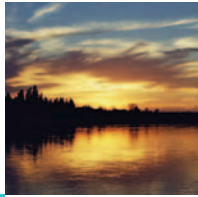# White Earth

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5.9   WHITE EARTH SUBWATERSHED

The White Earth Subwatershed lies entirely in the Boreal Forest Natural Region. It encompasses 649,481 hectares including 19,457 hectares of natural and artificial water bodies. The Smoky Lake and Thorhild Provincial Grazing Reserves lie in the Subwatershed. Many environmentally sensitive areas within the reserves have been left as natural habitat. White Earth Natural Area was created to protect the slopes of Long Lake and White Earth Creek.

The White Earth Subwatershed is sparsely populated and includes the municipal boundaries of Lamont, Improvement District 18, Smoky Lake, Sturgeon, Thorhild, Two Hills and Westlock Counties. Its main community is the Town of Thorhild with a population of 486 and also includes the settlements Abee, Andrew, Bellis, Busby, Clyde, Egremont, Legal, Mundare, Newbrook, Opal, Pickardville, Radway, Redwater, Smoky Lake, St. Michael, Star, Vimy, Warspite, Waskatenau, and Wostok.

Soils are excellent for agriculture and the primary economic activities are agriculture, including many mixed farming operations, and oil and gas exploration and development.

Long Lake Provincial Park provides recreational opportunities including hiking, camping, canoeing, cross-country skiing, bird watching and fishing in an artificial lake in the park.

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

5.9.1   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.

5.9.1.1 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 White Earth 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 White Earth Subwatershed.

5.9.1.2 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.

About 3.5% (15,720 ha) of land in the White Earth Subwatershed is affected by linear developments. The majority of linear developments (44%) are roads of one form or another, including gravel and unimproved

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roads (34% of linear development) and paved roads (9% of linear developments). Other linear developments include cutlines (27% of the area of linear development), pipeline rights of way, (21%), transmission line rights of way (4%) and active or abandoned rail lines (4%).

5.9.1.3 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 3% of the Subwatershed. The vast majority of the Subwatershed is classified in various land uses related to agricultural production: cropland, 38%; grassland, 28%; and forage, 11%. About 20% (126,844 ha) of the Subwatershed is treed.

About 3.5% of the land area in the Subwatershed has been disturbed by the linear development. The greatest area of disturbance is due to well sites, which affect 0.7% of the Subwatershed (4,717 ha). Disturbance due to municipalities of various sizes including Legal, Redwater, Thorhild, and Smoky Lake affects about 0.3% of the Subwatershed (2,247 ha). The remainder of the land use is related to two First Nations' reserves (less than 1%) and a runway.

Water bodies including rivers, lakes and dugouts cover about 19,457 hectares, or 3% of the Subwatershed area.

5.9.1.4 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 Subwatershed. Based on the available information, livestock densities in the White Earth Subwatershed are moderate with low densities in the northeast and somewhat higher densities in areas near St. Paul. Manure production in the soil polygons that cover the White Earth Subwatershed was estimated at between 0 and 5,422,000 tonnes.

5.9.1.5 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 White Earth Subwatershed. The PFRA Land Classification shows wetlands on 0.3% (1,952 ha) of the White Earth Subwatershed. However, an inventory completed by Ducks Unlimited Canada for the Subwatershed found a total of 22,479 hectares of wetlands (3.5% of the Subwatershed area). The latter inventory included both permanent and temporary wetlands.

5.9.2 Water Quality and Quantity

Water bodies in the Subwatershed region include the North Saskatchewan River, Redwater River and White Earth, Egg, Kennedy, Weasel, Waskatenau, Peno, Whitford, and Namepi Creeks. Larger Lakes are Whitford, Smoky, Wakomao, Hanmore, Mons, Bridge, Hollow, Duggans, Cucumber,
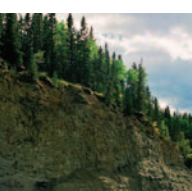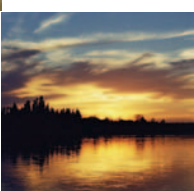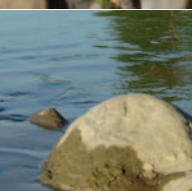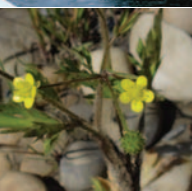
Skaro and Gregory. Smoky Lake County is active with watershed initiatives in the Smoky Lake, Stony Creek, and White Earth Creek watersheds.

Towns in the Subwatershed have various types of wastewater treatment facilities. Mundare's drinking water supply is provided from Edmonton by EPCOR Water Services and the North Saskatchewan River. Retention lagoons provide wastewater treatment and effluent is released in the spring.

In this Subwatershed, the channel of the North Saskatchewan River is about 245 metres wide and 1.9 metres deep and is entrenched in a stream cut valley in a hummocky till plain. The channel is sinuous with occasional islands and mid-channel bars and a substrate dominated by sand and gravel.

No LTRN water quality stations exist in this Subwatershed, therefore no long term water quality data has been summarized. There are no fecal coliform results for White Earth Creek, but it was sampled for TP once in 1990 and the level was 0.076 mg/L. There have been no pesticide samples collected in this Subwatershed. These gaps should be addressed in future studies.

