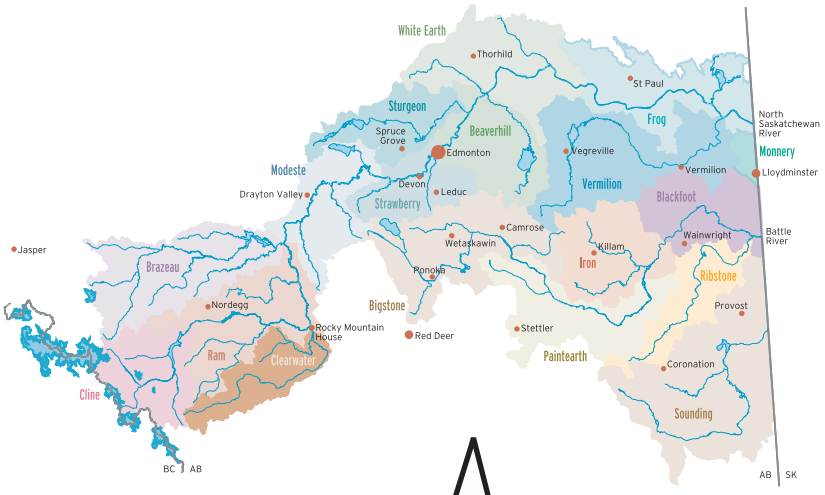
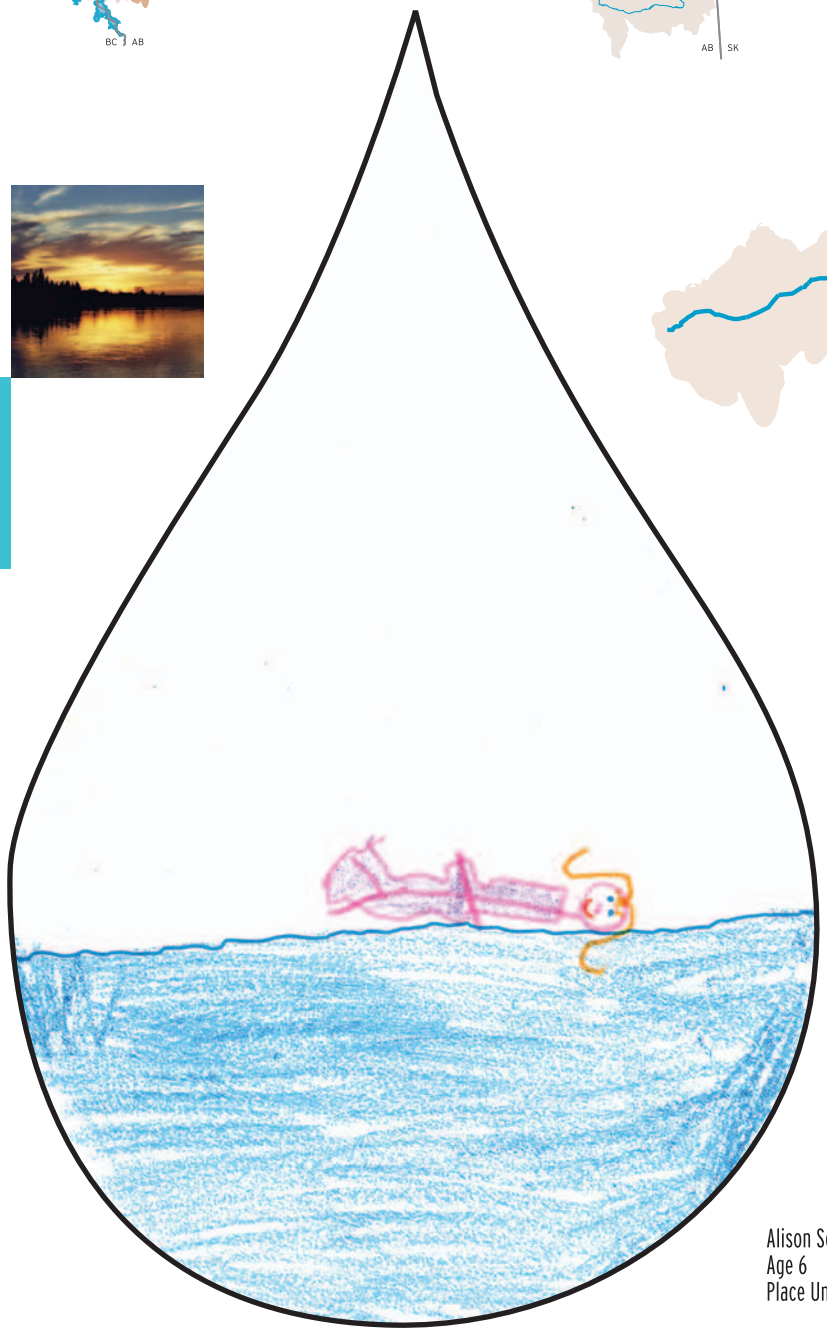
Clearwater





