

WATER FOR LIFE GOAL 1: Safe, secure drinking water supply for Albertans

The BRP opportunities can secure sufficient water storage and significantly improve headwaters protection, creating the conditions for a long-term safe and secure drinking water supply for the approximately 1.3 million Albertans now living in the Bow River Basin. Stress tests were done on the modelled scenarios to ensure an adequate water supply would be available for the population forecast in the Calgary Metropolitan Plan



Wedge Pond in Kananaskis

for the next 65 years. Under all but the most extreme circumstances, different management practices will make available adequate water storage and supply upstream of Calgary without creating any new reservoirs. The proposed stabilization of Lower Kananaskis Lake and the Kananaskis River downstream to Barrier Lake to improve aquatic ecosystem health, fisheries productivity, and recreational opportunities also would provide an emergency-only drinking water supply for the downstream population in the event of a prolonged drought beyond those seen in the historic record. The Spray reservoir could similarly be used in extreme circumstances for municipal water supply upstream of the Kananaskis confluence with the Bow.

WATER FOR LIFE GOAL 2: Healthy aquatic ecosystems

One principle of the BRP was to evaluate each reach of the Bow and its managed tributaries to ensure no measurable environmental harm would occur in any reach while substantially improving aquatic ecosystems in other reaches. The vastly improved knowledge base created by the BROM and the initial scenarios provide the foundation for long-term protection of river ecology without impeding population growth and economic development that are forecast for the next 65 years. Two examples of improvements in every scenario are the dramatic improvement to the Kananaskis Lake and Kananaskis River ecosystems, and the considerable improvement to flow rates downstream of the Bassano Dam (see Figures 10-12). The Bow River Water Quality Model work described earlier confirms the positive ecological benefits offered by an integrated scenario. Managing the entire Bow River System as an integrated system rather than as a reach-by-reach series of unconnected flowing water bodies, can ensure adequate flow to support essential ecological processes for the very long term. This includes additional work to explore pulsed flows downstream of Bassano to improve riparian habitat, examine flow requirements to support the world-class trout fishery downstream of Calgary, and provide additional flow rates to reduce the risk of low dissolved oxygen levels through Calgary. Many other improvements may be uncovered through further collaborative work with the model.

WATER FOR LIFE GOAL 3: Reliable, quality water supplies for a sustainable economy

The three primary economic pillars in the Bow River Basin are the urban administrative and services businesses (including financial services) and the energy sectors, agriculture and its related businesses, and tourism and recreation. All depend on an adequate and

reliable water supply. All the BRP scenarios provide for additional water for recreational and aesthetic purposes in the headwaters and throughout the Bow River System. Water for municipalities using or wanting to use the Bow as their source was built into the scenarios by providing for the use of all the water in the Calgary licence, whether by the City, its regional water utility, or other municipalities. The irrigated agriculture sector is the major water user in the Bow Basin. The three Irrigation Districts that use the Bow actively participated in developing scenarios to improve water use efficiency throughout the basin, including in their operations. One of the innovative outcomes of the BRP partnership was modelling the potential use of off-stream storage reservoirs in the BRID to enhance the flow below Bassano during low-flow periods. By maintaining McGregor and Travers reservoirs at high levels during high-flow periods, there would be less need for BRID diversions during low-flow periods in late summer. This would allow more water to flow downstream to support aquatic ecosystem health. The BROM is also a valuable tool to model and increase understanding of the impacts of potential new development in the basin.

The results, conclusions and opportunities in this report describe many significant benefits to integrated management of the Bow River System. All of these benefits could accrue to southern Alberta and the province as a whole through a thoughtful, well-planned and timely response to the opening that is expected to occur in the next year with respect to managing this river system. The Bow River Project Research Consortium is optimistic that these opportunities will be acted on and is pleased to have contributed to the discussion.

