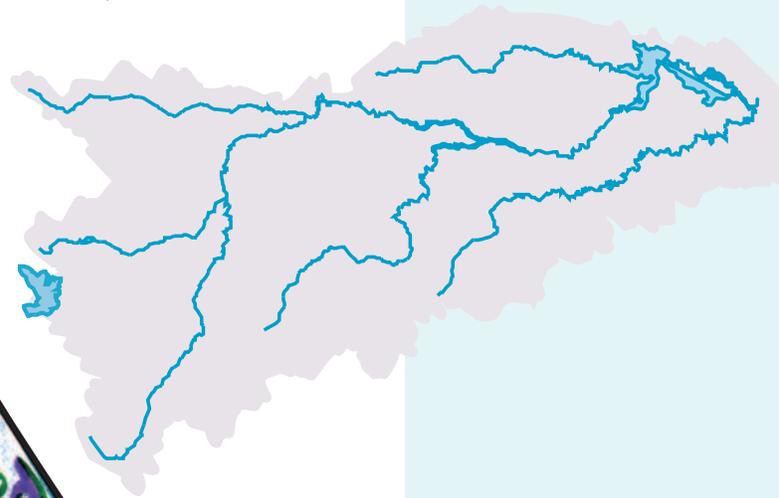
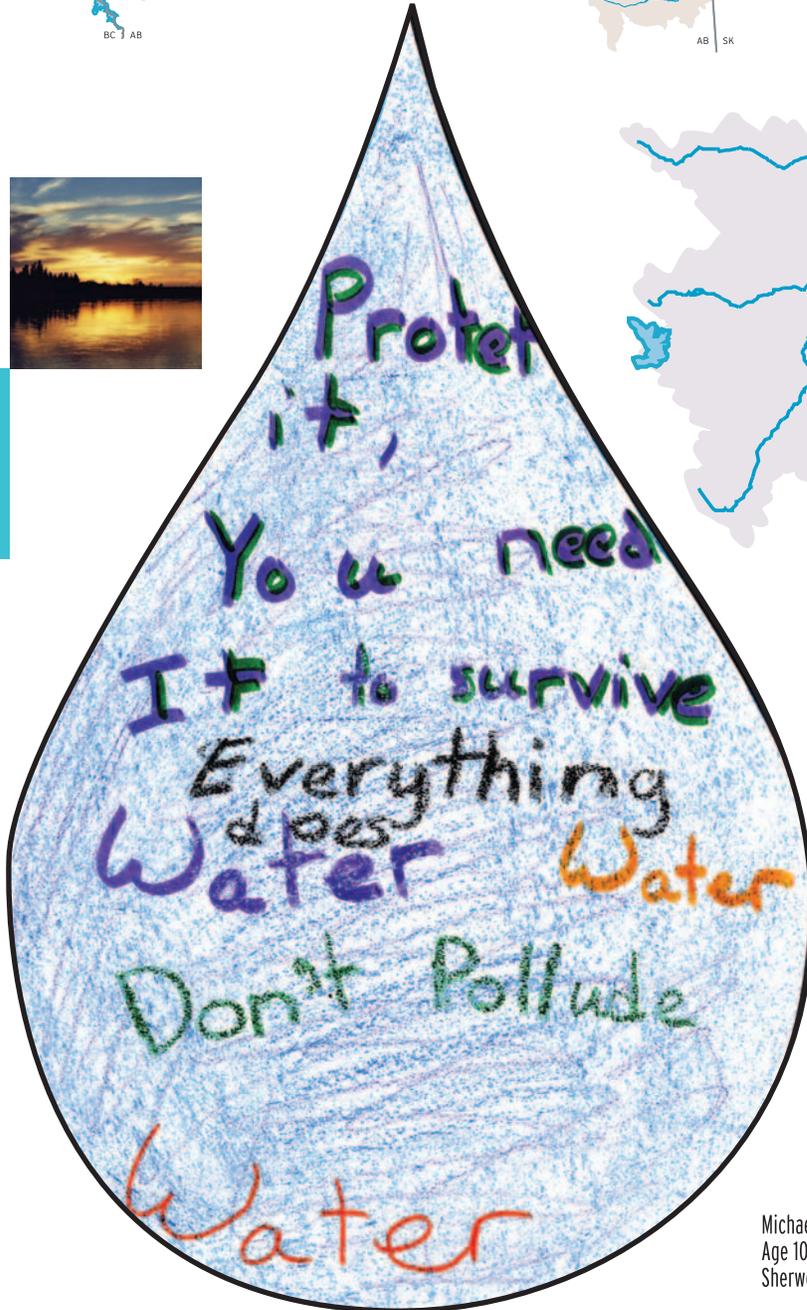
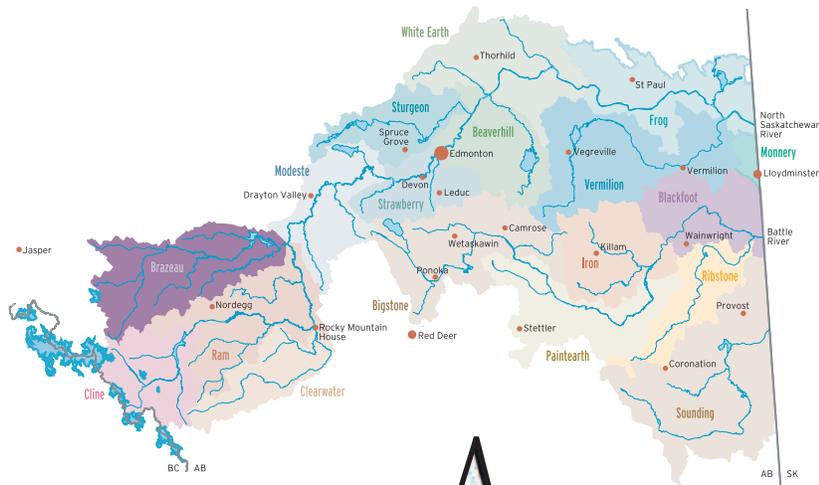


