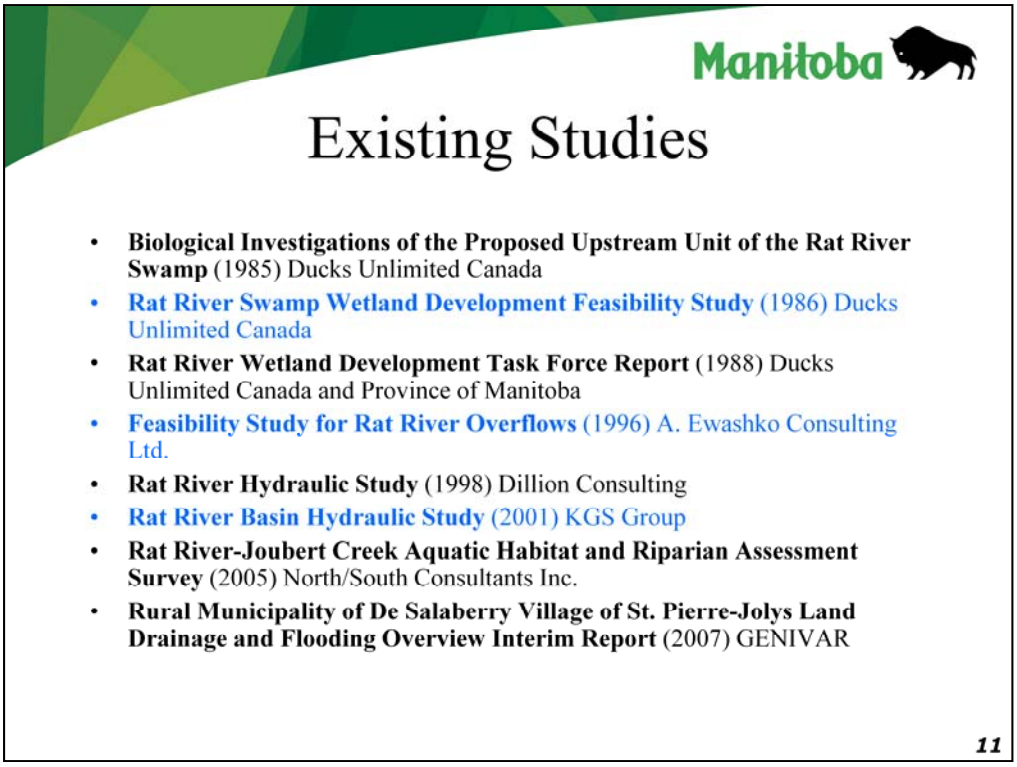
Jodi Goerzen – Project Manager, Seine-Rat River Conservation District

Gerry Maynard – Councillor, R.M. of De Salaberry

Jules Gosselin – Rat River sub-district member, Seine-Rat River Conservation District

Jim Swidersky – Reeve, R.M. of Stuartburn

Ed Penner – Councillor, R.M. of Stuartburn



The above list provides the previous surface water studies have been conducted for the Rat River Watershed.

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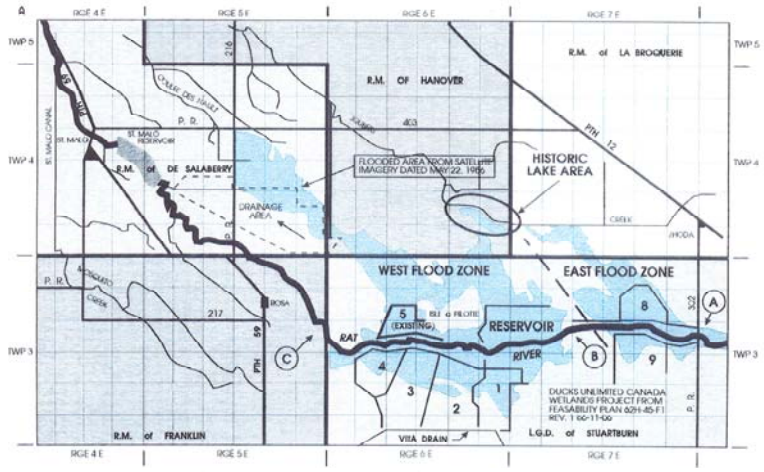
Existing Studies

- **Rat River Swamp Wetland Development Feasibility Study** (1986)
  Ducks Unlimited Canada



