

# Flood Fighting

in Manitoba

A History and Background of  
Manitoba's Flood Protection Works

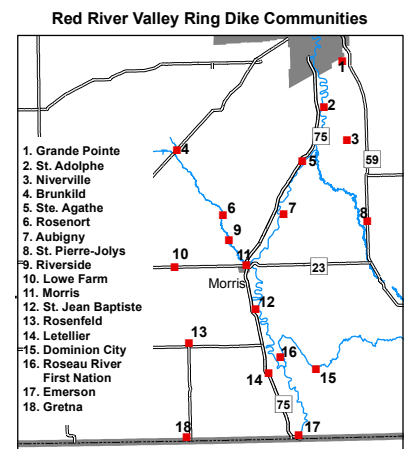
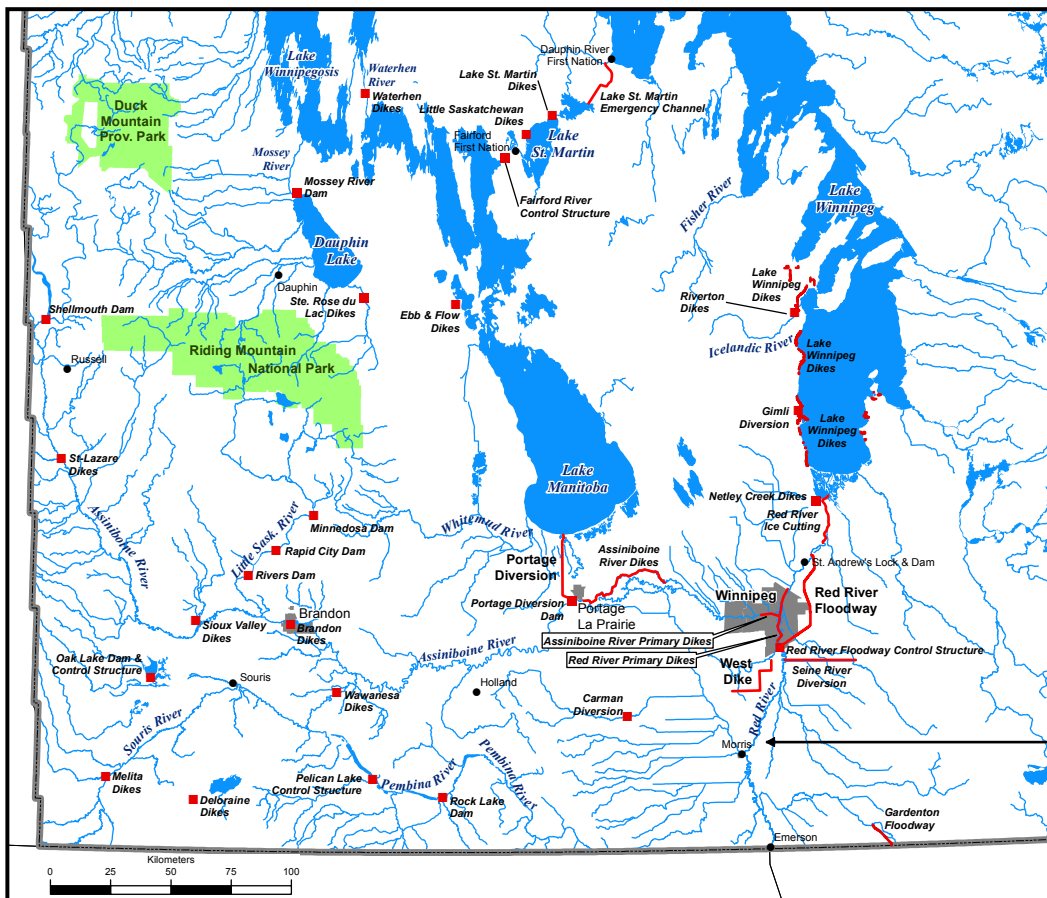
# Flood Fighting in Manitoba

Southern Manitoba has extensive flood control measures in place, particularly in the Red River Valley, from Winnipeg, south to the US border. Flood controls were built after the devastating flood of 1950, which flooded the Red River Valley and the City of Winnipeg. Construction of the Red River Floodway was completed in 1968. Additional flood control improvements, including an expansion of the floodway, were made after the Flood of the Century in 1997. This flood was substantially larger than the 1950 flood, but resulted in far less property damage because of the flood control measures in place. There are also flood control measures along the Assiniboine River.

Flood protection work has prevented property damage and reduced the potential impact of flooding on families and communities. Since the 1997 flood, more than \$1 billion has been invested in flood mitigation efforts in Manitoba. This investment has prevented over \$7 billion in damages throughout Manitoba.