Brazeau



Michaela Eifler
Age 10
Sherwood Park

5.2 BRAZEAU SUBWATERSHED

The Brazeau Subwatershed encompasses a biologically diverse area within parts of the Rocky Mountain and Foothills natural regions. The Subwatershed covers 689,198 hectares of land and includes 18,460 hectares of lakes, rivers, reservoirs and icefields. The Brazeau is in the municipal boundaries of Clearwater, Yellowhead and Brazeau Counties. The 5,000 hectare Brazeau Canyon Wildland Provincial Park, along with the 1,030 hectare Marshybank Ecological reserve, established in 1987, lie in the Brazeau Subwatershed. About 16.4% of the Brazeau Subwatershed lies within Banff and Jasper National Parks. The Subwatershed is sparsely populated, but includes the First Nation O’Chiese 203 and Sunchild 202 reserves. Recreation activities include trail riding, hiking, camping, hunting, fishing, and canoeing/kayaking.

Many of the indicators described below are referenced from the “Brazeau Hydrological Overview” map located in the adjacent map pocket, or as a separate Adobe Acrobat file on the CD-ROM.

5.2.1 Land Use

Changes in land use patterns reflect major trends in development. Land use changes and subsequent changes in land use practices may impact both the quantity and quality of water in the Subwatershed and in the North Saskatchewan Watershed. Five metrics are used to indicate changes in land use and land use practices: riparian health, linear development, land use, livestock density, and wetland inventory.

5.2.1.1 Riparian Health

The health of the riparian area around water bodies and along rivers and streams is an indicator of the overall health of a watershed and can reflect changes in land use and management practices. No published assessment of riparian health was found for the Brazeau Subwatershed, so we cannot make any conclusions about riparian health for this Subwatershed using this indicator. This data gap could be addressed in future research in the Brazeau Subwatershed.

5.2.1.2 Linear Development

Quantifying linear development in the Subwatershed helps us understand potential changes in water quality and quantity, fish and wildlife populations, and riparian health. Of the land area in the Brazeau Subwatershed, 1.4% (9,315 ha) is taken up by linear development. The majority of this (63%) is cutlines. Roads of one form or another, unimproved or gravel roads (11.6%), truck trails (5.9%) and undivided paved roads (0.05%) cover the next largest portion of the watershed. Pipelines (15%) and transmission lines (4%) account for the remainder of the linear disturbance in the Brazeau Subwatershed.

