WESTLAKE INTEGRATED WATERSHED MANAGEMENT PLAN

SURFACE WATER HYDROLOGY REPORT

1. General Description

The Westlakes Watershed is located on the western shore of Lake Manitoba as shown on Figure 1. Watershed and basin boundaries form a prime ecological unit for (i) information and knowledge management and analysis, and (ii) water and land use planning and management. Watershed and basin boundaries are defined through the application of the best available science and modified with documented and verifiable local input. Agriculture and Agri-Food Canada (AAFC), formally the Prairie Farm Rehabilitation Administration (PFRA), and Manitoba Water Stewardship have delineated a system of watershed and basin boundaries for Manitoba. These boundaries have been designed to extend to the mouths of some rivers and streams and along large bodies of water. The Westlakes planning area boundaries were established using this system of watersheds.

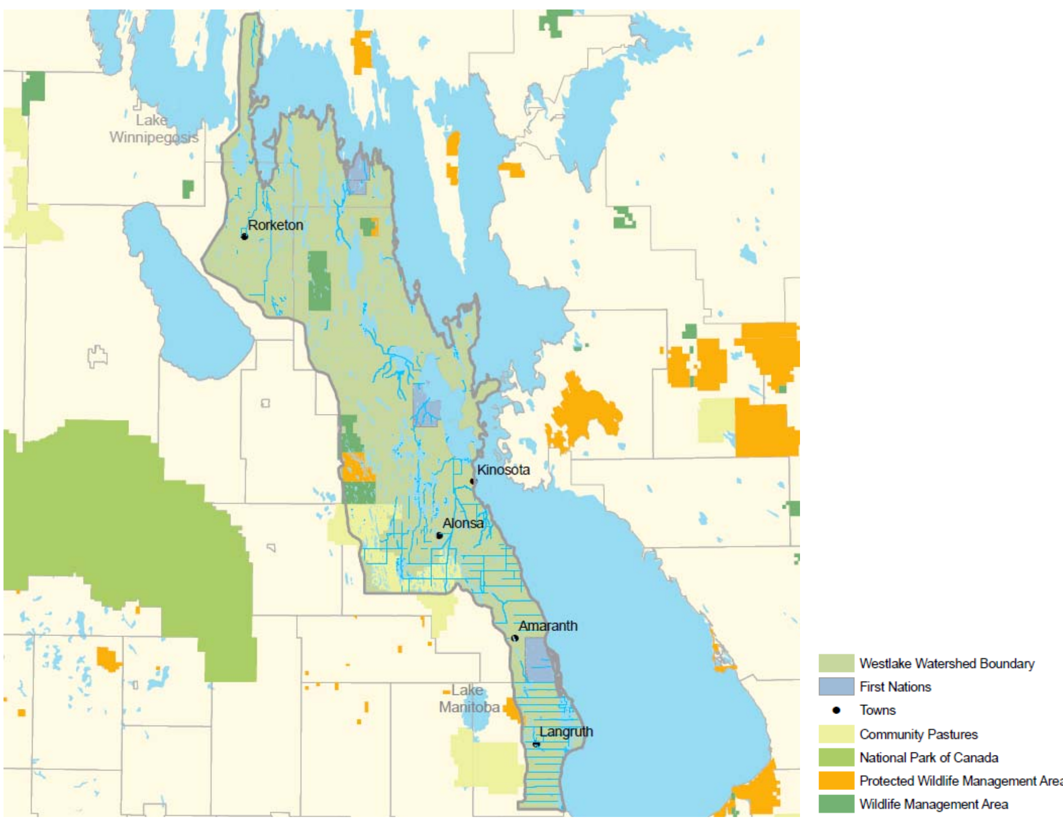


Figure 1: Westlake IWMP Area

The planning area in this case is a watershed, but is made up of a number of sub-watersheds, the main ones being Hamblin Drain, Crane River, Lonely Lake, Sucker Creek and Garrioch Creek. Other drainage systems include Reedy Creek, Bluff Creek, North Leifer Drain, Harcus Drain and Smalley School Drain. 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.

