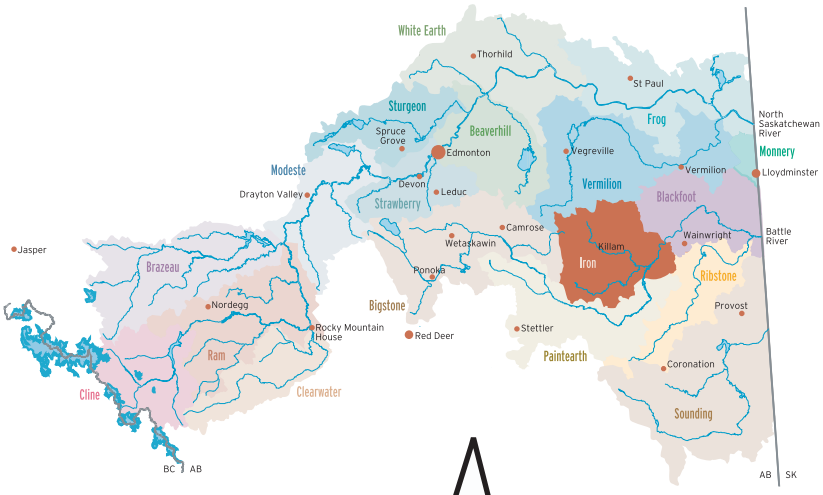
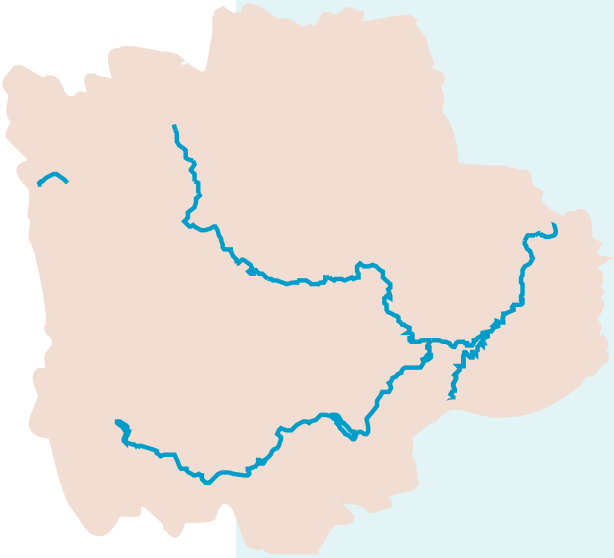
Iron





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5.15 IRON SUBWATERSHED

The Iron Subwatershed lies in the Central Parkland Natural Subregion and encompasses 556,001 hectares including 20,566 hectares of natural and artificial water bodies. The Iron Subwatershed is part of the Battle River watershed and includes Beaver, Flagstaff, Provost and Wainwright Counties. The Subwatershed includes the settlements of Amisk, Forestburg, Galahad, Hardisty, Heisler, Irma, Killam, Kinsella, Lougheed, Sedgewick, Strome and Viking with a total population of about 11,500. In addition to oil and gas and mining activity, agriculture is the major economic activity in the Subwatershed.

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

5.15.1 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.

5.15.1.1 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. Riparian inventory data were collected in 2001 for 31 kilometres of Iron Creek shoreline in Flagstaff County (ARHMP Cows and Fish 2002e). The majority (53%) of riparian areas along Iron Creek were rated as 'healthy, but with problems' while 37% were rated as 'unhealthy' and 10% as 'healthy'. Major problems included invasive plants, preferential grazing, pugging and hummocking and alteration of streambanks (by livestock or humans).

Riparian inventory data were gathered in the County of Wainwright in 2001 for 14 kilometres of Grattan Creek shoreline (ARHMP Cows and Fish 2002d). The majority (54%) of the quadrats sampled were assessed as 'healthy, but with problems', with 38% being assessed as 'unhealthy'. Two quadrats (8%) were assessed as 'healthy'. Major problems were invasive plants, preferential grazing, human alteration of shore and bank structure, and pugging and hummocking.

5.15.1.2 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. Over 2% (13,192 ha) of land in the Iron Subwatershed is affected by linear developments. The majority of this (58%) is in roads of one form or another, including gravel and unimproved roads (48% of the linear development) and paved roads (7% of linear developments). Other linear developments include pipeline rights of way (16% of the area of linear development), cutlines (14%), transmission line rights of way (9%), and active or abandoned rail lines (3%).