5.2.1.3 Land Use Inventory

An inventory of land uses quantifies natural landscape types and land uses and may be used to explore changes in water quality and quantity, fish and wildlife populations, and riparian health. Only 15% of this Subwatershed has been classified based on the PFRA Land Classification System. Of this, 105,419 hectares, 88% (93,247 ha) is classified as trees and 10% as “other lands”. The remainder is grassland (2%, 1,914 ha) with small areas of forage and shrubs. Eighty-three percent of the Subwatershed is in provincial government forest management units (FMU).



In addition to the linear disturbances noted above, about 0.2% (1066 ha) of the Subwatershed area is affected by well sites and a smaller percentage, about 107 hectares, is used for various facilities including an air strip, gas plants, gravel pit, etc. While there is little industrial or urban land use in the Subwatershed, there are many mineral deposits including coal, oil and gas, limestone, and aggregates. There were many coal mines in operation in the first half of the 20th century. These are no longer active.

5.2.1.4 Livestock Density

Areas of higher livestock density may be expected to have greater impacts on downstream aquatic systems. Manure production was used as a surrogate for livestock density. Manure production information was available only on the basis of soil polygons. These polygons do not correspond to the Subwatershed boundaries and provide only a rough estimate of manure production in the actual watershed. Based on the available information, livestock densities in the Brazeau Subwatershed are low. Manure production in the soil polygons that cover the Brazeau Subwatershed was estimated at between 0 and 726,300 tonnes.

5.2.1.5 Wetland Inventory

Wetlands serve many functions in the natural landscape. The loss of wetlands to development can have impacts on water quantity and quality to downstream habitats. There was no information available on wetland area in the Brazeau Subwatershed; however, the Alberta Sustainable Resource Development base features hydrology indicated that only 2.6% (18,460 ha) of the Subwatershed was any form of water bodies.

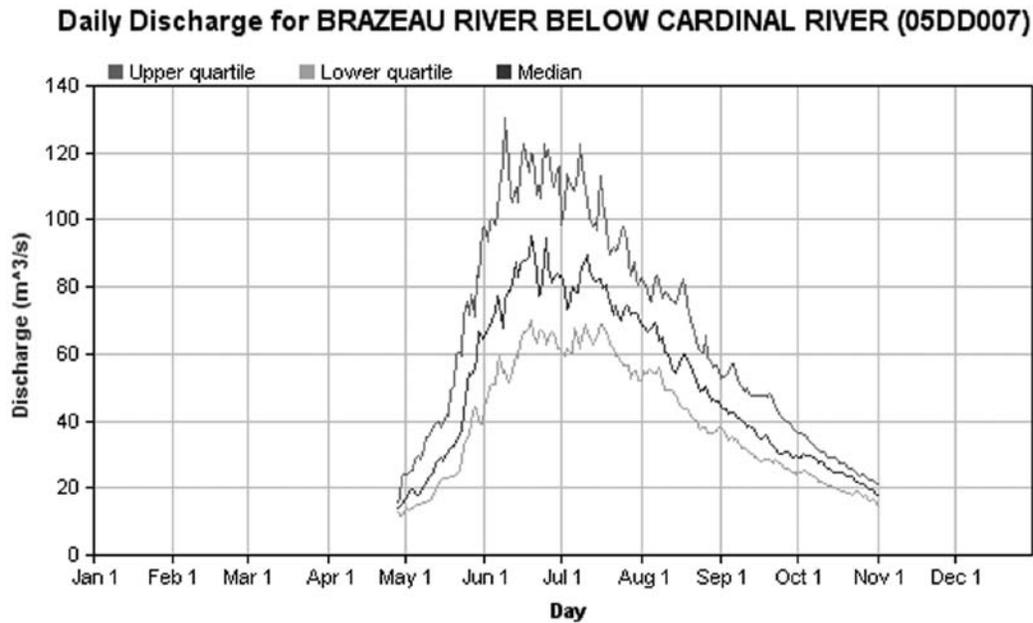
5.2.2 Water Quality and Quantity

Larger lakes and reservoirs in this Subwatershed include the Brazeau Reservoir, Brazeau Lake, Southesk Lake, Job Lake, Muskiki Lake, Leah Lake and Thunder Lake. Other waterbodies in the Subwatershed include the Brazeau, Elk, Blackstone, and Cardinal rivers, and Nomad, Ruby, Southesk, Chungo, Wawa, Rundle, Chimney, Thistle, Coast, Marshybank, and Brown Creeks. The Coronet Glacier is the largest glacier, and there are several smaller, unnamed glaciers in the Subwatershed.

