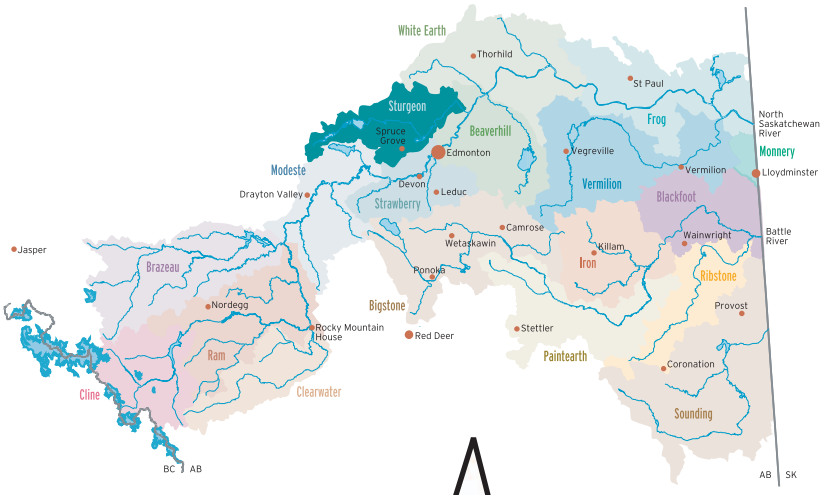
Sturgeon



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5.7 STURGEON SUBWATERSHED

The Sturgeon Subwatershed lies in the Parkland and Boreal Forest Natural Regions and encompasses 331,764 hectares including 15,813 hectares of natural and artificial water bodies. The Sturgeon Subwatershed includes the municipal boundaries of Barrhead, Lac Ste. Anne, Parkland and Sturgeon Counties and the communities of Spruce Grove, Stony Plain, Onoway, Morinville, Bon Accord, Gibbons, Calahoo, Villeneuve, Spring Lake, the First Nations' reserves of Alexis 133 and Alexander 134 and parts of the City of Edmonton and St. Albert.

The Subwatershed contains Class 1 soils which makes this some of the most arable agricultural land in Alberta. However, this area is strongly impacted by urban development. Those areas in the Subwatershed that are not developed for municipal uses are mostly agricultural land with areas in boreal mixedwood forests and muskeg. As a result, the main economic base is agriculture along with oil and gas production, processing and aggregate extraction.

Several lakes in the Subwatershed provide a high amount of recreational activity including power boating, sailing, water skiing, and windsurfing. Camping and cross-country skiing are also common.

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

5.7.1 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.

5.7.1.1 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 Sturgeon 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 Sturgeon Subwatershed.

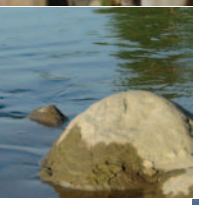
5.7.1.2 Linear Development

Quantifying linear development in the Subwatershed helps us understand potential changes in water quality and quantity, fish and wildlife populations, and riparian health.

More than 3% (10,901 ha) of the land in the Sturgeon Subwatershed is taken up by linear developments. The majority of this (56%) is in roads of one form or another, mostly paved undivided roads and gravel roads. Other linear developments include pipeline rights of way, (17% of the area of linear developments), cutlines and seismic lines (13%), utilities (non-pipeline) rights of way and used or abandoned rail lines (4%).





5.7.1.3 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 that are natural and constructed, including lakes, rivers, streams, wetlands, dugouts and reservoirs cover just over 5% of the Subwatershed. The vast majority of the Subwatershed is classified in various land uses related to agricultural production: cropland, 31%; forage, 25%; and grassland, 22%. Only 11% of the Subwatershed is treed.

Almost 71% of the land area has been disturbed by various forms of development; the vast majority (94%) of this disturbance is due to municipalities of various sizes; mainly the large urban centres of Spruce Grove, Stony Plain, St. Albert, Morinville and Edmonton. The remainder of the land disturbance is related to linear developments, wellsites, and industrial sites and gravel mining.