Alison Schumacher
Age 6
Place Unknown




5.4 CLEARWATER SUBWATERSHED

The Clearwater Subwatershed lies within parts of the Rocky Mountain and Foothills natural regions and encompasses 322,787 hectares. A very small portion of the Subwatershed is within parks or protected areas (1.4%; 4,405 ha) and includes 66 hectares located within the boundary of Banff National Park. The Clearwater Subwatershed lies in the municipal boundaries of Clearwater County and includes a portion of the Town of Rocky Mountain House. The topography of the Subwatershed is that of strong, rolling ridges of shale and sandstone. The Subwatershed receives about 550 mm in annual precipitation and has a mean annual temperature of 1° C. Waterbodies cover about 1.6% (5225 ha) of the Subwatershed.

Like the Ram Subwatershed, the economic base of the Clearwater Subwatershed consists of oil and gas, forestry, agriculture, and tourism.

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

5.4.1 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.

5.4.1.1 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 the impact of changes in land use and management practices.

No published assessment of riparian health was found for the lakes, wetlands, rivers or creeks in the Clearwater 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 within the Clearwater Subwatershed.

5.4.1.2 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.

Two percent (6,572 ha) of the land area in the Clearwater Subwatershed is taken up by various linear developments. The majority of the linear developments (59.4%; 3906 ha) is cutlines. Roads of one form or another (28.8%), pipeline rights of way (15.3%) and transmission line rights of way (5.5%) are the majority of the remainder. About 1% of the linear disturbance is railway line rights of way.

5.4.1.3 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. Forest Management Units cover a large portion (86.7%) of the Subwatershed. Twenty-eight percent of the watershed has been classified based on the PFRA Land Classification System. Of the 90,567 hectares classified, 59.7% (54,084 ha) is classified as trees and 29.9% (27,075 ha) as forage. The remainder consists of grassland (10.2%, 9,191 ha), water bodies and crop lands.

In addition to the linear disturbances noted above, 3.4% (11,117 ha) of the Subwatershed area is classified as municipal or reserve area and 0.3% (976 ha) is occupied by well sites. A small percentage (0.09% or 280 ha) is used for various other facilities including an air strip, gas plants, and gravel pits.

5.4.1.4 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 Clearwater Subwatershed are low in most of the Subwatershed with manure production being between 0 and 726,300 tonnes. However, manure production is high in the soil polygons that cover the eastern-most corner of the Subwatershed near Rocky Mountain House. In this area, manure production is in the order of 2,449,000 to 5,422,000 tonnes.

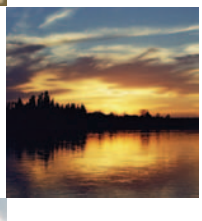
5.4.1.5 Wetland Inventory

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 Clearwater Subwatershed; however, the PFRA Land Classification indicated that only 0.1% (114 ha) of the Subwatershed was any form of water bodies.