No LTRN water quality stations exist in this Subwatershed, therefore no long term water quality data has been summarized. However, sixty-nine total phosphorus samples and ten fecal coliform samples were collected along the Brazeau River from 1961-64, 1967-76, 1985-86 and 2003-04. The total phosphorus samples ranged from 0 to 3.1 mg/L, and averaged 0.226 mg/L. The fecal coliform samples ranged from 0 to 1 count/100 mL, and averaged 0.01 counts/100 mL. All fecal tests were well below the CCME Surface Water Quality Guidelines for Contact Recreation. There has been no sampling done for pesticides in the Brazeau Subwatershed.

Water quantity is measured at nine HYDEX stations (05DD001-05DD009): three have real-time online data (05DD004, 05DD007, and 05DD009). The Brazeau River and most of its upper tributaries exhibit typical mountain discharge regimes with over 50% of the total annual discharge occurring in June, July and August. The main stem of the North Saskatchewan River depends on glacial meltwater and groundwater for base flows and periods of low water extend from the fall through late spring (Allan 1984). The Brazeau Dam and hydroelectric plant on the Brazeau River form the Brazeau Reservoir, which is operated by TransAlta Utilities Corporation for hydroelectric power generation. Figure 8 shows a hydrograph typical of a glacial meltwater dominated stream, with peak flows during the warm summer months and some impact on flows from summer storms. Figure 9 shows an almost constant flow from the Cardinal River. Comparison of these two Rivers is difficult, as the scale for each differs.



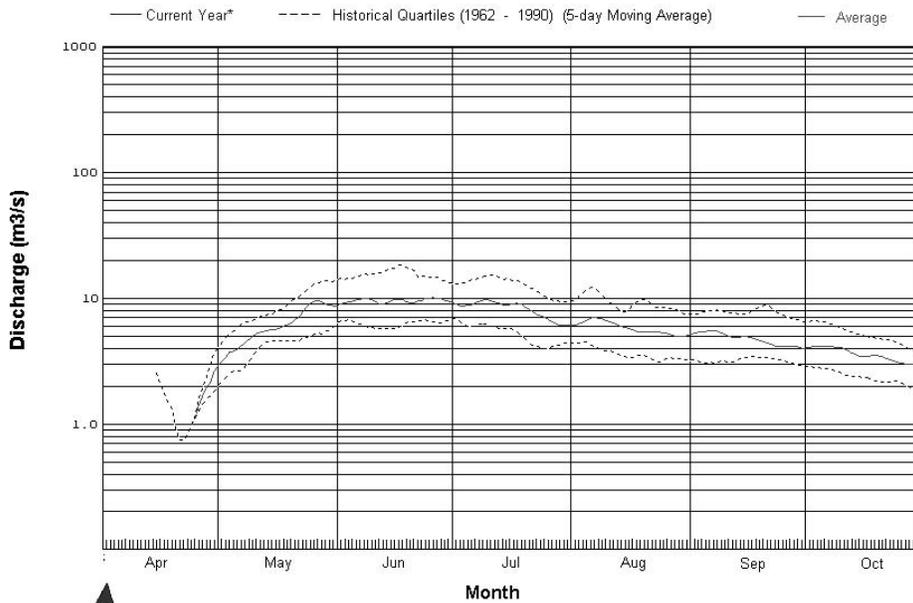


Statistics corresponding to 38 years of data recorded from January 1961 to December 2003.*

Figure 8: Brazeau River below Cardinal River mean monthly discharge (Station 05EA007).

Cardinal River Near The Mouth

(05DD008 - 40078.1)



Evaluation and Reporting Section
Environmental Monitoring and Evaluation Branch

* Preliminary Data Subject to Revision

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Figure 9: Cardinal River near the mouth mean monthly discharge for the open water season (Station 05DD008).



5.2.3 Biological Indicators

Biological indicators include information on plant and animal species from which various aspects of ecosystem health can be determined or inferred by linking this information to information on water quality and quantity, land use and management practices.

5.2.3.1 Aquatic Macrophytes

The growth of aquatic macrophytes is directly related to the availability of the nutrient phosphorus in the water in which they are growing. Excessive growth may indicate decreased water quality, which, in turn, may be linked to various point sources (e.g. wastewater outfalls) or non-point (e.g. agricultural run-off) sources on the landscape. No published assessment of aquatic macrophytes was found for the lakes, wetlands, rivers or creeks in the Brazeau Subwatershed, so we cannot make any conclusions about aquatic ecosystem health. This data gap could be addressed in future research of Brazeau Subwatershed waterbodies.

