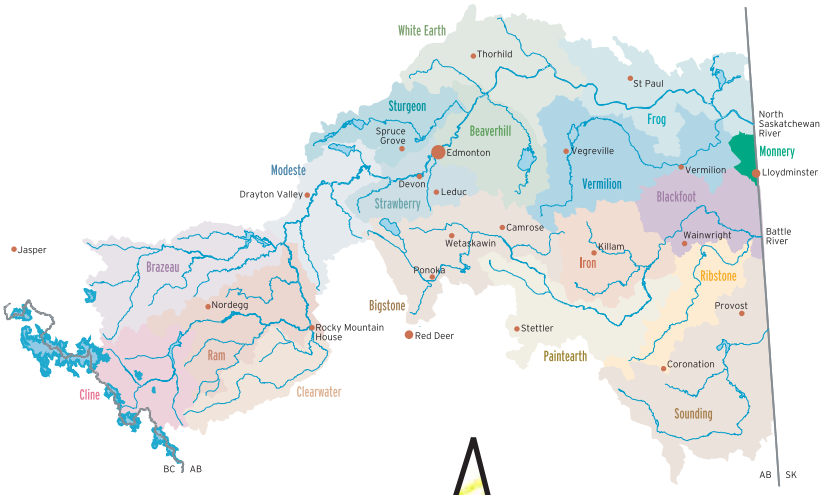
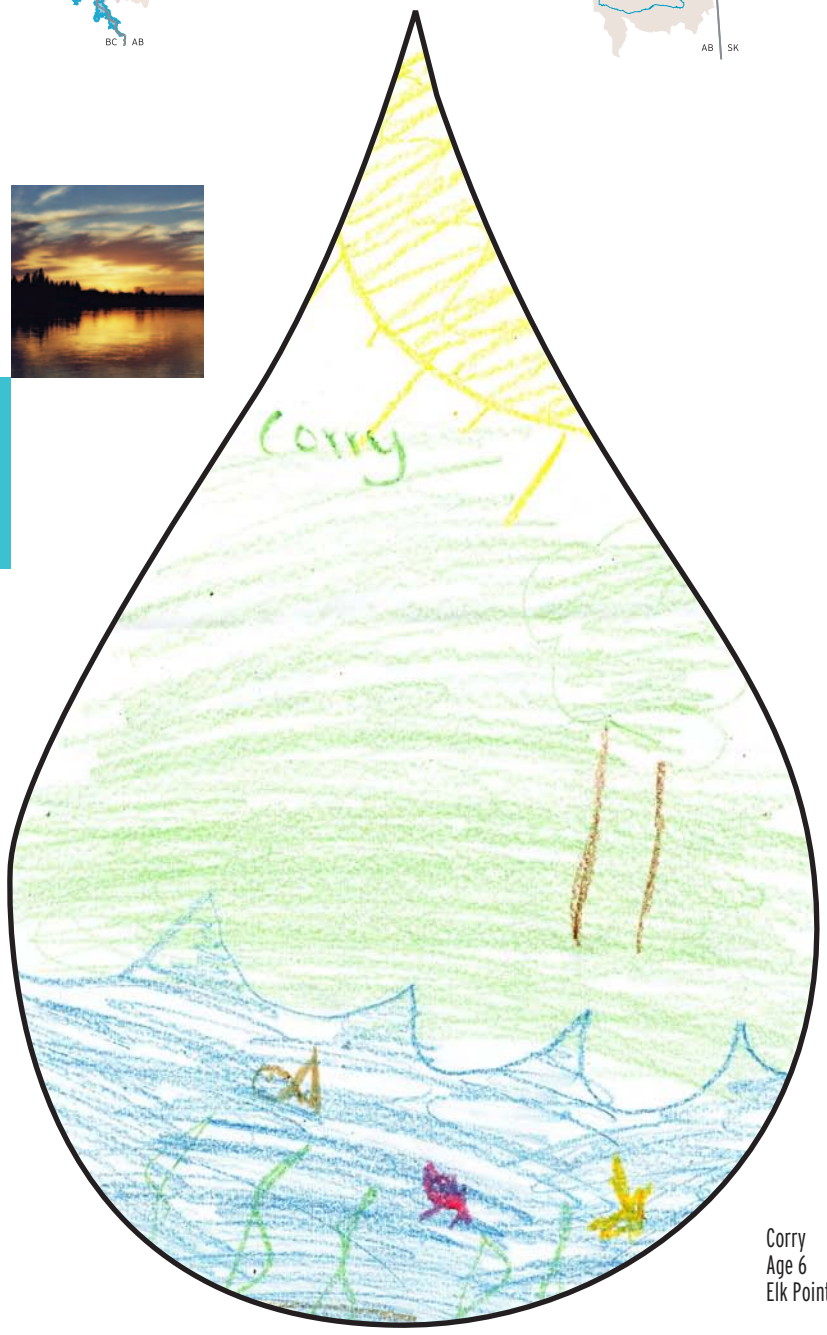
# Monnery