From an elevation of approximately 312.4 m (1025 feet) on the southwestern portion of the watershed, the land generally slopes in a northeasterly direction to Lake Manitoba. Lake Manitoba has a range of regulation between 247.16 m (810.87 feet) to 247.77 m (812.87 feet) as recommended by the Lakes Winnipeg and Manitoba Board in 1958. In the Westlakes Watershed there are numerous low ridges extending in a north and a northwesterly direction. These ridges form barriers to drainage off low-lying marshy tracts between the ridges. Some of the ridges are composed of sand and gravel and are ancient beaches that continue for long distances. Other low ridges are composed of boulder clay. The ridges control the drainage pattern in the district and are the key to solving any surface water problems

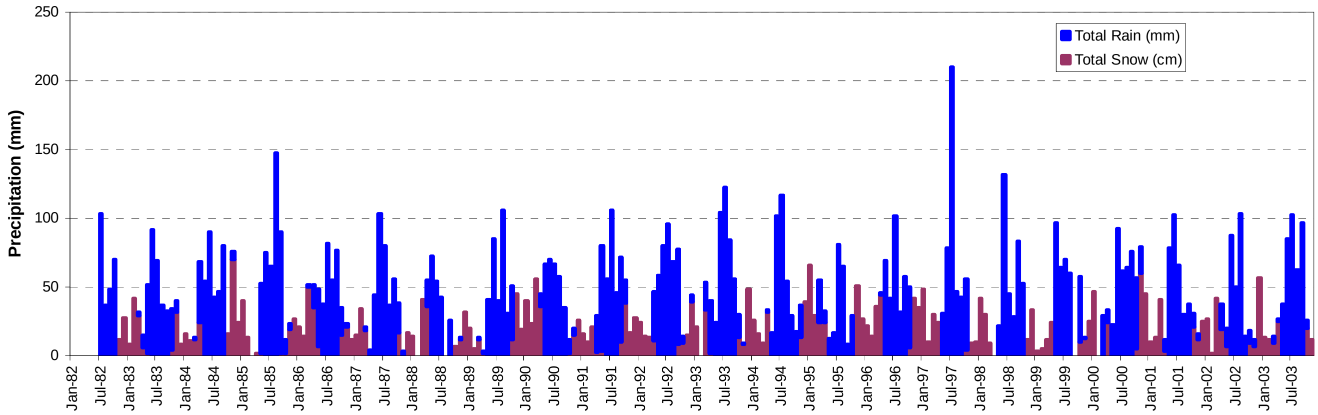
2. Climate

Climate data was extracted from Environment Canada's data base for:

- Rorketon (1982 – 2003)
- Alonsa (1980 – 2007)
- Amaranth (1980 – 2004)
- Langruth (1970 – 2001)

The monthly totals of precipitation, both as rain and as snow, for each station are provided in Figure 2 and Figure 3. Monthly precipitation normals for Alonso (1980 – 2000) and Langruth (1971 – 2000) are provided in Figure 4. From 1980 to 2000, Alonsa received an annual average of 567 mm of precipitation. Langmuth received an annual average precipitation 546 mm between 1971 and 2000. Monthly temperature normals were only available for Langmuth and provided in Figure 5. The average annual temperature at Langmuth between 1971 and 2000 is 2.4°C. The Willow Creek planning area receives the largest portion of its annual precipitation in the spring and summer months. The monthly mean precipitation and temperature are shown in **Error! Reference source not found.** and **Error! Reference source not found.**. Data for Winnipeg are also shown in the figures for reference.