5.15.1.3 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. Water bodies, both natural and constructed, and including lakes, rivers, streams, wetlands, dugouts and reservoirs cover 20,566 (4%) of the Subwatershed. The vast majority of the Subwatershed is classified in various land uses related to agricultural production: grassland, 50%; cropland, 44%; and forage, 4%. About 0.3% (1,744 ha) of the Subwatershed is covered with trees.

About 7.6% of the land area in the Subwatershed has been disturbed by various forms of disturbance including the linear development described above. The greatest area of disturbance following linear development is the area affected by C.F.B. Wainwright; 33,539 hectares - 6% of the Subwatershed. Well sites affect about 1% of the Subwatershed (5,858 ha). Disturbance due to municipalities of various sizes including Forestburg, Hardisty, Sedgewick and Viking affects about 0.4% of the Subwatershed (2,278 ha). The remainder of the land disturbance is related to linear developments (2.4%), and industrial facilities including oil and gas plants, runways, sand and gravel pits, and other industrial sites (577 ha).

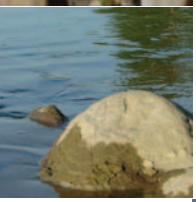
5.15.1.4 Livestock Density

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 Iron Subwatershed are moderate. Manure production in the soil polygons that cover the Iron Subwatershed was estimated at between 256,000 and 1,767,000 tonnes.

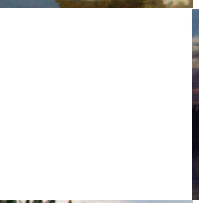
5.15.1.5 Wetland Inventory

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.

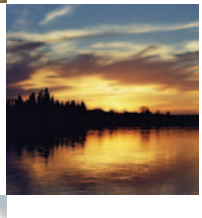
Data from both Alberta Sustainable Resource Development base features hydrology and PFRA Land Classification failed to identify wetlands in the Iron Subwatershed. However, an inventory completed by Ducks Unlimited Canada for the Subwatershed found a total of 34,182 hectares of wetlands (6.1% of the Subwatershed area). The inventory included both permanent and temporary wetlands.



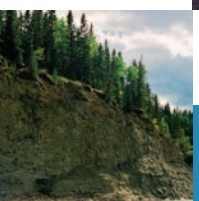
5.15.2 Water Quality and Quantity



Water bodies in the Iron Subwatershed include the Battle River and Iron and Grattan Creeks. Larger lakes in this Subwatershed include Wavy, Thomas, Vernon, Bellshill, Hattie, Peninsula, Wilkins, Jamieson, Betty, Byers, Schultz and Camp. The Iron Creek Watershed Improvement Society is an active community watershed group in this Subwatershed. Several towns in the Subwatershed have wastewater detention lagoons that discharge into tributaries of the Battle River. Viking discharges into Thomas Creek; Killam into an unnamed creek, and Wainwright into Bushy Head Lake.



No LTRN water quality stations exist in this Subwatershed, therefore no long term water quality data has been summarized. This data gap should be addressed in future research in this Subwatershed. However, four stations along Iron Creek were sampled for fecal coliforms and TP during the years 1972, 1986, 1989, 2000, and 2003-04. The 60 fecal coliform samples contained no evidence of fecal coliforms. The 11 TP samples ranged from 0.005 to 0.5 mg/L, and averaged 0.197 mg/L. No pesticide sampling has been completed in this watershed to date.






Water quantity is measured at two HYDEX stations (05FB002-05FB003): neither have real-time online data. Figure 24 shows the Iron Creek hydrograph for the open water season. This hydrograph is typical of a non-glacial, non-groundwater fed stream, with flow contributions from spring runoff and summer storms only and drying in late summer.