Corry
Age 6
Elk Point






## 5.12 MONNERY SUBWATERSHED

The Monnery Subwatershed lies in the Dry Mixedwood Natural Subregion and encompasses 125,537 hectares including 7,049 hectares of natural and artificial water bodies. The Monnery Subwatershed is bounded on the east by the Saskatchewan border and includes Improvement District 18 and Vermilion River County. Settlements in the Subwatershed include Blackfoot, Lloydminster, Streamstown, Tulliby Lake and the Makaoo 120 First Nations Reserve, with a total population of about approximately 12,000.

The geology and soil types of the Subwatershed provide for a viable agricultural industry. Agriculture is the primary industrial activity in the Subwatershed, although oil and gas operations are prevalent.

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

### 5.12.1 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.

#### 5.12.1.1 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 Monnery 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 Monnery Subwatershed.

#### 5.12.1.2 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. Almost 3% (3,419 ha) of land in the Monnery Subwatershed is affected by linear developments. The majority of this (51%) is in roads of one form or another, including gravel and unimproved roads (38% of the linear development) and paved roads (10% of linear development). Other linear developments include cutlines (20% of the area of linear development), pipeline rights of way (19%), transmission line rights of way (7%), and active or abandoned rail lines (3%).

#### 5.12.1.3 Land Use Inventory

An inventory of land quantifies natural landscape types and uses and may be used to explore changes in water quality and quantity, fish and wildlife populations, and riparian health. Water bodies, both natural and constructed including lakes, rivers, streams, wetlands, dugouts and reservoirs cover 6% of the Subwatershed. The vast majority of the Subwatershed is classified in various land uses related to agricultural production: grassland, 43%; cropland, 36%; and forage, 0.3%. About 6.5% (8,150 ha) of the Subwatershed is covered with trees. Almost half (46%) of the Subwatershed area lies in a Provincial FMU, but none lies in Parks or Protected Areas.


About 9% of the land area has been disturbed by various disturbances including the linear development described above. Three percent of the Subwatershed is in a First Nations' reserve; 2% is area affected by well sites (2,779 ha). Municipalities of various sizes including Lloydminster affect about 2% of the Subwatershed (2,323 ha). The remainder of the land disturbance is related to linear developments (2.8%), and industrial facilities including oil and gas plants and a runway (28 ha).

Water bodies including rivers, lakes and dugouts cover about 7,049 hectares; about 6% of the area of the Subwatershed.

#### 5.12.1.4 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 within the actual Subwatershed. Based on the available information, livestock densities in the Monnery Subwatershed are moderate. Manure production in the soil polygons that cover the Monnery Subwatershed was estimated at between 1,194,000 and 2,448,000 tonnes.

#### 5.12.1.5 Wetland Inventory

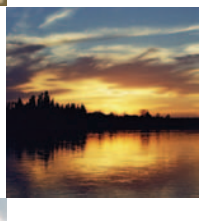
Wetlands serve many functions in the natural landscape. The loss of wetlands to development can have impacts on water quantity and quality to downstream habitats. Data from Alberta Sustainable Resource Development base features hydrology failed to identify wetlands in the Monnery Subwatershed. The available PFRA Land Classification includes 290 hectares of land classified as wetlands (0.2% of the Subwatershed area). However, an inventory completed by Ducks Unlimited Canada for the Subwatershed found a total of 8,186 hectares of wetlands (6.8% of the Subwatershed area in Alberta). The inventory included both permanent and temporary wetlands.