Rorketon:



Alonsa:

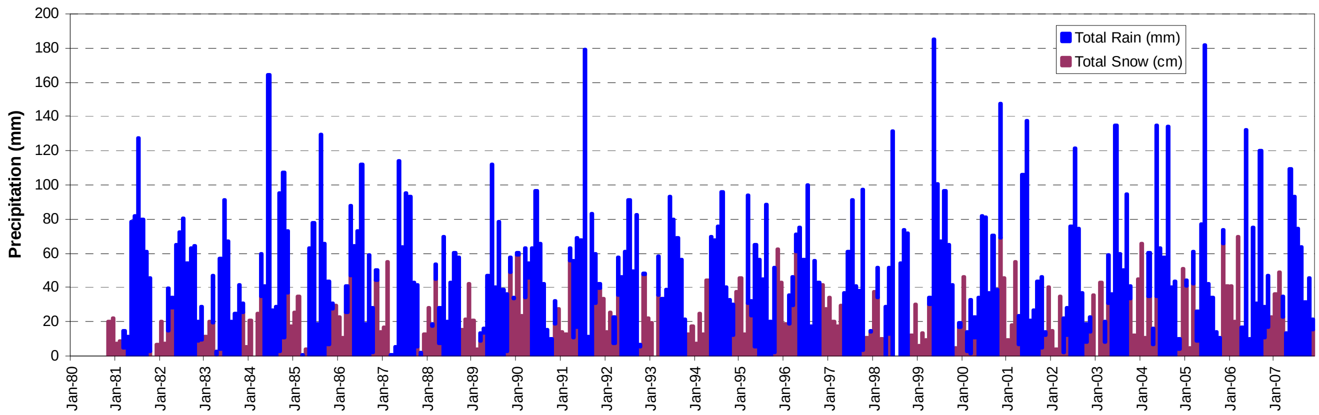
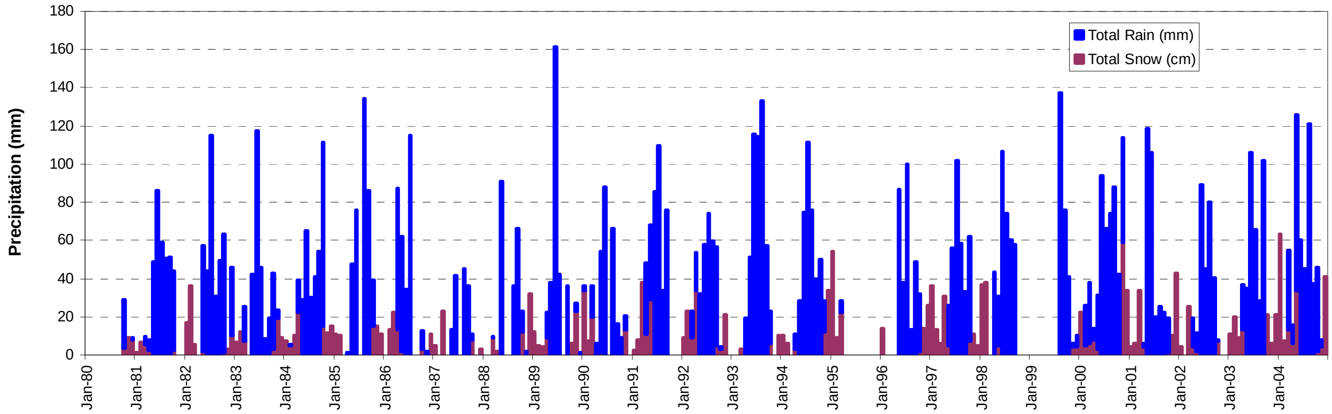


Figure 2: Monthly precipitation totals for Rorketon and Alonsa.

Amaranth:



Langruth:

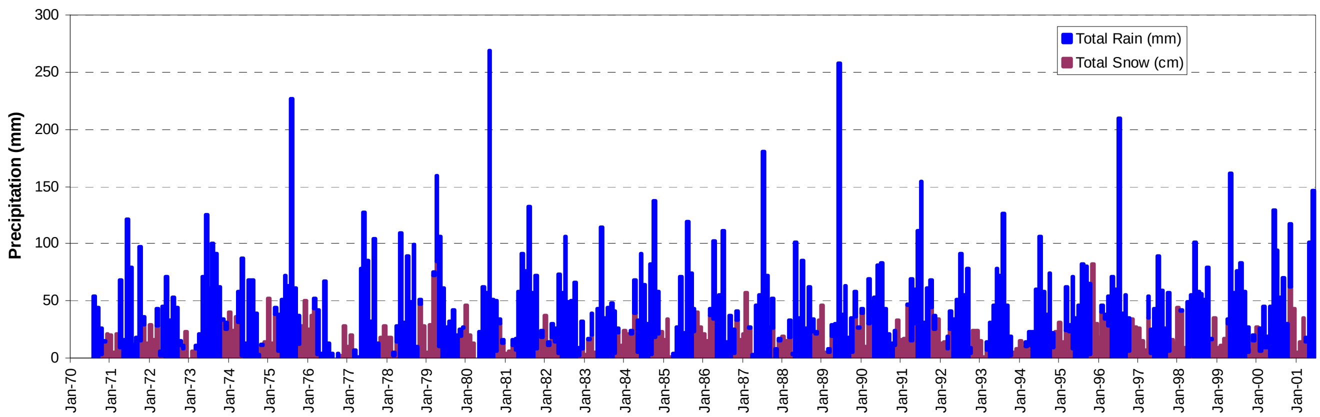
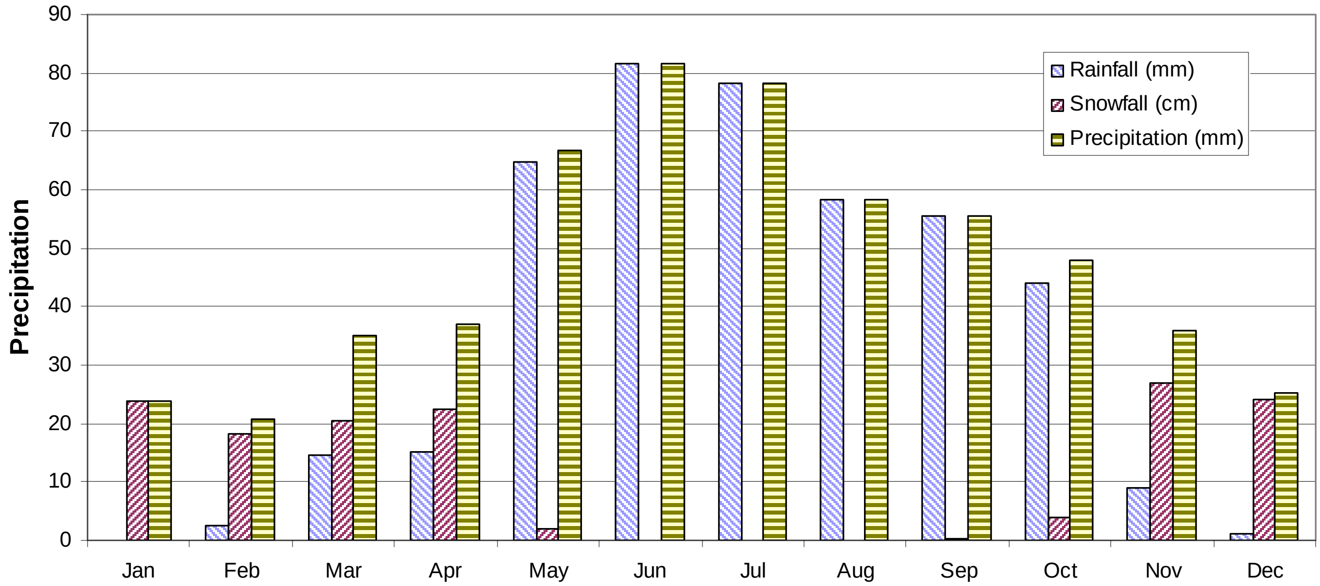


Figure 3: Monthly precipitation totals for Amaranth and Langruth.