5.7.1.4 Livestock Density

Areas of higher livestock density may be expected to have greater impacts on downstream aquatic systems.

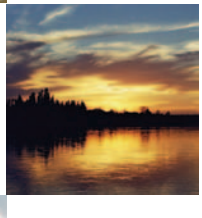
Manure production was used as a surrogate for livestock density. Manure production information was available only on the basis of soil polygons. These polygons do not correspond to the Subwatershed boundaries and provide only a rough estimate of manure production within the actual watershed. Based on the available information, livestock densities in the Sturgeon Subwatershed are moderate. Manure production in the soil polygons that cover the Sturgeon Subwatershed was estimated at between 1,194,000 and 3,246,000 tonnes.

5.7.1.5 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. Alberta Sustainable Resource Development base features hydrology data shows that wetlands account for a fraction of 1% (2,956 ha) of the land area in the Sturgeon Subwatershed. However, another inventory completed by Ducks Unlimited Canada for the Subwatershed found a total of 22,582 hectares of wetlands (6.8% of the Subwatershed area). The DUC inventory included both permanent and temporary wetlands. The Big Lake wetland near the city of St. Albert has been designated under Special Places 2000 as one of the top ten Alberta wetlands under Wetlands for Tomorrow. This wetland is also recognized as a Globally Significant Important Birding Area because of the number and diversity of avian species using the area for breeding, migration and staging.

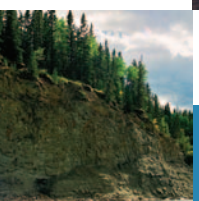
5.7.2 Water Quality and Quantity

Water bodies in the Sturgeon Subwatershed include the Sturgeon River, and Lac Ste. Anne, Isle, Sandy, Big, Manawan, Deadman, Birch, Big, Eden, Sauer, Hubbles, Spring, Muir, Round and Matchayaw (Devil) Lakes. The Lac Ste. Anne and Lac Isle Water Quality Society, the Onoway River Valley Conservation Association and the Sandy Lake Restoration Society are all active community watershed groups in this Subwatershed.



Lakewatch data for Lac Ste. Anne (2002), Isle Lake (2000 and 2001) and for Sandy Lake (2000 and 2001) are available from ALMS. Water quality for Lac Ste. Anne, Sandy, Isle, Eden, Sauer, Hubbles and Spring Lakes can be found in the Atlas of Alberta Lakes (Mitchell and Prepas 1990). Big Lake Environmental Support Society (BLESS) is an active advocate for Big Lake.

No LTRN water quality stations exist in this Subwatershed, therefore no long term water quality






data has been summarized. However, Atim Creek was part of the CAESA stream network as a site in an area of high agricultural activity. Water quality data (nutrients, organic and inorganic chemistry, suspended solids, color, pH, and bacteria) is available for this creek from 1995-1996 (Anderson *et al.* 1998).

Thirty-one different stations along the Sturgeon River were sampled for fecal coliforms and TP over the years 1971-77, 1983-2000, and 2002-2004. The 41 fecal coliform samples ranged from 0 to 110 counts/100 mL, and averaged 19 counts/100 mL. These samples were below the CCME Surface Water Quality Guidelines for Contact Recreation. The 784 TP samples collected ranged from 0 to 3.5 mg/L, and averaged 0.195 mg/L. Pesticide detections in this Subwatershed included 2,4-D, Gamma-benzenehexachloride (Lindane), Atrazine, Bromoxynil, Dicamba, MCPA, MCPP, Picloram, Triallate, and Trifluralin, all of which were below the CCME Surface Water Quality Guidelines for the Protection of Aquatic Life. Imazamethabenz-methyl, Imazethapyr, Triclopyr, Clopyralid, Ethalfluralin, and Gamma-BHC were detected, but no guidelines have been set for these chemicals to date.