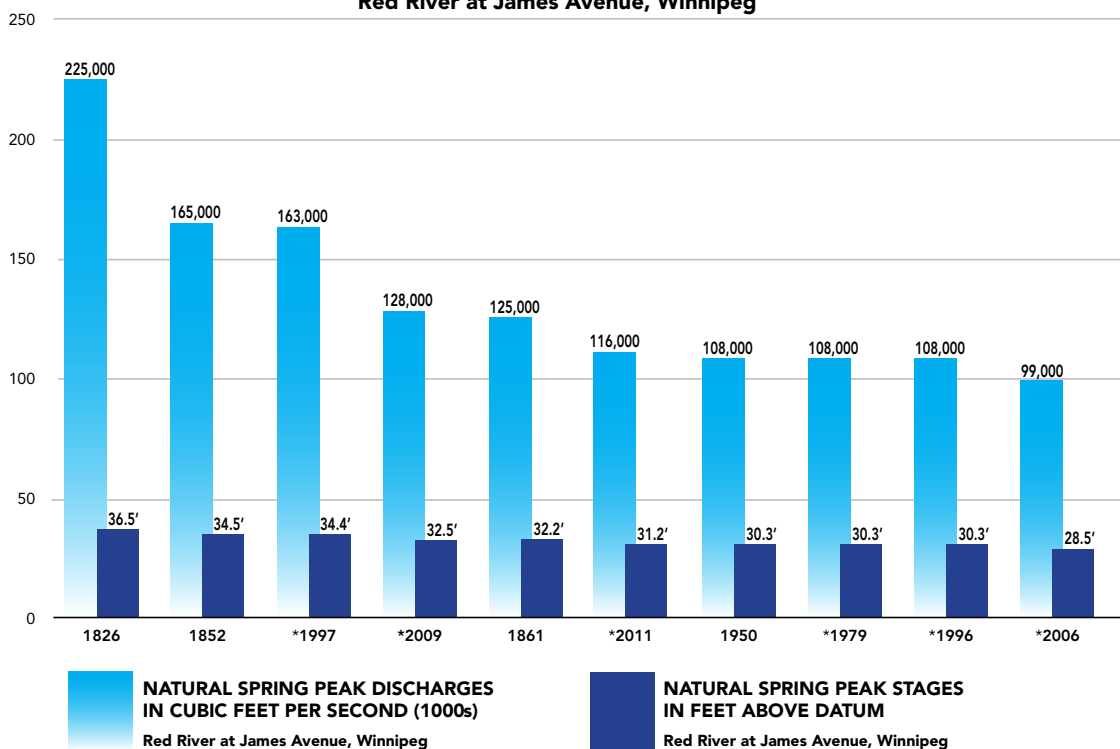
The 2011 flood affected a large geographic area and thousands of Manitobans. Early flood forecasts and flood-mitigation efforts helped many communities get a head start on protecting homes and lands, but damage was still widespread.