### 5.12.2 Water Quality and Quantity

Larger waterbodies in this Subwatershed include Pasatchaw, St. Ives, Rock Island, Two Hills, Christopher, John, Garson, Bennett, Onion and Meridian Lakes.

The City of Lloydminster obtains its water from the North Saskatchewan River. Wastewater treatment is provided by a secondary wastewater treatment plant and aeration lagoons.

Water quality in the main stem of the North Saskatchewan River is monitored regularly by Environment Canada at Lea (Jubilee) Park and the river crossing at Highway 17. Monthly physical, nutrients, metals and flow data are available from 1970 to the present. CCME Water Quality Index (WQI) data are available for both sites from Environment Canada for 1983-2002 (Glozier et al. 2004). For the 1983-2002 period, river water quality at both sites was found to be marginal (calculated WQI = 53). A marginal value (calculated WQI 45 to 59) means that water quality is frequently threatened or impaired, and that conditions often depart from natural or desirable levels. The variables of non-compliance were not stated in the report (Glozier et al. 2004). As expected, the CCME WQIs decreased markedly from the other Environment Canada headwater site WQI at Whirlpool Point. Water quality typically decreases as one travels downstream due to inputs from both natural, anthropogenic, point and non-point sources.



Water quantity is measured at one HYDEX station (05EF001) in the Alberta side of the Monnery Subwatershed on the main stem of the North Saskatchewan River at Deer Creek (Figure 21). This hydrograph is typical of a glacial meltwater dominated stream, with peak flows during the warm summer months and some impact on flows from spring and summer storms.