Water quantity is measured at six HYDEX stations (05EC002-05EC007). None of the sites has real-time online data. Figure 18 shows the Redwater River hydrograph, which is typical of a non-glacial fed stream. Flow contributions are from spring runoff and summer storms only.
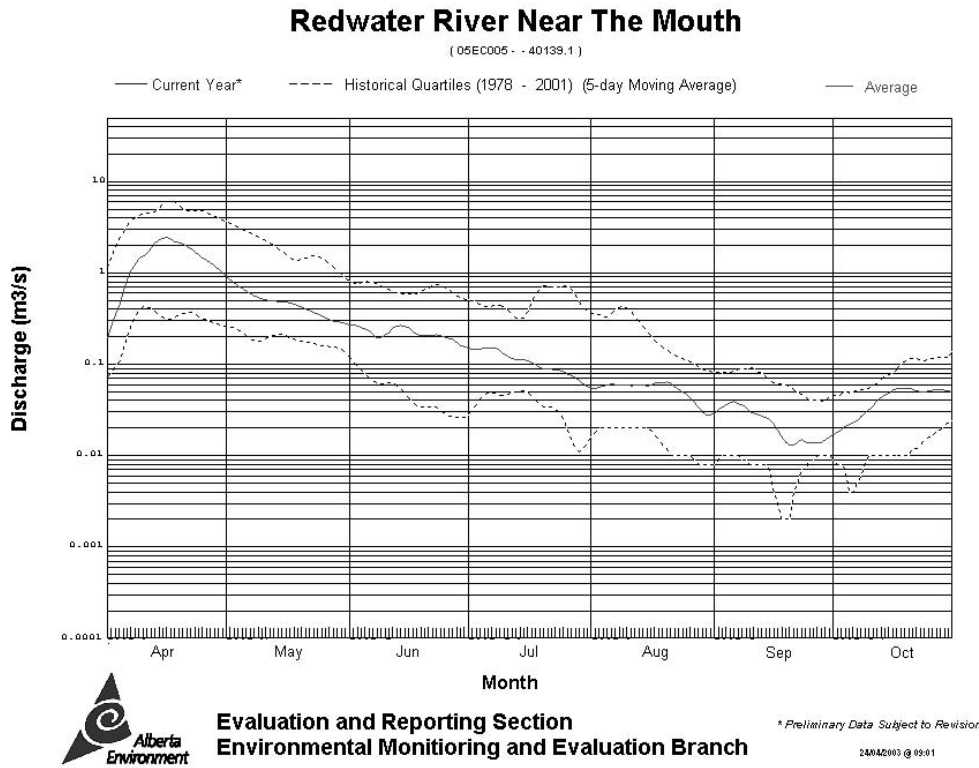
Figure 18: Redwater River near the Mouth mean monthly discharge for the open water season (Station 05EC005).

5.9.3   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.

5.9.3.1 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 White Earth 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 White Earth Subwatershed.

5.9.3.2 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.

A systematic estimate of fish populations in the White Earth Subwatershed has not been conducted. Because of turbulent flow patterns, warmer temperature, turbidity and substrate, the North Saskatchewan River in this Subwatershed provides good quality habitat for walleye, sauger, and goldeye and support a mix of other cool water fish species including northern pike, mooneye and yellow perch (Allan 1984).

5.9.3.3 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 White Earth Subwatershed is located in the Boreal Forest Region of Alberta. The Boreal Forest Region includes many areas of bogs, fens, swamps and marshes, and has the Dry Mixedwood Subregion. The Dry Mixedwood Subregion includes tree species such as aspen, balsam poplar, white spruce, balsam fir and jack pine, and has several peatlands.

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

5.9.4   White Earth Summary

The White Earth Subwatershed is sparsely populated. The majority of the land use in this Subwatershed is related to agricultural production, and about 20% of the Subwatershed is treed.
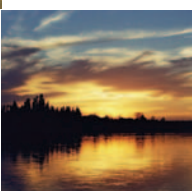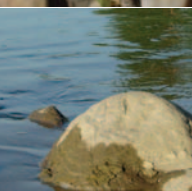
Livestock densities are moderate with low densities in the northeast and somewhat higher densities in areas near St. Paul. Primary economic activities include agriculture and oil and gas exploration and development. Over 2% of the Subwatershed is affected by linear developments including roads, cutlines, pipeline rights of way, transmission line rights of way and rail lines. Another 1% is affected by well sites, municipalities, two First Nations' reserves, and a runway.

Water bodies cover 3% of the Subwatershed; however, no published assessment of riparian health was found. The available PFRA Land Classification shows wetlands on 0.3% of the Subwatershed; however, Ducks Unlimited Canada data show wetlands covering 3.5% of the land area. This variance should be resolved.

No long-term river water quality information exists for the Subwatershed. Water quantity is measured at six HYDEX stations, and none of these has real-time online data.

A systematic estimate of fish populations in the White Earth Subwatershed has not been conducted and no information was found on water plants or benthic invertebrates.

In summary, there has been little systematic assessment of this Subwatershed and there are significant gaps in the available information. However, of the six indicators assessed, two were good, three were fair, and two were poor, yielding an overall subjective rating of fair. These gaps should be addressed; however, the relatively low level of development and disturbance, and the moderate level of livestock development suggest that there may be fewer concerns in this Subwatershed as compared to other Subwatersheds.

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