## Flood Control Infrastructure in Southern Manitoba



## Top 10 Red River Floods since 1800

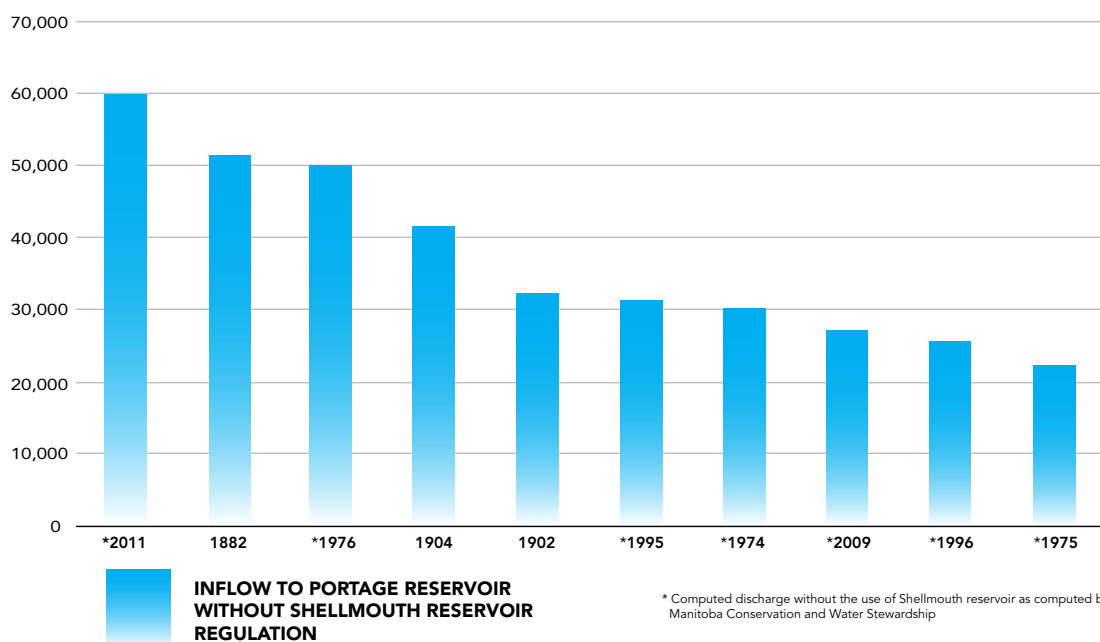
### Red River at James Avenue, Winnipeg



\* Computed Natural Discharge Without Use Of Red River Floodway, Portage Diversion, Shellmouth Dam  
Compiled by Manitoba Conservation and Water Stewardship

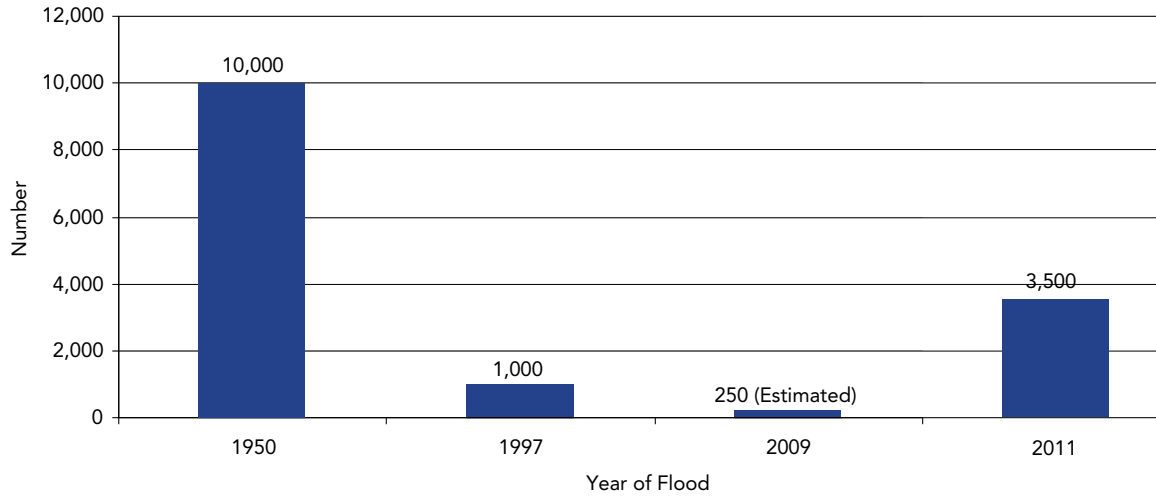
## Top 10 Assiniboine River Floods Since 1880s

### Assiniboine River at Portage la Prairie

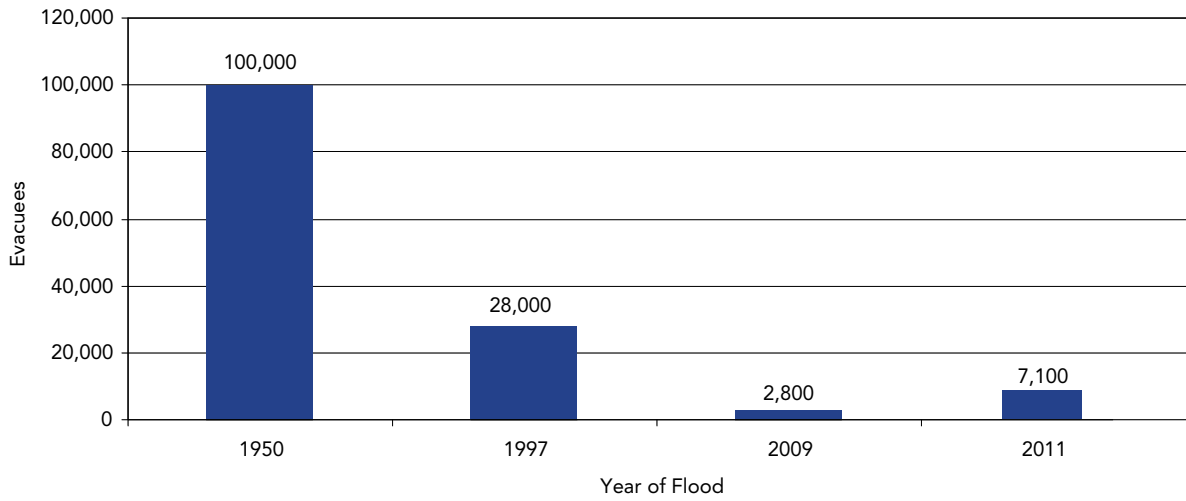


\* Computed discharge without the use of Shellmouth reservoir as computed by Manitoba Conservation and Water Stewardship