5.4.2 Water Quality and Quantity

Water bodies in the Subwatershed include the Clearwater and Tay Rivers, Elk, Rocky, Cut-off, Swan, Prairie, and Cow Creeks. Larger lakes include Swan, Martin, Devon, Strubel, Clearwater and Phyllis. The largest glacier in the Subwatershed is the Ram River Glacier, and there are several unnamed glaciers in the far western section of the reach. The Rocky Riparian Group is an active regional watershed group in this Subwatershed, and this group has an agricultural focus.

No LTRN water quality stations exist in this Subwatershed, therefore no long term water quality data has been summarized. However, the Clearwater River was sampled at two stations for fecal coliforms and TP between 1964-1986. Five fecal coliform samples ranged from 1 to 17 counts/100 mL, and averaged 9 counts/100 mL. These fecal results are well below the CCME Surface Water Quality Guidelines for Contact Recreation. Eleven TP samples ranged from 0 to 0.111 mg/L and averaged 0.012 mg/L.



Water quantity is measured at seven HYDEX stations (05DB001-05DB007) with one having real-time online data (05DB006). Figure 11 shows the Clearwater River hydrograph, which is typical of a glacial meltwater dominated stream, with peak flows during the warm summer months and some impact on flows from summer storms.

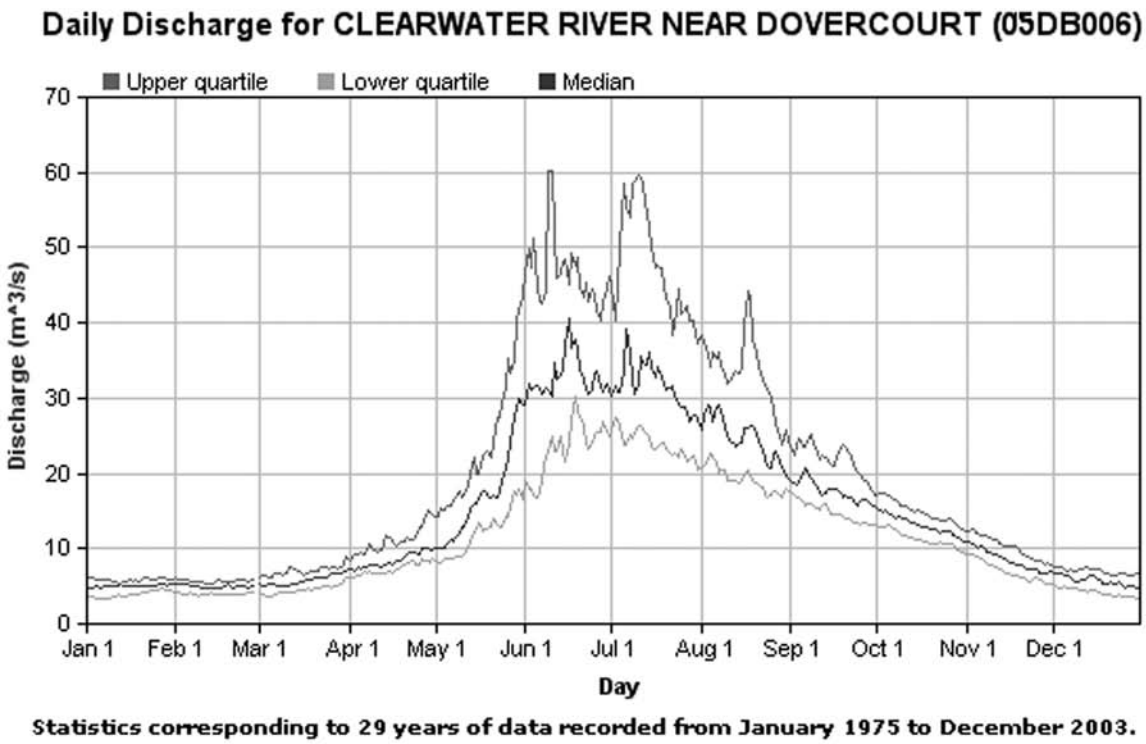


Figure 11: Clearwater River at Dovercourt mean monthly discharge for the year (Station 05DB006).