Alonsa (Precipitation):



Langruth (Precipitation):

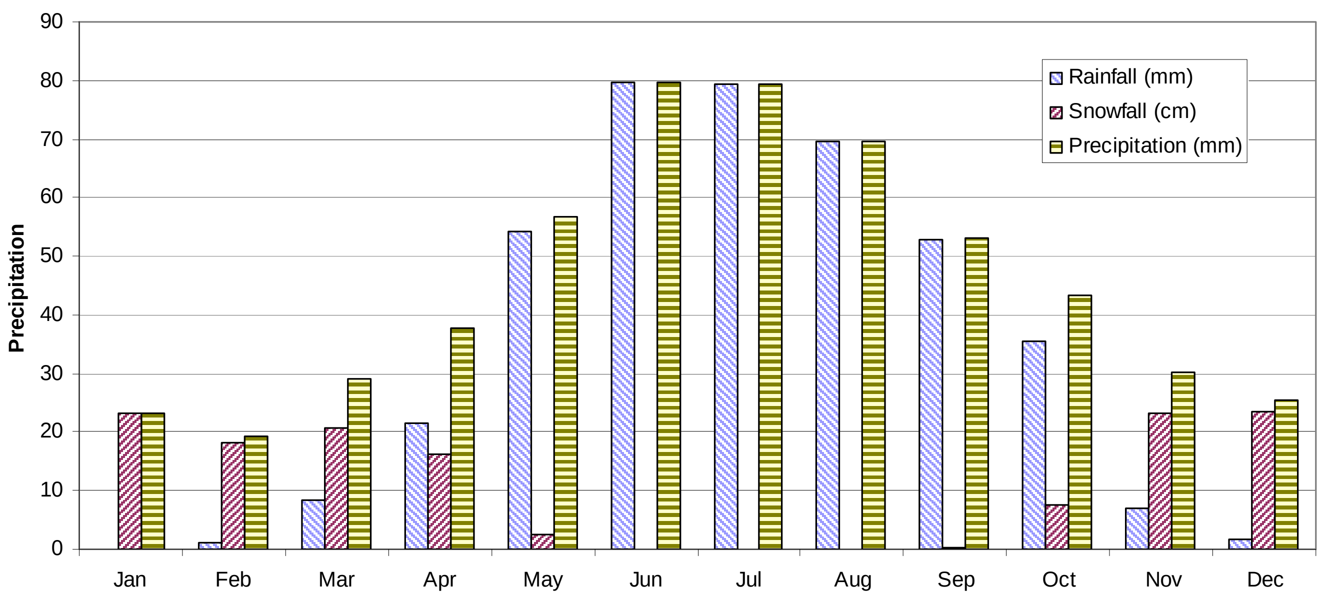


Figure 4: Long-term monthly precipitation normals at Alonsa and Langmuth.

Langmuth (Temperature):