5.2.3.2 Fish Population Estimates

Inventories of selected fish populations may show changes in the presence and abundance of species that may be related to environmental factors including changes in water quality or quantity. Two native salmonids, mountain whitefish and bull trout, are widely distributed throughout the Subwatershed. Northern pike have been noted in the lower Blackstone River system but are considered rare. The lower reach of the Nordegg River supports a mix of cold water salmonids, namely mountain whitefish and bull trout, as well as the occasional northern pike and walleye (Allan 1984).

5.2.3.3 Vegetation Types

Inventories of flora populations may show changes in abundance that may be related to environmental factors including changes in land use practices. The Brazeau is located partly in the Rocky Mountain Natural Region and partly in the Foothills Region of Alberta. The Rocky Mountain Natural Region is split into 4 subregions; the alpine subregion, the lower subalpine, the upper subalpine and the montane subregion. The alpine subregion is typically unvegetated and lacking soil. The lower subalpine is composed mainly of lodgepole pine, Engelmann spruce, and subalpine fir, while the upper subalpine has spruce and fir closed forests, and open forests featuring Engelmann spruce, subalpine fir and whitebark pine. Lodgepole forests can be found at lower elevations. The montane subregion is composed of Douglas fir, limber pine, white spruce and grasslands. Fens are very common in the lower foothills as well. Throughout most of the Subwatershed, the dominant species is lodgepole pine where fire occurs; white spruce is dominant where there has been no recent fire. Some risk to the Subwatershed may be attributed to a monotypic forest, which may be more susceptible to disease.

5.2.3.4 Benthic Invertebrates

Inventories of benthic invertebrate populations may show changes in the presence and abundance of species that may be related to changes in water quality. No published assessment of benthic invertebrates was found for the lakes, wetlands, rivers or creeks in the Brazeau Subwatershed, so we cannot make any conclusions about ecosystem health using this biological indicator. This data gap could be addressed in future research in this area.



5.2.4 Brazeau Summary

The Brazeau Subwatershed is a healthy Subwatershed, but significant data gaps exist. It is an important and scenic headwater area within the North Saskatchewan Watershed that has some land use disturbance, is sparsely populated and is mostly forested. There is low industrial or urban land use in the Subwatershed; however, 83% of the lands lie within a Provincial FMU. The impact of forestry in this Subwatershed could therefore be significant. The Subwatershed is an important destination for recreational users. Due to the altitude, rugged terrain and poor soils at the western portion of this Subwatershed, there is limited potential for agriculture. Because of this, Agriculture and Agri-Food Canada (PFRA) has only classified the land use of 15% of the eastern portion of the Subwatershed; and of that only 2% is grasslands. Available manure loadings suggest that livestock densities are low.

No published assessment of riparian health was found for the Brazeau Subwatershed. This data gap should be addressed, especially because a relatively high proportion of the Subwatershed's disturbance is due to forestry cutlines. In addition, a small area is affected by well sites and other oil and gas facilities. The impacts of these developments have not been assessed nor were the impacts of forest operations assessed for this report. The importance of this site for source water protection cannot be overemphasized, so frequent monitoring is recommended.

The available data showed no wetlands in the Brazeau Subwatershed. These data should be verified with other sources.

No long-term river water quality or groundwater quality information exists for this Subwatershed. Water quantity is measured at nine stations, three of which have real-time online data. These stations provide information critical to the operation of the Brazeau Dam and hydroelectric plant.

A systematic examination of water plants has not been completed in the Brazeau Subwatershed. A fish population assessment has not been done, nor were any published assessments of benthic invertebrates found for the creeks, rivers and streams of the Brazeau Subwatershed. As all three of the above metrics have been identified as important biological indicators, studies could be undertaken for lakes, reservoirs, creeks, streams and rivers in the Subwatershed to gain a better understanding of Subwatershed health.

In summary, there has been little systematic assessment of the state of the Brazeau Subwatershed and there are significant data gaps, which should be addressed. However, of the seven indicators assessed, five were good, one was fair, and one was poor, yielding an overall subjective rating of good. Future studies should focus on the impacts of linear development and the potential conflicts between industrial activities - forest harvesting and oil and gas development – and recreational uses.