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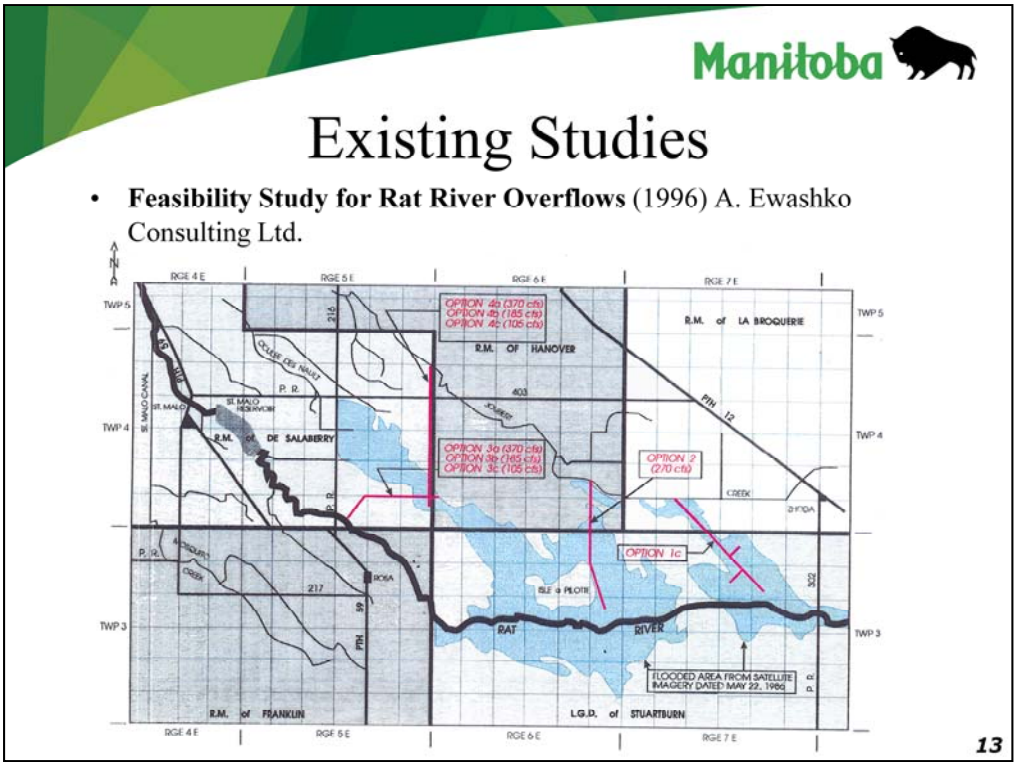
The report outlines two options to develop the Rat River Swamp areas in Township 3 Range 7E. The development would consist of a seven cell wetland complex and a flood storage reservoir. The second option was approximately 10% larger in surface area and required the acquisition of private land. Both options were considered viable after a cost-benefit analysis was completed. The projects were not considered viable from flood protection benefits alone, however when wildlife benefits such as waterfowl production, harvesting fish for stocking, and muskrat were considered the cost-benefit ration was close to or greater than one.

On the November 2009 watershed tour, the interest in building more cells remains high. The cost-benefit ratios of constructing the other cells are no longer current and would need to be re-evaluated if the project was to be reconsidered.



The study revisited the problem of overbank flows of the Rat River in the vicinity of the Rat River Bog. The report was a “desk-top study” and employed information from previous reports, studies, and surveys to report and evaluate flood reduction options. Five options for containing or diverting flood waters are presented along with preliminary cost estimates. Recommendations were provided and include a combination of the options presented.

The Feasability Study for Rat River Overflows developed five options to resolve flooding in the study area:

•Containment of Rat River overflows east of Isle a Pilotte (Ewashko Option 1)