### Number of Homes Damaged During Spring Floods



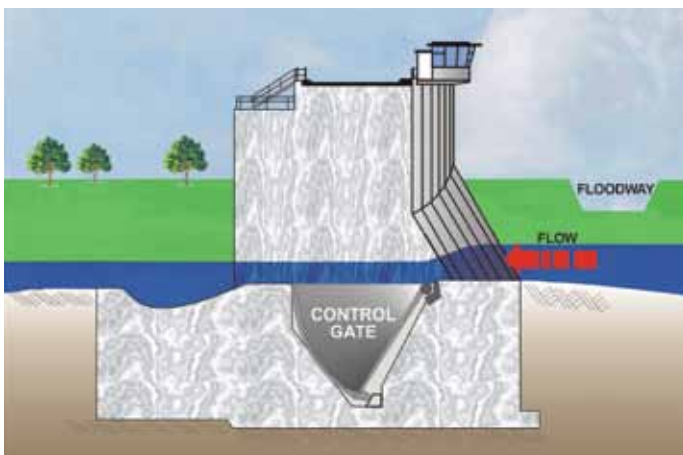
### Number of People Evacuated During Spring Floods



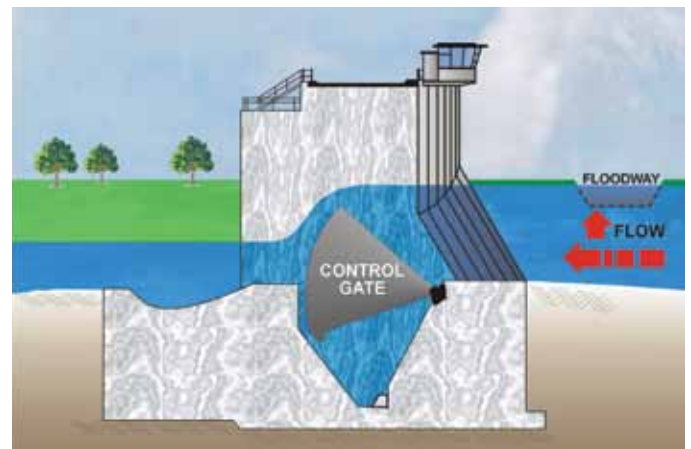
## Red River Floodway

One of the most significant flood protection measures in Manitoba is the Red River Floodway, which protects the City of Winnipeg. Starting in 2005, Canada and Manitoba invested \$665 million to further expand the Red River Floodway.

- The original floodway was built between 1962 and 1968 and cost \$63 million.
  - At the time, excavation of the floodway channel was the second largest earth moving project in the world (second only to the Panama Canal and larger than the Suez Canal project).
  - Since 1968, it has prevented more than \$40 billion (in 2011 dollars) in flood damage in Winnipeg.
  - It is often referred to as Duff's Ditch in recognition of then-Premier Duff Roblin, who spearheaded the development of the floodway.
- The expansion of the current floodway system (including the West Dike and channel outlet) began after the 1997 flood, to protect the City of Winnipeg from a one-in-700-year flood. It increased the floodway's capacity – from 90,000 cfs (cubic feet per second) to 140,000 cfs. The floodway operates by diverting a portion of the Red River flow around Winnipeg through the floodway channel. During flooding, as the river naturally rises, it spills over the floodway channel entrance and flows down the floodway channel. When this happens, the river water flows through two routes – through the city and through the floodway. At the same time, it drops below its natural level, south of the floodway inlet.



Floodway gates during normal summer conditions



Floodway gates raised to regulate water levels

- When the floodway gates are raised, the water level south of the floodway inlet is restored to its natural level which, in turn, allows more water to spill into the floodway. As Red River flows continue to increase, the level south of the inlet drops below natural again and the gates are raised further. This process continues as long as the flow in the Red River continues to increase.
- During the majority of floods, the floodway is operated to ensure that the water level south of the city is maintained at the natural level – that is the level that would occur if the flood control works did not exist.
- In a major flood, even larger than 1997, the flow through the city will be controlled with the guidance of three spring floodway operating rules. These rules are designed to ensure Winnipeg’s primary diking system is not overwhelmed. When these rules are implemented to protect the city, there may be instances when additional water going through the floodway causes artificial flooding of land and roads south of the floodway inlet. In recognition of this possibility, the Manitoba government has legislation in place which provides compensation to individuals impacted by this artificial flooding.
- A fourth floodway operating rule is also in place, but is only applied during the summer when high water levels affect Winnipeg’s storm sewer and combined sewer systems. The combination of high water and a high intensity rain storm can overwhelm the sewer systems causing basement flooding. If this occurs, operation of the floodway can lower water levels in the city, reducing the damages and potential health risk caused by basement flooding.
- The floodway is recognized as a National Historic Civil Engineering Site and is considered one of the world’s 16 engineering marvels. For more information, see [www.floodwayauthority.mb.ca](http://www.floodwayauthority.mb.ca).