Water quantity is measured at seven HYDEX stations (05EA001-05EA005, 05EA009-05EA010) with one station having real-time online data (05DEA005). Figure 15 shows the Atim Creek hydrograph, which is typical of a non-glacial fed stream. Flow contributions are from spring runoff and summer storms only.

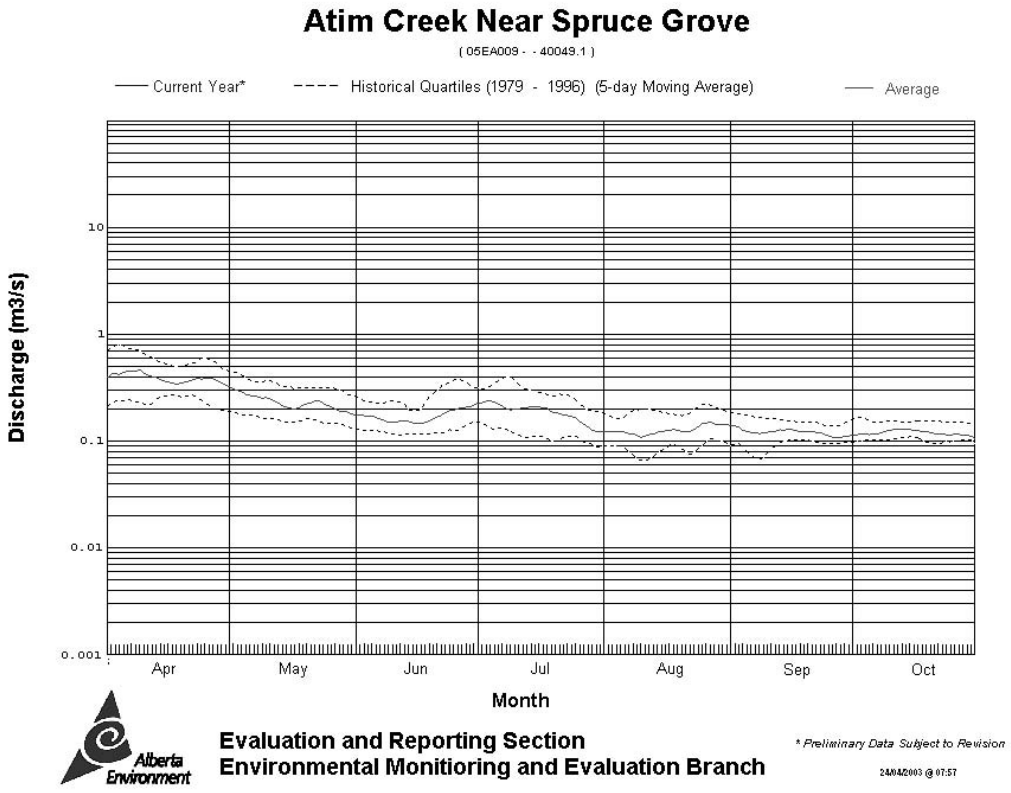
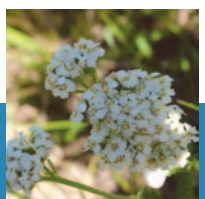


Figure 15: Atim Creek near Spruce Grove mean monthly discharge for the open water season (Station 05EA009).




5.7.3 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.

5.7.3.1 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.

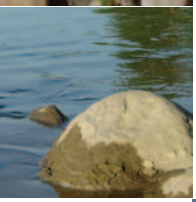
A systematic examination of macrophytes in the Sturgeon Subwatershed has not been conducted; although inventories have been completed on several lakes. For example, an inventory of macrophytes in Lake Isle was completed as part of a fisheries inventory by R.L. & L. (1987d). The inventory found that aquatic macrophytes occurred throughout the photic zone of the lake. Greater bulrush, common cattail, sedge and reed grass were the most abundant emergent species. Northern watermilfoil, Richardson pondweed, large-sheath pondweed and coontail were the most abundant submergent species.