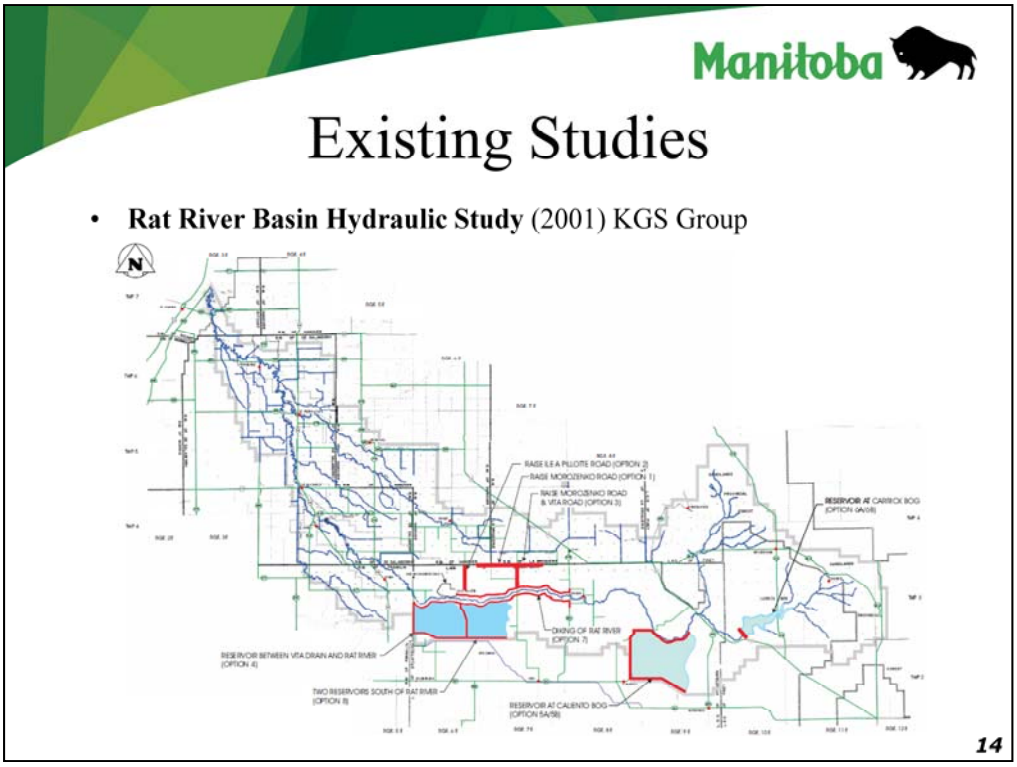
•Diversion of overflows north of Isle a Pilotte to Joubert Creek (Ewashko Option 2)

•Diversion of flows from a point NE 1-4-5E west and south to Rat River (Ewashko Option 3)

•Diversion of flows from a point NE 1-4-5E along the North-South Intermunicipal Boundary between Ranges 5 and 6 north to Joubert Creek (Ewashko Option 4)

•Upgrading of the municipal drain N 8,9,10-4-5E (Ewashko Option 5)

The plan in the slide displays the final recommendations of the study. Since overflows to Joubert Creek are one of the major surface water issues in this area, at this time it is doubtful that diverting more water to Joubert Creek would be a favorable course of action.



KGS Group developed a numerical model (U.S. Army Corps UNET model) of the drainage basin from a point approximately 1.3 miles downstream of Otterburne to where P.T.H. 12 crosses the Rat River. A number of potential projects to improve flood protection along the Rat River were developed and analyzed with the UNET model. Cost estimates of the eight flood protection options were estimated, however, cost-benefit analysis was not included in the scope of the project.

The project listed projects to prevent overflows to Joubert Creek as well as some large water retention projects.

This is the most recent comprehensive study undertaken in the study area.

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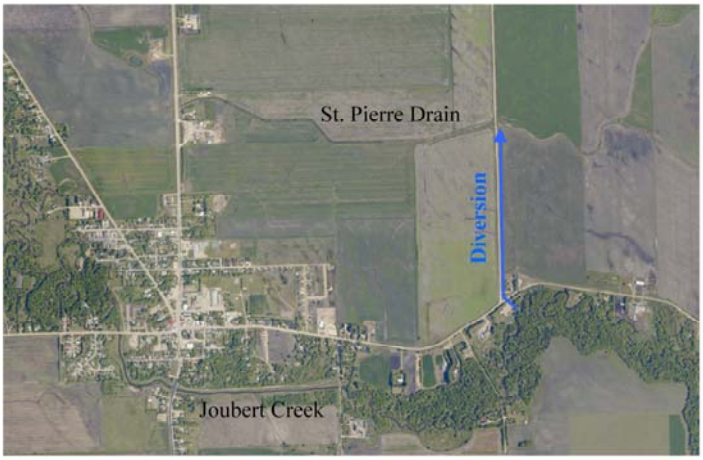
Existing Studies

- **Rural Municipality of De Salaberry Village of St. Pierre-Jolys Land Drainage and Flooding Overview Interim Report** (2007) GENIVAR