*Floodway inlet control structure south of Winnipeg*



*Floodway outlet structure north of Winnipeg*



## City of Winnipeg Flood Protection

- The main protection for the city is the Red River Floodway, the Portage Diversion and the Shellmouth Reservoir.
- Within the city there is a primary dike system that protects land along the Red and Assiniboine rivers. There are also secondary dikes to protect low-lying areas on the river side of the primary dikes, including Kingston Row, Lord Avenue, North Drive and Kilkenny Drive North. For more information about Winnipeg's flood protection see: [www.winnipeg.ca/emergweb/](http://www.winnipeg.ca/emergweb/).
- After the 1997 flood, \$10.8 million was invested to protect homes and condominium complexes. As well, the secondary dikes in the city were further strengthened.
- The \$130 million under the 1997 Canada-Manitoba Partnership Agreement on Red River Valley Flood Protection funded these improvements.

## West Dike

- The 45 km (28 miles) West Dike is located south of Winnipeg and also provides flood protection for the city. It prevents Red River floodwaters from flowing into the La Salle River and entering Winnipeg. The dike is high enough to handle wind and waves during major floods. It was substantially and quickly reinforced in 1997.
- As part of the Red River Floodway expansion, the dike was extended approximately 11 km (7 miles) and raised in various areas up to 1.5 m (5 ft).

## Red River Valley Ring Dike Communities and Properties

- There are 18 ring dike communities in the Red River Valley providing protection up to 1997 levels, plus 0.6 m (2 ft). The dikes protect the communities and can be partially or fully closed during a flood. During the 2009 flood, the ring dikes prevented about \$700 million in flood damages to these communities.



*Ring dike community of St. Jean Baptiste*



*Ring dike community of Morris*

## Spring Flood Peaks

(feet above sea level; Winnipeg is based on James Ave.)

RED RIVER				
	Emerson	Morris	Winnipeg	Selkirk
1979	791.3	781.3	19.2	---
1997	792.5	783.3	24.5	729.5
2009	790.8	781.9	22.5	728.8
2011	790.3	779.3	19.6	724.0

- The communities in the Red River Valley with ring dikes are: Emerson, Gretna, Letellier, Rosenfeld, Dominion City, St. Jean Baptiste, Riverside, Rosenort, St. Pierre-Jolys, Aubigny, Morris, Roseau River, Lowe Farm, Ste. Agathe, Brunkild, St. Adolphe, Niverville and Grande Pointe.
- Over 1,800 sites in the valley have been flood-protected – homes, businesses, farms – preventing another \$100 million in damages during the 2009 flood.
- Ring dikes and other forms of flood works protect 95 per cent of the homes, businesses and farms in the valley.
- The 1997 Canada-Manitoba Partnership Agreement on Red River Valley Flood Protection funded \$130 million in enhancements to eight ring dike communities that already had ring dikes; provided for the construction of 10 additional ring dikes; and supported flood protection for homes, farms and businesses.

## St. Andrews Lock and Dam

- Built in 1910, the federally operated structure helps regulate low-flow water levels on the Red River. Its primary function is to raise the water level over Lister Rapids to allow river navigation.

## North of Winnipeg to Lake Winnipeg

- Approximately \$4 million has been invested in the ice mitigation program for this area. It includes seven ice cutters, three Amphibex icebreakers and support units for the equipment. One Amphibex is owned by the North Red Community Water Maintenance and two are owned by the Manitoba government.
- Following the severe ice jams in 2009, the 63 most flood-prone homes and cottages in the Breezy Point and St. Peters Road areas were purchased by the government so the homeowners could relocate.



One of seven ice-cutting machines



Amphibex icebreaker



## Assiniboine River Watershed

- The Assiniboine River runs from southern Saskatchewan and ends when it meets the Red River in the City of Winnipeg. The river twists and turns for approximately 1,070 km (665 miles).
- A community ring dike protects St. Lazare which is south of the Shellmouth Dam.
- The flood-prone section of the Town of Melita is located along the Souris River, which feeds into the Assiniboine River. It is protected by dikes and a raised portion of Hwy 3, including the intersection of Hwy 3 and PTH 83. This project was funded by the Manitoba government in 2009.
- The last major floods along the Assiniboine River were in 1976, 1995 and 2011.