6. REFERENCES

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PHOTO CREDITS

<i>Bow Glacier above Bow Lake</i> Carlos Amat Photography for the City of Calgary	1
<i>Spray Lakes Reservoir in Spray Valley above Canmore</i> Alberta Tourism, Parks and Recreation Ministry, Parks Division, Kananaskis Country Region	3
<i>Ghost Dam</i>	7
<i>Trout in the Bow River</i> Bow River Basin Council	9
<i>Winter on the Bow River</i> Bow River Basin Council	10
<i>Participants working at CAN session</i>	11
<i>Canoeing on the Bow River</i> Stewart Rood	19
<i>Pelicans on Irrigation Reservoir</i> Bow River Irrigation District	20
<i>Lower Kananaskis Lake in September & May</i>	24
<i>Kayaking at Canoe Meadows on the Kananaskis River below Barrier Dam</i> Alberta Tourism, Parks and Recreation Ministry, Parks Division, Kananaskis Country Region	26
<i>Irrigation Canal</i> Western Irrigation District	29
<i>Calgary's Bearspaw Water Treatment Plant</i> City of Calgary	32
<i>Bow Bridge in Calgary</i>	35
<i>Irrigation Pivot</i> Bow River Irrigation District	36
<i>Fisherman on the Bow River</i> Trout Unlimited Canada	37
<i>Spray Lakes Reservoir in Spray Valley above Canmore</i> Alberta Tourism, Parks and Recreation Ministry, Parks Division, Kananaskis Country Region	43
<i>Pike Fishing in the Bow River Basin</i> Bow River Irrigation District	46
<i>Wedge Pond in Kananaskis</i> Helen Scarth Photography, Stuf2 Incorporated	50

7. GLOSSARY AND ACRONYMS

Unless otherwise noted, the definitions in this glossary were taken or adapted from Alberta Environment's Approved Water Management Plan for the South Saskatchewan River Basin (Alberta), 2006.

AF ~ acre-foot; the volume of water required to cover one acre to the depth of one foot.
One AF = 1.23348 dam³.

Ancillary Services ~ Ancillary services, such as "spinning reserve" and automatic generation control, maintain the electrical system within narrow tolerances as load rises and falls. It also helps ensure that power is delivered at stable voltages. (Alberta Energy)

Aquatic Environment ~ (As defined in Alberta's Water Act) The components of the earth related to, living in or located in or on water or the beds or shores of a water body, including but not limited to all organic and inorganic matter, and living organisms and their habitat, including fish habitat, and their interacting natural systems.

AWRI ~ Alberta Water Research Institute

BRBC ~ Bow River Basin Council

BRID ~ Bow River Irrigation District

BROM ~ Bow River Operational Model

BRP ~ Bow River Project

cfs ~ cubic feet per second; one cfs = 0.02832 cms.

cms ~ cubic metres per second; one cms = 35.314 cfs

CRP ~ Calgary Regional Partnership

dam³ ~ one cubic decametre (1,233.48 cubic metres)

Dissolved Oxygen (DO) ~ Amount of available oxygen contained in the water, but not including the oxygen that is part of the water molecule (H₂O). Expressed as milligrams per litre.

EID ~ Eastern Irrigation District

FITFIR ~ "First-in-time, first-in-right" refers to the priority system for allocating water based on the seniority of the licence (that is, older licences have higher priority). FITFIR has been a key principle of granting and administering water allocations in Alberta since 1894 and continues to be the system of water allocation under the Water Act. It is active only when there is insufficient water to meet the needs of all licence holders. (Alberta Water Council, 2009; and Legislative History of Water Management in Alberta, <http://www.environment.alberta.ca/o2265.html>)

FSL ~ Full supply level

HADD ~ harmful alteration, disruption or destruction (of fish habitat)

Hydropeaking ~ The difference between maximum and minimum intra-day flows through turbines in the TransAlta system (BRP Research Consortium)

Instream Flow ~ The rate of flow in a river, without reference to its purpose.

Instream Needs / Instream Flow Needs (IFN) ~ This is the scientifically determined amount of water, flow rate, water level, or water quality that is required in a river or other body of water to sustain a healthy aquatic environment or to meet human needs such as recreation, navigation, waste assimilation, or aesthetics.

Instream Objectives ~ Regulated flows that should remain in the river via dam operations or as a restriction on licences. Below dams, Instream Objectives are in place throughout the SSRB, although some offer only limited protection of the aquatic environment. Instream Objectives have usually been set in response to fish habitat instream needs (the Fish Rule Curve) and/or water quality.