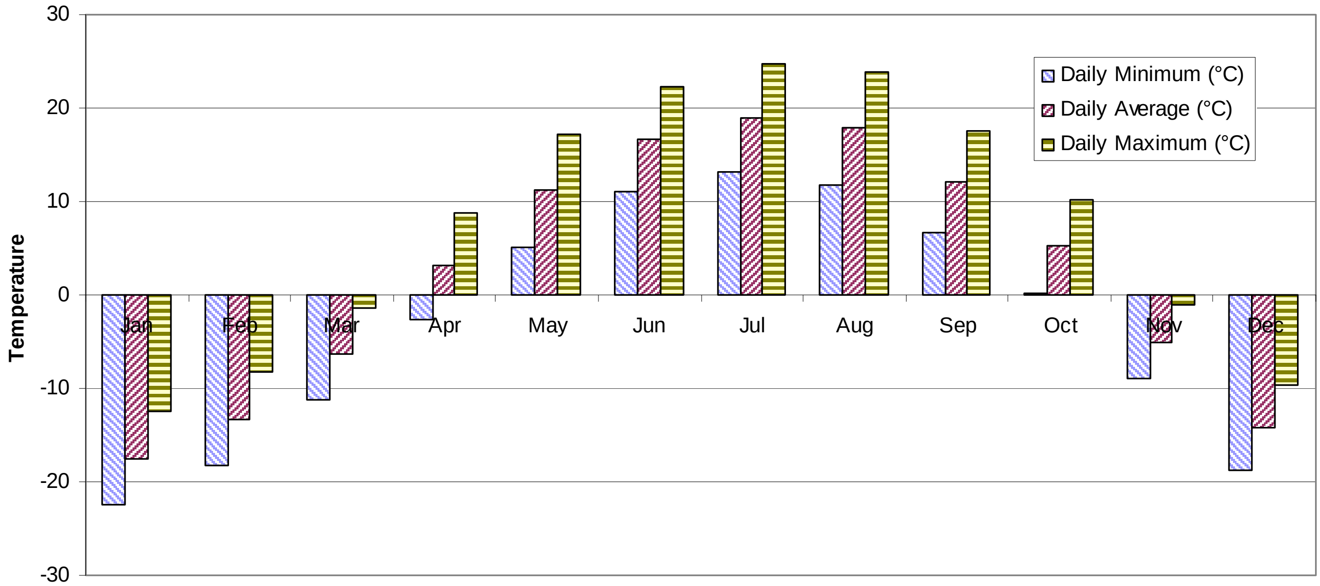


Figure 5: Long-term monthly temperature normals at Langmuth.

3. Hydrometric Data

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.

There are currently no long-term hydrometric stations in the watershed recording the stage and streamflow of watercourses. However, during spring runoff in 1979 the stage and the streamflow were recorded on Garrioch Creek at PR #278 and PTH #50 and on the Lonely Lake Drain at PR #235. Hydrographs of the spring runoff in 1979 are shown in Figure 6. The first peak is due to snowmelt and the second peak is due to rain on saturated soils in the watershed.