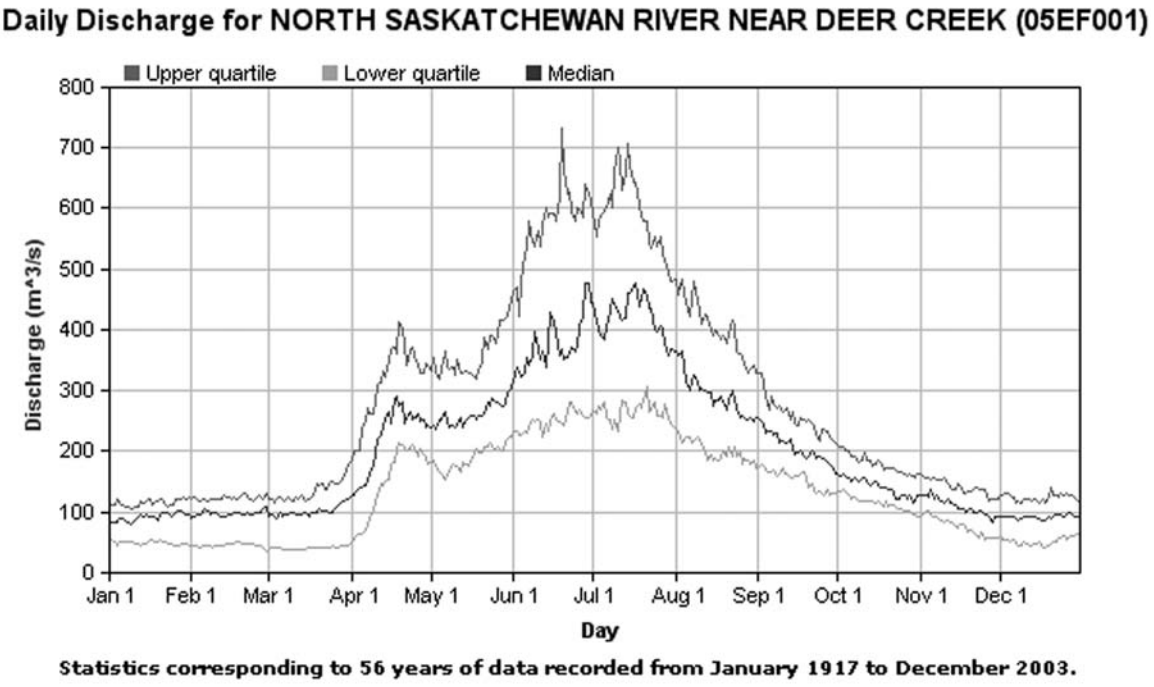



**Figure 21:** North Saskatchewan River at Deer Creek mean monthly discharge for the year (Station 05EF001).

### 5.12.3 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.

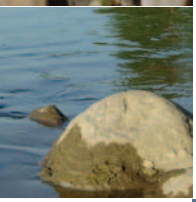
#### 5.12.3.1 Aquatic Macrophytes

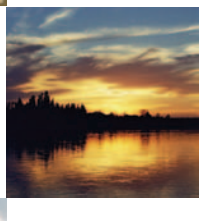
The growth of aquatic macrophytes is directly related to the availability of the nutrient phosphorus in the water in which they are growing. Excessive growth may indicate decreased water quality, which, in turn, may be linked to various point (wastewater outfalls) or non-point (general run-off) sources 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 Monnery 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 this area.











### 5.12.3.2 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 North Saskatchewan River supports a mix of cool water fish species including northern pike, walleye, sauger, goldeye, mooneye and yellow perch. Goldeye are the most abundant and the North Saskatchewan River is an important migratory corridor between upstream spawning areas and downstream rearing areas (Allan 1984).

### 5.12.3.3 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 Monnery Subwatershed is located within the Dry Mixedwood Natural subregion. This subregion is dominated by tree types such as Trembling Aspen and Balsam Poplar, which are replaced over time by White Spruce and Balsam Fir. In dry areas Jackpine is more dominant, and peatlands are common in wetter regions. There are no dominant grasses.

### 5.12.3.4 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 Monnery Subwatershed, so we cannot make any conclusions about ecosystem health using this indicator. This data gap could be addressed in future research within the Monnery Subwatershed.

### 5.12.4 Monnery Summary

Agriculture is the primary industrial activity in the Monnery Subwatershed, although oil and gas operations are prevalent. The majority of the Subwatershed is classified in land uses related to agriculture and livestock densities are moderate. About 6.5% of the land area is treed.

About 9% of the land area has been disturbed. Almost 3% of this is affected by linear developments including roads, cutlines, pipeline rights of way, transmission line rights of way, and rail lines. Other disturbances include a First Nations Reserve, well sites, municipalities, and industrial facilities.

Water bodies cover 6% of the Subwatershed. The PFRA Land Classification shows 0.2% of the Subwatershed as wetlands; however, Ducks Unlimited Canada information shows wetlands on 6.8% of the area. This variance should be resolved.

Water quality in the North Saskatchewan River is monitored regularly by Environment Canada. For the period 1983-2002, river water quality, based on the Canadian Council of Ministers of the Environment Water Quality Index, was marginal. This means that water quality is frequently threatened or impaired, and that conditions often depart from natural or desirable levels. The variables of non-compliance were not stated in the report by Glozier *et al.* (2004) and further analysis of the information is needed to determine whether water quality has improved in recent years as a result of improvements in water treatment by the City of Edmonton.






Water quantity is measured at one station in the Monnery Subwatershed. No long-term information on water plants, benthic invertebrates or riparian health was found for this Subwatershed. No assessment was found of fish populations; although it is reported that the North Saskatchewan River is an important migratory corridor between upstream spawning areas and downstream rearing areas.

In summary, there has been little systematic assessment of the Monnery Subwatershed and there are significant data gaps for the area. However, of the six indicators assessed, none were good, five were fair, and one was poor, yielding an overall subjective rating of fair. These data gaps should be addressed; in particular, the impacts of various land uses on riparian health, and the state of the aquatic ecosystem including water quality, water plants, and fish populations.