Irrigation District ~ An organization that owns and manages a water delivery system for irrigation for a given region. In Alberta, there are 13 irrigation districts. Some districts convey water for other purposes, such as municipal use and stockwatering.

Master Agreement on Apportionment ~ Schedule A of the 1969 Master Agreement on Apportionment for the South Saskatchewan River between Alberta and Saskatchewan allows Alberta to “divert, store or consume” from the river system each year, a volume of water equal to one-half of the apportionable flow of the South Saskatchewan River at the Alberta-Saskatchewan boundary. The remaining volume of flow must be allowed to pass downstream into Saskatchewan. The exception to this general rule is that Alberta is entitled to divert, store or consume a minimum of 2.1 million-acre feet in any year. The effect of this exception is that during years when the volume of natural flow is less than 4.2 million-acre feet (a rare occurrence), Alberta may pass less than one-half of the apportionable flow to Saskatchewan. If at any time during a year Alberta wants to divert, store or consume more than half the apportionable flow, a flow rate of 1,500 cubic feet per second (cfs) must be maintained at the Saskatchewan border, unless the natural flow is less than 3,000 cfs, in which case half the natural flow must be passed. (There is no policy in Alberta as to the amount of water each sub-basin of the SSRB must contribute to the Saskatchewan apportionment.)

Natural Flow / Natural Rate of Flow ~ Natural flow is the flow in rivers that would have occurred in the absence of any man-made effects on, or regulation of, flow. For purposes of water management, natural flow is a calculated value based on the recorded flows of contributing rivers; a number of factors concerning the river reaches (e.g. evaporation, channel losses, etc.); and water diversions. This is also known as “re-constructed flow” and “naturalized flow”.

OASIS ~ Operational Analysis and Simulation of Integrated Systems

Return Flow ~ Water that is included in an allocation and is expected to be returned to a water body after use and may be available for reuse, although the water quality characteristics may have changed during use. (Canadian Association of Petroleum Producers, Draft Water CEP Plan)

Riparian Area ~ The area along streams, lakes, and wetlands where water and land interact. These areas support plants and animals, and protect aquatic environments by filtering out sediments and nutrients originating from upland areas.

Riparian Vegetation ~ The vegetation that exists in riparian areas and is supported by the interaction of the water and land.

River Basin ~ An area of land drained by a river and its associated streams or tributaries.

SSRB ~ South Saskatchewan River Basin. The South Saskatchewan River Basin includes the sub-basins of the Red Deer River, Bow River, and Oldman River (including the South Saskatchewan).

Surface Water ~ Water bodies such as lakes, ponds, wetlands, rivers, and streams. It may also refer to sub-surface water or groundwater with a direct and immediate hydrological connection to surface water (for example, water in a well beside a river).

Water Allocation ~ The amount of water that can be diverted for use, as set out in water licences and registrations issued in accordance with the Water Act. (Canadian Association of Petroleum Producers, Draft Water CEP Plan)

Water Conservation Objective (WCO) ~ As defined in Alberta's Water Act, a Water Conservation Objective is the amount and quality of water necessary for the protection of a natural water body or its aquatic environment. It may also include water necessary to maintain a rate of flow or water level requirements.

From the *Water Act*: "Water Conservation Objective" means the amount and quality of water established by the Director under Part 2, based on information available to the Director, to be necessary for the:

- (i) protection of a natural water body or its aquatic environment, or any part of it;
- (ii) protection of tourism, recreational, transportation or waste assimilation uses of water; or
- (iii) management of fish or wildlife, and may include water necessary for the rate of flow of water or water level requirements.

A licence may be issued by the Director to the Government of Alberta for the purpose of implementing a Water Conservation Objective.

Water Diversion (or withdrawal) ~ Describes the amount of water being removed from a surface or groundwater source, either permanently or temporarily. (Canadian Association of Petroleum Producers, Draft Water CEP Plan)

Water Licence ~ A water licence provides the authority for diverting and using surface water or groundwater allocation. The licence identifies the water source, the location of the diversion site, an amount of water to be diverted and used from that source, the priority of the "water right" established by the licence, and the condition under which the diversion and use must take place.

Watershed ~ An area of land that catches precipitation and drains into a body of water, such as a marsh, stream, river or lake.

WID ~ Western Irrigation District

WRMM ~ Water Resources Management Model