5.4.3 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.

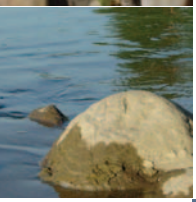
5.4.3.1 Aquatic Macrophytes

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 (wastewater outfalls) or non-point (general run-off) sources related to municipal development or land use practices.

No published assessment of aquatic macrophytes was found for the lakes, wetlands, rivers or creeks in the Clearwater Subwatershed, so we cannot make any inferences about ecosystem health for this Subwatershed using this indicator. This data gap could be addressed in future research within the Clearwater Subwatershed.





5.4.3.2 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. The Subwatershed contains about 700 kilometres of streams, 473 kilometres of which are rated as high quality, cold water salmonid streams. Bull trout and mountain whitefish are widely distributed in the Subwatershed. Brook trout and brown trout have been widely introduced by stocking and are abundant in some tributary streams. Walleye and northern pike occur occasionally in the lower main stem of the Clearwater River and Prairie Creek. The lower section of the Clearwater River has an irregular channel pattern with occasional island and mid channel bars, partly entrenched and confined in a stream cut valley and a predominately gravel substrate. The upper section has an irregular channel pattern with occasional islands, pool and riffle sequences, diagonal bars, and is partly entrenched and occasionally confined in a wide mountain valley and a gravel substrate (Allan 1984).

5.4.3.3 Vegetation Types

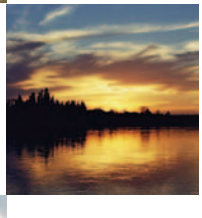
Inventories of flora populations may show changes in abundance that may be related to environmental factors including changes in land use practices. The Clearwater Subwatershed is located in both the Rocky Mountain Natural Region and the Foothills Region of Alberta. The Rocky Mountain Natural Region 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. Coniferous forests of white spruce and lodgepole pine dominate the vegetation in the higher elevations. At lower elevations, there is a co-dominance of trembling aspen, balsam poplar, lodgepole pine and white spruce.

5.4.3.4 Benthic Invertebrates

Inventories of benthic invertebrate populations may show changes 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 Clearwater Subwatershed, so we cannot make any conclusions about ecosystem health using this indicator. This data gap could be addressed in future research within the Clearwater Subwatershed.

5.4.4 Clearwater Summary

The economic base of the Clearwater Subwatershed consists of oil and gas, forestry, agriculture, and tourism. About 2% of the Subwatershed is taken up by linear developments, including cutlines, roads, pipelines, transmission lines and railway rights of way. In addition, 3.4% is classified as municipal or reserve area and a small percentage is affected by well sites and other facilities.



Less than a third of the Subwatershed has been classified under the PFRA Land Classification System. The area that has been classified shows about 60% as trees and 40% as forage, grassland, water bodies and croplands. Livestock densities are low in most of the Subwatershed except in the soil polygons that cover the eastern-most corner of the Subwatershed near Rocky Mountain House where livestock densities are high.




There was no information available on wetland area. These data need further examination because peatlands are known to be abundant in some areas of the Subwatershed.

Water quantity is measured at seven stations with one having real-time online data. No long-term river water quality information exists for the Subwatershed, and no published assessment of riparian health was found. In addition, a systematic examination of water plants has not been completed and no published assessment of benthic invertebrates or fish populations was found for the Clearwater Subwatershed.

In summary, there has been little systematic assessment of this Subwatershed and there are significant gaps in the information. However, of the six indicators assessed, four were good, two were fair, and none were poor, yielding an overall subjective rating of good. These data gaps should be addressed given the importance of this area for recreational uses and tourism, the importance of habitat in the area for fish species, and potential for conflicts with forestry, oil and gas activities and agriculture in some areas.