5.7.3.2 Fish Population Estimates

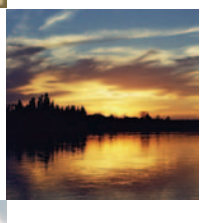
Inventories of selected fish populations may show changes in the presence and abundance of species that may be related to environmental factors including changes in water quality or quantity.

Fish species in the Subwatershed include lake whitefish, northern pike, walleye, burbot, white sucker, goldeye, and yellow perch. The lower 24 kilometres of the Sturgeon River are seasonally occupied by common North Saskatchewan River species such as northern pike, walleye, sauger, and goldeye. The remainder of the Sturgeon River is occupied primarily by pike, the occasional walleye, perch or lake whitefish that have entered the river from one of the larger lakes. Emigration from the North Saskatchewan River and the main stem lakes into the Sturgeon River, particularly by pike, is an important mechanism for repopulating the main river (Allan 1984).

The Sturgeon River is subject to considerable fluctuations in discharge; zero flows have been frequently recorded, reducing its capability to support fish. Shallow lakes in the Subwatershed may be subject to winter kill and can be described as eutrophic. The rate of eutrophication may have been accelerated by adjacent land use practices that add nutrients into the water (Allan 1984).

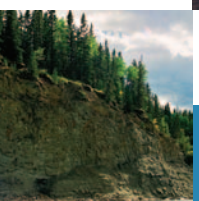


Sport fish in Lake Isle include northern pike, yellow perch, walleye; although white suckers account for most of the fish biomass. Other lakes in the Subwatershed typically contain northern pike and yellow perch, but some lakes are subject to winter kill (Allan 1984).



5.7.3.3 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 Sturgeon Subwatershed is located mainly in the Parkland and Boreal Forest Regions of Alberta. The Boreal Forest Region includes






many areas of bogs, fens, swamps and marshes, as well as the Dry Mixedwood Subregion. The Dry Mixedwood Subregion includes species such as aspen, balsam poplar, white spruce, balsam fir and jack pine, and has many peatlands. The Parkland Natural Region is the transition region between grasslands and coniferous forests. It includes one subregion, the Central Parkland, which is composed mainly of grassland with aspen, aspen parkland and closed aspen forest. Species include trembling aspen and balsam poplar.

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

5.7.4 Sturgeon Summary

The Sturgeon Subwatershed includes several towns, Reserves as well as parts of the City of Edmonton. Almost 71% of the land area has been disturbed by various forms of development; the vast majority due to municipalities and the remainder related to linear developments, wellsites, and industrial sites.

The Subwatershed also contains some of the most arable agricultural land in Alberta and those areas not developed for municipal uses are mostly agricultural land with only about 11% of the Subwatershed treed. Livestock densities in the Sturgeon Subwatershed are moderate. The main economic base is agriculture along with oil and gas production and processing. Several lakes in the Subwatershed provide a high amount of recreational activity.

No long term river water quality information exists for this Subwatershed. Water quantity is measured at seven stations, with one station having real-time online data.

Water bodies cover just over 5% of the Subwatershed. The available data showed that wetlands accounted for between less than 1% and 6.8% of the Subwatershed area. The differences in the estimate of wetland area may be resolved with future research. Peatlands are also abundant in areas of the Subwatershed.

No published assessment of riparian health, benthic invertebrates or aquatic plants was found for the Sturgeon Subwatershed. While a systematic examination of aquatic plants has not been conducted, inventories have been completed on several lakes. Detailed assessments of fish populations have not been done. However, of the nine indicators assessed, two were good, five were fair, and two were poor, yielding an overall subjective rating of fair. As all of the above have been identified as important biological indicators, studies could be undertaken on the 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 Sturgeon Subwatershed and there are some data gaps that should be addressed. Given the high percentage of the Subwatershed area that is affected by municipal and agricultural development, it is important to address these data gaps to assess the net impact of various land uses on the Subwatershed. Municipal development decisions should consider the value of prime agricultural lands to the agriculture industry and where possible, explore alternatives.