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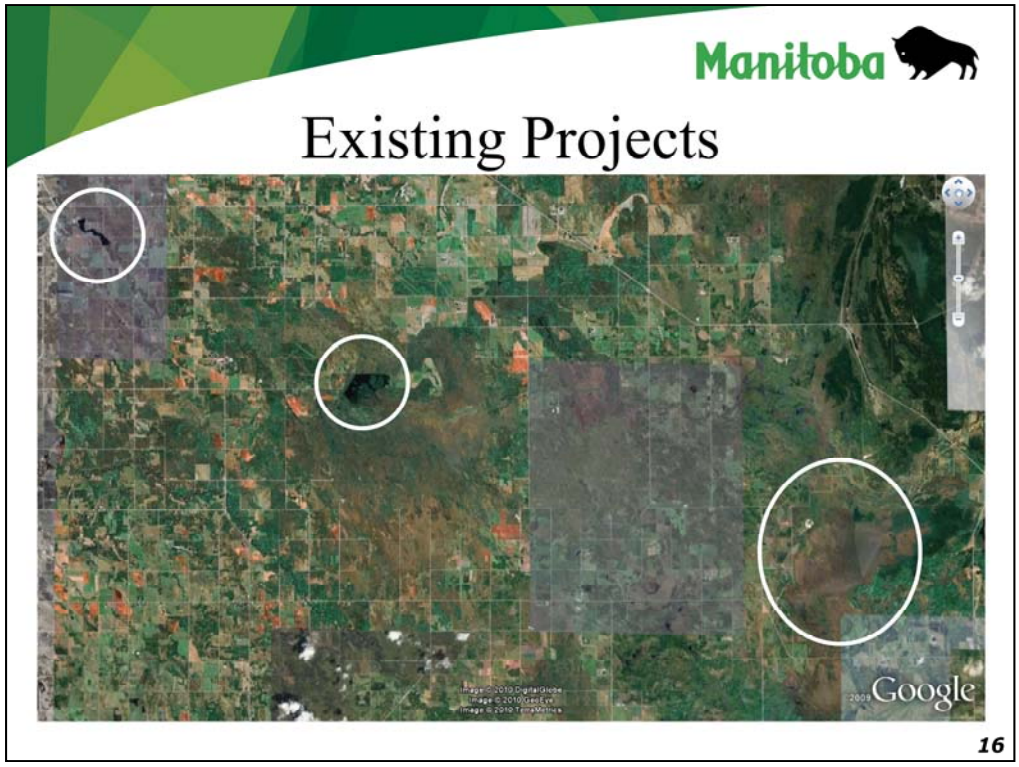
In 2007, GENIVAR provided St. Pierre-Jolys with preliminary concepts and survey data for developing a flood protection options for the village. The most desirable option was to divert to flood waters around the village by creating a channel east of the village from the Joubert Creek north to the St. Pierre Drain. Water would flow down the St. Pierre Drain and enter the Rat River downstream of the confluence of the Joubert Creek and Rat River. Expansion or deepening of the St. Pierre Drain may be necessary to accommodate the diverted flows.



Three major surface water storage projects have been completed on the Rat River:

- St. Malo Reservoir
- Ducks Unlimited Storage Cell
- Z-dike at Caliento Bog

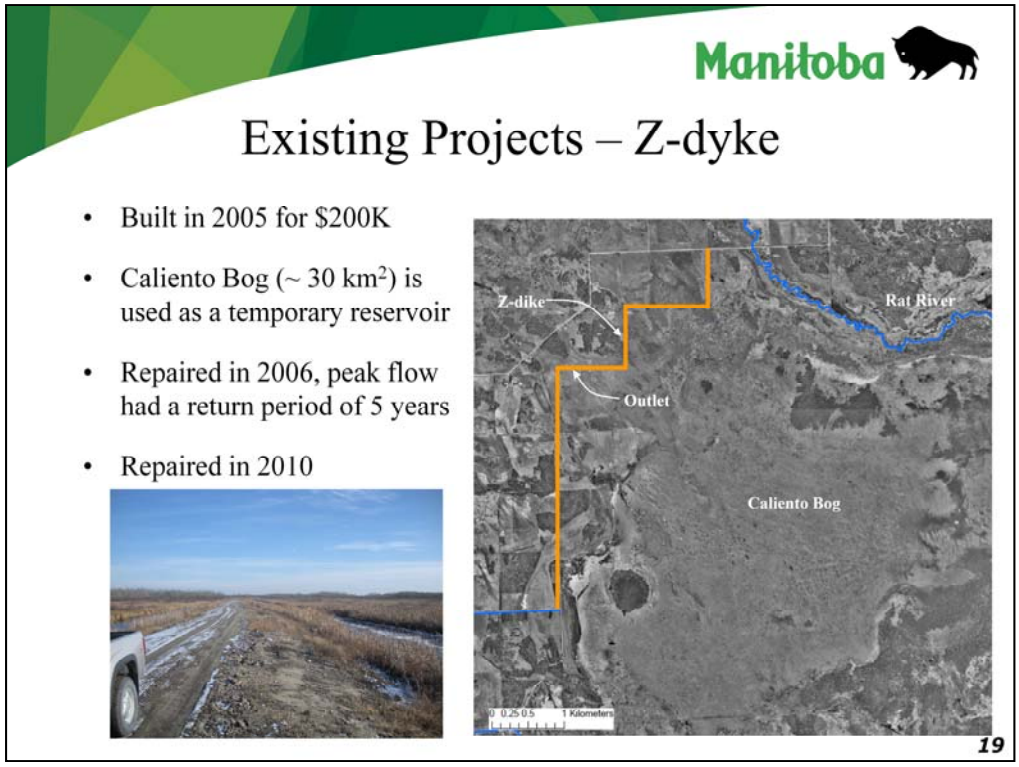
St. Malo Dam is located The St. Malo Dam was constructed in 1958 by PFRA. The intended primary use was to be a water supply reservoir for stock watering and domestic use. Since construction substantial recreation development has occurred in the area and a Provincial Park has been established.

At the full supply level of 256.032 m (840 ft) the reservoir has 2180 dam^3 (1770 acre-feet) of total storage and a flooded area of 63.9 ha (158 acres). An areal view of the reservoir is shown on the above slide. The reservoir is operated as near as possible to the full supply level year round. Flows in excess of the reservoir's full supply level are passed over a concrete spillway. Riparian releases can be made through a 1 m (36") diameter gated conduit upon request as required. Riparian releases have not been made for many years.

In 1993, Ducks Unlimited constructed one of several proposed wetland cells. The cell is located near Isle a Pilotte on parts of sections 21, 22, 27 and 28-3-6E.

The outlet control structure is locate in the southwest corner of the cell. The outlet is a drop inlet with removable stop logs and discharges back into the Rat River.

Originally, Ducks Unlimited proposed a seven cell wetland complex in the area. Funding for the large proposal was not available. Since interest in the project remained high, a single cell was constructed. The design and operation scheme of the constructed cell was modified from the original proposal. Although there are stop logs in the outlet structure, the cell is not operated with the flood control measures that were incorporated in the original operating scheme of the seven cell project due to the presence of an endangered plant species which requires specific water levels.



Caliento Bog is a large wetland area who's eastern edges is approximately 11 km east of the Village of Vita. The bog has an area of approximately 30 km^2.

In 2005, a large dyke was built along the west side of Caliento Bog. The approximate location of the dyke in relation to the bog is show in the above slide. The outlet structure is composed of a series of series of culverts placed at varied elevations in one section of the dike. The storage volume created by the dike is not known, however, the dike was reported by locals to have made an impact of peak flows since it was constructed. The dike is similar to projects suggested by KGS Group in their 2001 report.

Construction of the dam was undertaken by the RM. The initial cost of construction was approximately $200,000. The dike was damaged during the spring of 2006. The water level was at the top of the dike and washed out a section of the dike. The peak flow of 2006 has an approximate return period of five years. Repairs to the dike cost approximately $100,000. Additional repairs were required in 2010. To reduce the risk of washouts, a section of the dyke could be slightly lowered and rip-rapped to provide an area for overflows to occur in a controlled manner.

A portion of the dike was visited on the November 30th watershed tour. A photograph of a section of the Z-dike is shown. As seen in the photo, there are large areas of the dam that have exposed earth. It is recommended that grass is seeded on the dike to prevent erosion from rain and wave action.

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Surface Water Storage Recommendations

This part of the project is incomplete and will be completed by Mark Lee and Patrick Watson in the coming months.

Recommendations may include:

- Overflows to Joubert Creek:
  - KGS options to prevent overflows appear to still be relevant
- Potential storage sites
  - DU cell areas
  - Some KGS options

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