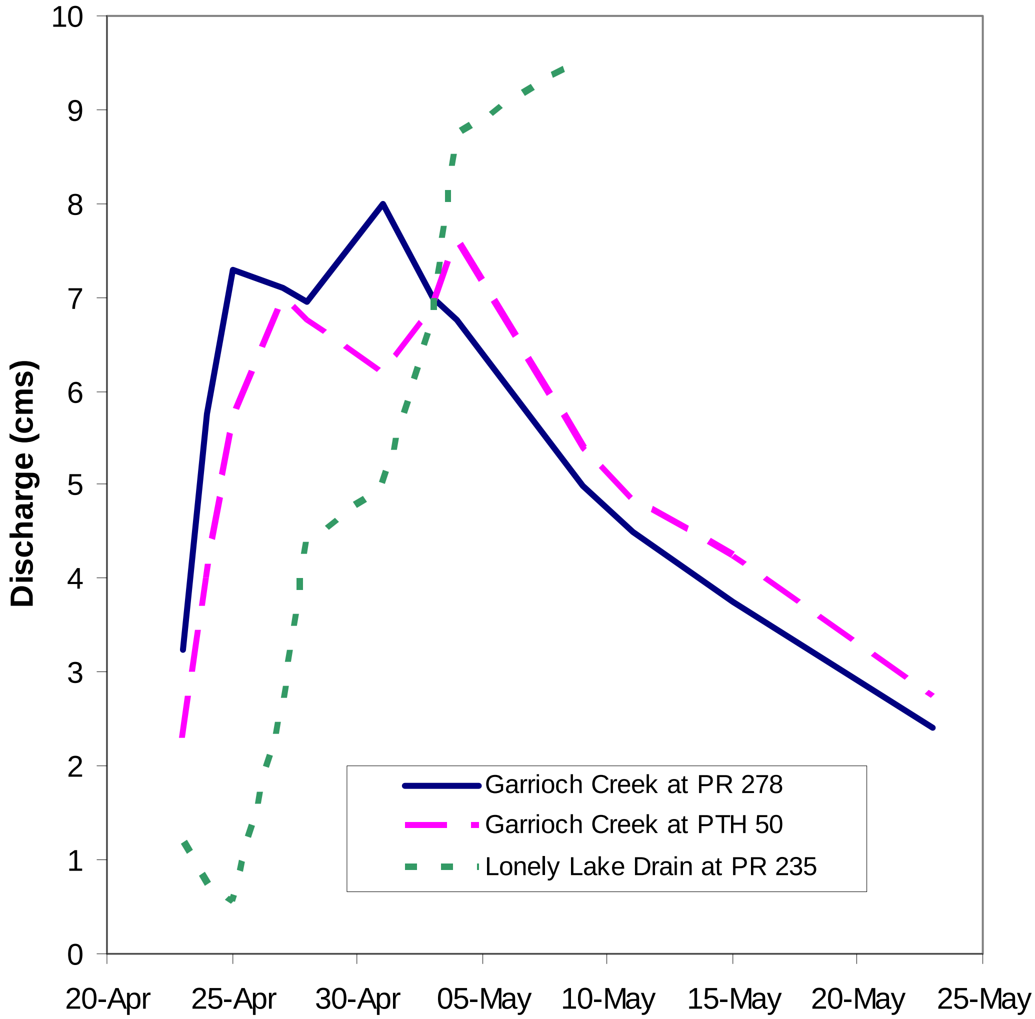


Figure 6: Hydrographs of Garrioch Creek and lonely Lake Drain during the 1979 flood

During the spring of 1979 a significant runoff event occurred as a result of rainfall near the peak of snowmelt runoff. Due to the lack of climate stations in the watershed at that time the extent of rainfall outside the Lonely Lake area was unknown. Normal precipitation for the period of November to April inclusive would be about 145 mm (5.7 inches) as interpreted from data supplied by the Atmospheric Environment Service. Precipitation for the same period in 1978 - 1979 amounted to approximately 259 mm (10.2 inches). Under normal circumstances, approximately 31 mm (1.2 inches) of runoff may be expected in the spring, if depressions and soil were assumed to store 114 mm (4.5 inches) of precipitation. However, during the spring of 1979 the rain on top of the snowmelt created about 145 mm (5.7 inches) of runoff. With snowmelt reducing the available surface water storage capability of the watershed, the rain greatly enhanced runoff conditions. Consequently, severe flooding occurred.

4. Potential damages from floods

Flood damage in the watershed has occurred to agricultural land and to the transportation system.

Agricultural productivity can potentially be reduced on both improved and unimproved lands due to flooding. Improved lands include cropland and pasture having had improvements made to cultivation, drainage, fertilization, seeding down or spraying. Improved lands also include areas allotted for barnyards, home gardens and roads on farms. Unimproved land includes woodland, areas of native pasture or hayland that has not been cultivated, brush pasture, grazing or waste land, sloughs, marsh and rocky land.

The severity of agricultural flood damage depends on the date and duration of flooding. Inundation of land in annual crops during the spring delays planting until the water recedes and the soil moisture content is suitable for seeding. A portion of the growing season normally available for the crop to mature is lost thereby reducing crop yields. Spring inundation of tame hay for a period of more than one week causes reduced yields of any alfalfa component, if growth has been initiated. After two weeks of inundation the alfalfa component can be expected to be destroyed. In a year such as 1979, the duration of spring flooding was such that there was insufficient time in the growing season for crop production to be possible on some fields. With regard to summer flooding, inundation damage can be highly variable depending on the type of crop grown, the duration of flooding and the maturity of the crop. July flooding of wheat, for example, can result in total crop loss after three or four days. Flooding of mature alfalfa in July can result in severe damage even after one day of inundation.

As a result of spring and summer flooding, flood damage is also sustained on unimproved agricultural land. The flood damage can be in the form of reduced animal grazing days, delays in putting up native hay resulting in poorer quality of hay produced, reduced yields and hay stack spoilage. Lengthy inundation of native hay meadows can result in a species change the following year. Less nutritive and palatable coarse sedges and reed grasses replace the normally occurring native grass species. Following a year of flooding, it requires a minimum of one year and sometimes two years of drier conditions for the meadows to revert to the former more productive grass species.