### Spring Flood Peaks

(feet above sea level)

ASSINIBOINE RIVER				
	St. Lazare	Brandon	Portage	Headingley
1976	1287.1	1179.5	854.2	770.5
1995	1288.8	1178.8	847.8	765.8
2009	---	1173.8	844.1	767.1
2011	1290.42	1180.1	850.6	769.4

## Shellmouth Dam

- The Shellmouth Dam (which helps protect Brandon, Portage la Prairie and Winnipeg from high flows on the Assiniboine River) is located about 24 km (15 miles) northwest of Russell. The reservoir created by the dam is approximately 56.3 km (35 miles) long. The reservoir is known as Lake of the Prairies.
- There is a reinforced-concrete, horseshoe-shaped conduit that allows a controlled release of water from the reservoir. During flooding, a portion of flood water is stored in the reservoir. When reservoir levels are very high, uncontrolled flows can spill over the concrete chute spillway and affect agricultural land.
- Construction on this project began in 1964 and was completed in 1972, at a cost of \$10.8 million.
- Canada and Manitoba have committed to cost-share improvements to the dam, including the installation of spillway gates on the concrete spillway. These gates would allow higher reservoir levels which could provide additional flood protection benefits and potential for more water supply for domestic, commercial and irrigation use.



Shellmouth Dam structure and reservoir (Lake of the Prairies)

## City of Brandon

- The Assiniboine River flows through the northern end of the City of Brandon. Most of the developed areas of the city are located on the higher elevations outside of the Assiniboine River Valley floodplain. However, some industrial, commercial, residential and recreational properties and facilities exist within the floodplain, most notably the Brandon Flats area, located south of the river between First Street and 26th Street.
- The flood-prone properties are protected by dikes to varying degrees. Prior to the 2011 flood, the City of Brandon raised approximately 5 km (3.1 miles) of dike by about 0.6 m (2 ft), to a level about 0.3 m (1 ft.) above the January and February 2011 flood outlooks. The Manitoba government committed to funding enhancements to permanently raise the level of protection to a one-in-300-year event.

## Portage Diversion

- This 29 km (18 mile) channel diverts water from the Assiniboine River, just west of Portage la Prairie, into Lake Manitoba near Delta Beach.
- The removal of up to 25,000 cubic feet per second (cfs) of flood water provides flood protection for Winnipeg and areas along the Assiniboine River and also supports flood protection along the Red River north of Winnipeg.
- The diversion protects several municipalities including Portage la Prairie, Cartier, St. Francis Xavier, Headingley, Woodlands and Macdonald. Communities that benefit include Portage la Prairie, Winnipeg, Oakville, Elie, Brunkild and La Salle.



*Portage Diversion structure*



*Portage Diversion channel*

- Without the Portage Diversion, during an extreme event such as the 2011 flood, there would have been flooding to the south of the Assiniboine River; the river would have naturally spilled to Lake Manitoba and substantial flooding would have occurred north of the Assiniboine. Assiniboine River water would have overflowed all the way to the Municipality of Morris.
- The Portage Diversion was built from 1965 to 1970 and cost \$20.5 million.
- During the flood of 2011, its capacity was increased for the short term to 34,000 cfs. Since 2011, about \$6 million in repairs have been completed on various sections of the diversion.
- The Shellmouth Dam, Portage Diversion and the Red River Floodway have prevented an estimated \$7 billion in damages from flood waters.
- The Portage Diversion is operated by raising gates in the Assiniboine River, when required, to divert a portion of the river through the diversion channel. There are also gates that control flow into the diversion channel.

Since its construction, the Portage Diversion has been operated 29 out of 43 years.

## Portage Diversion in Operation

Year	Start Date	End Date	Number of Days
1970	19-Apr	09-May	20
1971	09-Apr	22-Apr	13
1972	24-Mar	05-May	42
1974	16-Apr	17-Jun	62
1975	21-Apr	30-Jun	70
1976	01-Apr	05-Jun	65
1978	10-Apr	12-Apr	2
1979	20-Apr	15-Jun	56
1982	16-Apr	20-Apr	4
1983	19-Mar	09-May	51
1985	27-Mar	03-Apr	7
1986	29-Mar	15-Apr	17
1986	06-May	15-May	9
1987	06-Apr	18-Apr	12
1989	17-Apr	21-Apr	4
1992	30-Mar	15-Apr	16
1992	23-Apr	01-May	8
1995	25-Mar	09-Jun	76
1996	05-Apr	10-Jun	66
1997	04-Apr	30-May	56.0
1998	01-Apr	09-Apr	7.7
1999	29-Mar	24-Jun	86.9
2001	08-Apr	21-May	43.2
2003	09-Apr	12-Apr	2.2
2004	02-Apr	11-Apr	8.8
2005	05-Apr	23-Apr	18
2005	13-Jun	28-Jul	45
2006	04-Apr	31-May	57
2007	26-Mar	16-Apr	21
2007	25-Jun	09-Jul	14
2009	28-Mar	23-May	56
2010	01-Apr	26-Apr	25
2010	30-May	06-Aug	68
2011	01-Apr	05-Aug	126

