

## **What determines how much water runs in the rivers of the South Saskatchewan River Basin?**

This is a very brief description of the main factors that determine how much water flows in the rivers in the South Saskatchewan River Basin (SSRB).

### **It all starts with Mother Nature:**

- Snow accumulates in the Rocky Mountains.
- Most runoff from snow melt is in May and June.
- Rocky Mountain snowmelt accounts for 75 per cent of the river flows.
- Melting glaciers contribute some flow to the Bow River, and very little to the other rivers.
- Rainfall occurs most frequently in June.
- The amount, timing and intensity of runoff from rainfall and snow melt is affected by:
  - How much moisture is in the soil;
  - Temperatures;
  - Evaporation;
  - Type of soil;
  - Topography.
- River flows are highly variable, both from season to season and from year to year.
  - Maximum annual volume from the SSRB can almost double from the average in a wet year, and in a dry year it can be half.
  - Using the Bow River as an example, the variation in rate of flow between seasons can be very large. At the river's mouth, natural flows in the peak runoff in June can be as much as 1,200 cubic meters per second, and low flows in mid-winter can be as low as 5 cubic meters per second.

### **Next, people influence the flows:**

#### Impermeable surfaces

- Roofs and paved surfaces in urban areas cause more rainfall to flow into the rivers than would naturally. Often this water is of poor quality by the time it reaches the river.

#### Dams

- Dams for hydropower
  - Fill with water during the summer and fall, and release water during the winter.
  - These dams can result in large variations in flow during the course of the day, as the dams are used to quickly supply power to meet peak demands, as in the evening.

- Dams for irrigation and other water supply:
  - Fill mainly in the spring and early summer during peak runoff, and release water from the reservoir into canals or from the dam for diversion downstream during the spring and summer;
  - Dickson Dam on the Red Deer River is filled by the fall, in order to release a steady supply of water through the winter.
- Newer dams owned by the Government of Alberta are multi-purpose, and water is stored and released for:
  - water supply;
  - recreation;
  - aquatic environment;
  - apportionment agreement with Saskatchewan.
- Many dams, particularly those that are new, require a certain minimum rate of flow pass through the dam for the aquatic environment. This can be a single rate of flow value, or one that varies to mimic natural patterns.

#### Flow diversion

- Flow diversion for agriculture, municipalities and industry
  - weirs, pumping
- With some exceptions, flow diversions require a licence from Alberta Environment that stipulates the total annual volume, and can specify a rate of diversion and other conditions.
- Exceptions are defined in the *Water Act* and regulations. These include:
  - a right to divert up to 1,250 cubic meters per year for household purposes;
  - registrations for traditional agricultural uses;
  - uses such as fire fighting.
- Water allocation licences are governed by a strict set of rules under the *Water Act*. Licences are subject to a priority system that allows the needs of older licences to be met before newer licences can divert water. In drier years, this system is enforced through "water mastering."

#### Return flows

- Often a part of the water diverted is returned back to the river after it is used.
  - In an irrigation district, some water flows through the system and is not used. Between irrigation districts the amount ranges between 10 to 30 per cent. This amount will decrease in the future as the districts improve their water use efficiency.
  - In some cases, water is returned to a different river
  - Industries and municipalities return treated waste water to rivers. Approximately 80 per cent of the diversion is typically returned.
- Waste water, particularly from municipal waste water treatment plants, usually requires some dilution to become assimilated into the river water. This can require maintaining a certain rate of flow in the river.

#### Water conservation objectives

- Water allocation licences issued in recent years include a conditions called the "instream objective" or "water conservation objective" that determines the minimum flows that must

be present before water can be diverted. These minimum flows are intended to help protect the aquatic environment.

- Water conservation objectives can be established to determine the quantity of water to remain in the rivers. These can affect flows in three ways:
  - By governing the flows that must be released from a dam.
  - By governing when a licence holder can divert water.
  - By guiding Alberta Environment officials on decisions about water allocation or flow restoration. A water conservation objective can limit the amount of water that can be allocated, or define the amount of flow to be restored.
- The *Water Act* also provides for the creation of Crown Reservations, which can define how much water is to remain in the river and how much can be diverted, and for what purposes.

#### International and Interprovincial water sharing agreements

- Agreements with neighbouring provinces and the United States affect the amount of flow in the rivers of the SSRB:
  - The *Master Agreement on Apportionment* governs the volume of water that must be passed on to Saskatchewan, and the rate of flow at the border.
  - The *Boundary Waters Treaty* governs the sharing of the waters of the St. Mary and Milk Rivers with the United States. A certain amount of water from the St. Mary River, which has its source in Montana, is diverted into the Milk River for conveyance through Alberta and back into eastern Montana, where it is used mainly for irrigation.