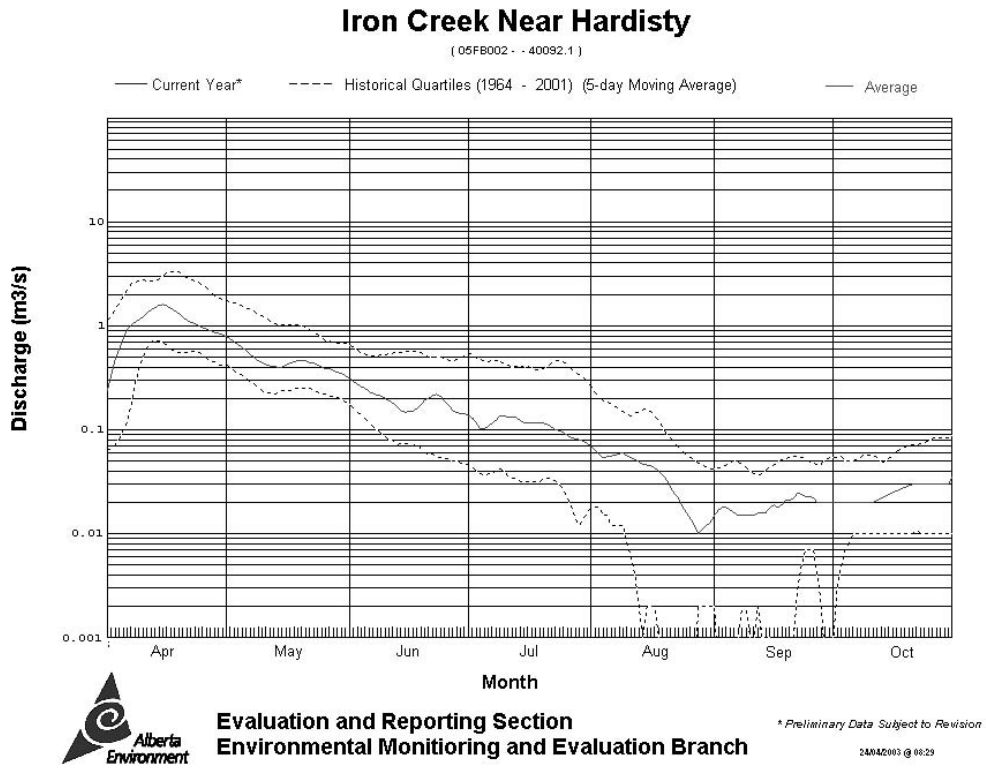


Figure 24: Iron Creek near Hardisty mean monthly discharge for the open water season (Station 05FB002).

5.15.3 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.

5.15.3.1 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 Iron 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 Iron Subwatershed.

5.15.3.2 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. Fish species are those characteristic of the Central Parkland Natural Subregion; although there is a lack of permanent water bodies and high salt concentrations. In the main stem of the Battle River, walleye, goldeye and northern pike occur; however, their numbers are limited by low flows (Allan 1984).

5.15.3.3 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 Iron Subwatershed is located in the Central Parkland Subregion. This subregion is composed mainly of grassland with aspen, to aspen parkland to closed aspen forest. Tree species include trembling aspen and balsam poplar, while grasslands are dominated by Rough Fescue.

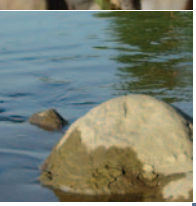
5.15.3.4 Benthic Invertebrates

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

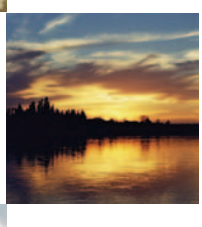
5.15.4 Iron Summary

The Iron Subwatershed is part of the Battle River watershed. In addition to oil and gas and mining activity, agriculture is the major economic activity. The majority of the Subwatershed is classified in land uses related to agriculture and livestock densities are moderate. About 0.3% is treed and water bodies cover 4% of the Subwatershed.

Riparian inventory data were collected for 31 kilometres of Iron Creek shoreline. Fifty-three percent of riparian areas were rated as 'healthy, but with problems' while 37% were rated as 'unhealthy' and 10% as 'healthy'. Riparian inventory data also were gathered for 14 kilometres of Grattan Creek shoreline. Fifty-four percent of the riparian area was assessed as 'healthy, but with problems', 38% as 'unhealthy' 8% were assessed as 'healthy'.

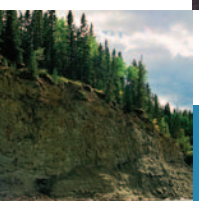


Over 2% of land is affected by linear developments including roads, pipeline rights of way, cutlines, transmission line rights of way, and rail lines. Another 5.6% of the land area is affected by C.F.B. Wainwright. Well sites, municipalities, and industrial facilities affect another 2%.



The PFRA Land Classification shows no wetlands in the Subwatershed; however, Ducks Unlimited Canada data show wetlands on 6.1% of the area. This discrepancy should be resolved.

Water quantity is measured at two stations: neither have real-time online data. No long term river water quality information or information on water plants, fish populations, or benthic invertebrates






was found for Iron Subwatershed. In the main stem of the Battle River, walleye, goldeye and northern pike occur. Fish populations are limited by low flows, a lack of permanent water bodies and high salt concentrations.

In summary, there has been little systematic assessment of this Subwatershed and there are significant gaps in the available information. However, of the seven indicators assessed, none were good, four were fair, and three were poor, yielding an overall subjective rating of fair. The high level of agricultural land use, moderate livestock densities, and the results of riparian health assessments suggest that it is important to address the data gaps and to further assess the impacts of various land uses on the Subwatershed.