Number of years operated= 29  
 Total number of years since construction= 43  
 Total number of days in operation= 1,235

■ Start and end dates of the Portage Diversion in operation.

## Assiniboine River Dikes

- There are 134 km (83.2 miles) of dikes on the Assiniboine River east of Portage la Prairie.
- The dikes were first constructed by the federal government in 1912, reinforced in 1950 and again improved in the years following the 1997 flood. Responsibility for the dikes is now with the Manitoba government, but they were a federal responsibility until 1996.
- The dikes protect farmland, farms and residences as well as the communities of Elie, La Salle, Sanford and Starbuck which would be affected if the Assiniboine River flows overtopped the dikes.
- The province again raised the dikes under emergency conditions prior to the 2011 flood and continues to make improvements to this system.

## Other Flood Protection

Manitoba's flood potential is affected by a combination of many factors such as river flow, soil moisture conditions at freeze-up, snow-water content in the snowpack and weather conditions. Manitoba has many rivers and lakes that require flood control measures across the province.

- **Carman Diversion** – Completed in 1991, the \$6 million diversion was funded by the federal and provincial governments and the Town of Carman. It diverts flood water from the Boyne River west of the town through a 9.8 km (6 miles) channel that exits into the Norquay Channel northeast of the town, providing protection for the Town of Carman. Before the diversion was built, Carman experienced major floods in 1893, 1923, 1970, 1974 and 1979. The 1979 flood caused damages of over \$3 million.
- **Gardenton Floodway** – Completed in 1930 by the provincial and federal governments, it diverts flood waters from the Roseau River into a relief channel that is protected by two dikes on either side of the channel banks. It prevents flooding of local communities such as Vita as well as farms and agricultural lands.
- **Pelican Lake Controls** – Completed in 1991 by the federal and provincial governments, the project includes a diversion channel from the Pembina River to Pelican Lake, along with outflow capacity improvements to allow better regulation of water levels.
- **Rock Lake** – In 1993, a weir and an outlet channel to the Pembina River were built, along with dikes on the west side of the lake, to protect flood-prone farmland.
- **The Pas area** – A series of dikes along the Saskatchewan River at The Pas protects agricultural and residential land. Funds have been invested in minor upgrades to the system in the past five years. Included in the dike system:
  - The Carrot River dikes run for approximately 39 km (24 miles), from The Pas to the Saskatchewan border.
  - The 34.6 km (21.5 miles) Salt Channel dikes protect the western boundary of the Carrot Valley area.
  - These dikes, the Pasquia River dikes and four high-volume pumps protect about 57,061 hectares (141,000 acres) of residential and farm land, including the Carrot Valley. A permanent, 11 km (6.8 miles) dike was built at Ralls Island in 2011.
- **Seine River Diversion** – Completed in 1960, the channel diverts flood water from the Seine River into the Red River in the vicinity of St. Adolphe. It significantly reduces the risk of flooding for communities like Ste. Anne and Lorette, as well as residences and farms located along the Seine River.

- **Ste. Rose du Lac** – A diking system was built to protect the town following damage from the 1975 flood. The 1986 flood overtopped these dikes so the federal, provincial and local governments upgraded the existing structures. New dikes and other infrastructure were also built. All the works cost \$2.75 million. They protect against a one-in-100-year flood on the Turtle River.

## Lake Winnipeg

- The lake is the 11th largest fresh water lake in the world. There are numerous seasonal and permanent cottage and beach communities along the south basin and it supports a \$40 million annual fishery.
- In the summer of 1974, approximately 100 km (62 miles) of dikes were built by the Manitoba government and local communities in response to the threat of high Lake Winnipeg levels.
- In 2005, in response to lake levels that were the highest since 1974, several local governments declared states of local emergency and requested help to finance the construction of dikes along Lake Winnipeg, to protect against high lake levels and windstorms. Between 2005 and 2007, the Manitoba government invested \$12 million to build 50 km (31 miles) of dikes.
- A massive storm (also known as a weather bomb) on October 27, 2010 significantly damaged parts of these dikes and caused some flooding and property damage along the south basin of Lake Winnipeg. A Disaster Financial Assistance (DFA) program was established to help with the repair costs of storm damage to residential properties and municipal structures.
- Additional flood protection along the lake includes the Gimli diversion, which was completed in 1995. The diversion channels spring melt waters away

from the Town of Gimli and the residential and industrial park in the RM of Gimli, including Loni and South Beaches.

