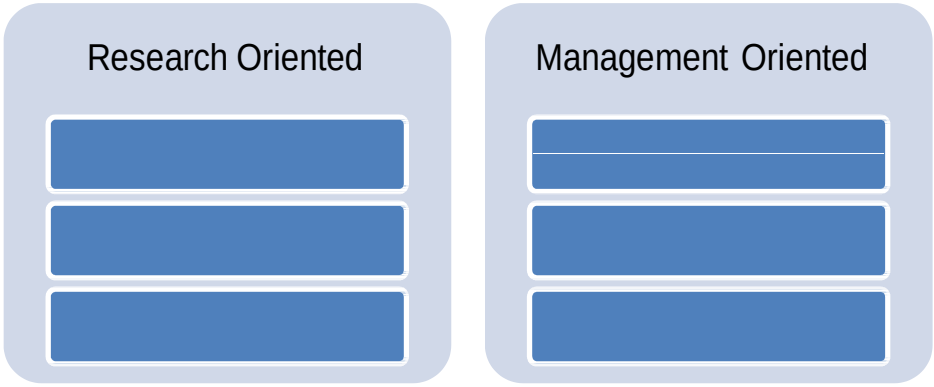
Bow River Phosphorus Management Plan (PMP) Modelling for Phosphorus

The Bow River begins in the Rocky Mountains and runs through foothills onto the prairies, ending at the confluence with the Oldman River, where it becomes the South Saskatchewan River. The river is an important source of water for municipal uses, livestock, irrigation, fisheries, recreational use and hydroelectric power. Between the Bearspaw and Bassano Dams, population, industry and agriculture result in large volumes of water being withdrawn from the Bow. The high reliance on the Bow River in this area makes it important to understand the quality of the water available and to plan effectively for its use. One component of this planning is water quality modelling.

What is modelling?

Modelling allows us to organize and synthesize observations and measurements from real systems, understand cause and effect relationships, and fill gaps in data in a cost-effective way. Water quality models can be used to inform both research-oriented and management oriented objectives:

Modelling goals (Khandan, 2002)



Water quality models are excellent tools to be used in the implementation of policy, regulatory development, remediation, and enforcement needs and activities. They help to assess processes modified by natural and human-induced changes in the river system (Lung, 2001).

How is ESRD assessing phosphorus loadings?

In order to give an overall picture of the current status of phosphorus in this reach of the Bow River, current, reliable information needed to be collected, compiled and processed. Part of this information includes understanding the link between water flow processes with water quality conditions. Also, from a planning perspective, it is necessary to better understand the effects of anticipated future phosphorus loading conditions and its impact on the water quality. Thus, a better understanding of the daily maximum allowable load that would meet the desired quality objectives (i.e., the amount of phosphorus the river can handle daily) was also needed.

ESRD has assembled two tools - the Loading Duration Curve (LDC) and the Bow River Water Quality Model (BRWQM) to better understand the effects of current and future phosphorus loadings.

Loading Duration Curve (LDC)

Loading Duration Curve (LDC) compares the amount of phosphorus in various places in the Bow River at different times of year as the water levels change. By combining the information about the amount of water flow and the water quality, this tool can help determine water flow conditions under which the desired water quality objectives may not be met. ESRD has developed and updated the LDC for this section of the Bow River.

Bow River Water Quality Model (BRWQM)

The Bow River Water Quality Model (BRWQM) uses information about the water coming into and out of this reach, the change in landscape as the river flows downstream, and how this information changes over time. While this explanation may appear overly simplified, a lot of information from multiple sources is incorporated into this work. This includes predicted water flows, water surface elevations (which can be further used to develop cross-sectional water velocities), wetted widths, water depths and volume of water bounded between adjacent cross-sections.

This information, along with a complete record of all headwater, tributary and storm water inflows, can be used to develop predictions of water quality in the Bow River. The BRWQM is being used to assess the impact of current and forecasted phosphorus loadings on the desired water quality objectives. This information will help guide the type and level of management actions to manage phosphorus loadings into the Bow River.

For more information contact:
Louella Cronkhite, Project Lead
Environment and Sustainable Resource Development
Planning & Strategic Engagement
2nd Floor, Provincial Building
200 - 5 Ave S.,
Lethbridge, AB T1J 4L1
Phone: 403-381-5647, Toll free in Alberta: 310-0000
louella.cronkhite@gov.ab.ca