- The lake also serves as a reservoir for Manitoba Hydro. Manitoba Hydro has improved the outlet channel capacity by 50 per cent, building 13 km (8 miles) and 3.2 km (2 miles) channels to reduce flood damage to properties around Lake Winnipeg. For more information see [www.gov.mb.ca/waterstewardship/licensing/lake\\_wpg\\_regulation.html](http://www.gov.mb.ca/waterstewardship/licensing/lake_wpg_regulation.html).

## Lake St. Martin/Lake Manitoba

- **Fairford Dam** – A new dam, built in 1961, replaced an old structure first built in 1934. It regulates water levels of Lake Manitoba and flows into Lake St. Martin and the Dauphin River.
- Due to unprecedented flooding in 2011, an emergency outlet channel was built to drain flood water from Lake St. Martin and Lake Manitoba into Lake Winnipeg. Lake Manitoba drains through the Fairford Channel into Lake St. Martin and Lake St. Martin drains into Lake Winnipeg via the Dauphin River.
- Exploratory work for possible channel locations started July 4, 2011, and the 6.5 km (4 miles) outlet opened on November 1, 2011. The channel was closed in November 2012 as required under the federal terms and conditions for emergency operations.
- More than 130 workers and over 100 pieces of heavy equipment were involved in this construction project. Once the project was finished, the Fairford Dam structure was able to remain open through the winter, which helped lower the Lake Manitoba water levels and resulted in lower levels on Lake St. Martin.



The province works closely with Manitoba municipalities to plan and prepare for potential spring flooding.

## Flood Fighting Equipment

Manitoba has invested in a variety of flood fighting equipment, ranging from heavy equipment to specialized dikes and water barriers and has an inventory of temporary flood response equipment such as tiger dams and aqua dams:

- four Amphibex icebreakers, including one owned by the North Red Community Water Maintenance Organization
- seven ice-cutting machines
- six Argo amphibious ATVS and six trailers
- two million regular sandbags
- six provincial sandbagging machines
- 17,000 super sandbags
- 43 km (26 miles) of Hesco cage barriers
- 61 heavy-duty steamers
- 34 mobile pumps
- 50 km of water-filled barriers of which 22 km are in rapid-response trailers

# Manitoba's Emergency Management System

Manitoba has a strong emergency response plan that includes all municipalities and has been well-tested and implemented in previous flood emergencies.

- Manitoba Emergency Measures Organization (EMO) is the provincial government agency responsible to ensure the province has emergency plans, programs and systems that can be applied to identified risks and hazards. These plans and programs are contained within the Manitoba Emergency Plan (MEP). The plan is assessed and updated on an ongoing basis.
- Under *The Emergency Measures Act*, municipalities must have an emergency plan that is approved by EMO. All municipalities now have approved emergency plans and EMO works with all municipalities to ensure they are maintained.
- Manitoba's legislation provides for Emergency Prevention Orders which allow for a more limited set of powers than a State of Emergency Order. They can be used when there is a real possibility that the impact of an emergency or disaster could be reduced or averted.
- Municipalities are well-prepared to manage emergencies using:
  - o dedicated emergency co-ordinators who work closely with EMO's regional emergency managers
  - o current, effective, provincially approved emergency plans
  - o local and regional training programs
  - o local and regional emergency exercises that test plans for continuous improvement
  - o local emergency operation centres to co-ordinate with the provincial emergency co-ordination centre
- Manitoba's emergency response also includes:
  - o the provincial website, updated regularly with current flood forecasts, road and travel updates, evacuation details, important information about flood preparation – property protection, evacuation, pet and livestock protection, property recovery, financial help and stress management
  - o regular road updates on the province wide, toll free phone line
  - o ongoing updates on Twitter, Facebook, and Mobile
- Stay informed:
  - o Go to [www.manitoba.ca/flooding](http://www.manitoba.ca/flooding) for current forecasts, road closures and general information
  - o Go to [www.mb511.ca](http://www.mb511.ca) for updated road closures and travel info
  - o Call 1-866-626-4862 for general information
  - o Call 511 for current road/travel updates
  - o Follow us on Twitter - @mbgov and @mbgovroads
  - o Follow us on Facebook – [www.facebook.com/ManitobaGovernment](http://www.facebook.com/ManitobaGovernment)

