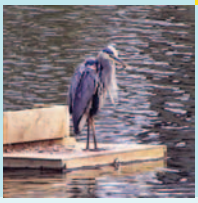
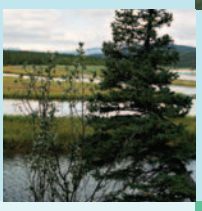




Chapter 1.0

Executive Summary




1.0 EXECUTIVE SUMMARY

1.1 BACKGROUND

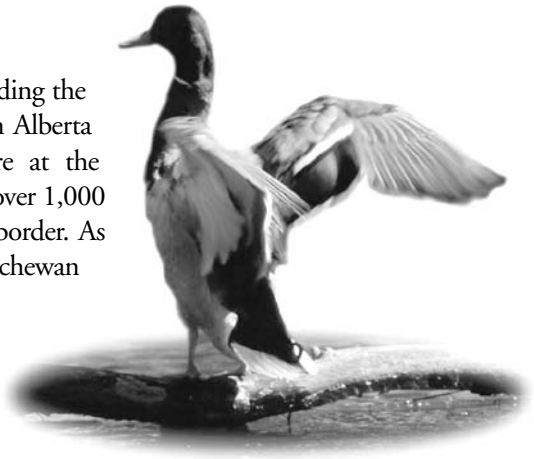
The North Saskatchewan Watershed Alliance (NSWA) identified a "State of the Watershed" report as one of its key initiatives to better understand the current status of the watershed and to provide a baseline from which an Integrated Watershed Management Plan could be prepared (NSWA Business Plan, 2000).

The NSWA's vision is a watershed where ecological integrity is the foundation for environmental, cultural, social and economic decision-making. Actions taken and policies followed will result in the wise use and management of the North Saskatchewan Watershed in Alberta. This includes actions to protect and improve water quality and ecosystem function and taking a multi-barrier approach to source water protection. The NSWA has recently been appointed by Alberta Environment as the Watershed Planning and Advisory Council (WPAC) for the North Saskatchewan Watershed in Alberta. Through this designation, the Alberta government has sanctioned the NSWA's responsibility to prepare a watershed management plan that requires as a foundation, the current state of the watershed.

This document reports on the state of the watershed within Alberta by each of its 18 subwatersheds that are based on highest order tributary. The report quantifies land uses and comments on land use, water quality and environmental integrity in the North Saskatchewan Watershed. The report provides a "snapshot in time" and is not intended to demonstrate long-term changes in land use, water quality or show historical trends. The report will be revisited in the future to determine if implementation of the Integrated Watershed Management Plan (IWMP) has made a change to the watershed health indicators both studied in this report and those determined in the future.

To actively engage watershed stakeholders, and to gain a better understanding of current public concerns and issues within the watershed, a public participation program was implemented. The program included disseminating information about the NSWA and the project through the production of information panels that were displayed in various locations throughout the watershed in the summer of 2003. These were followed up with three public open houses held in Rocky Mountain House, Sherwood Park and Elk Point, Alberta. Issues and concerns were obtained from verbal and written comments recorded during the open houses. Water quality, quantity (drought), land use practices and the industrial use of water were the most frequently mentioned concerns.

1.2 WATERSHED OVERVIEW



This scope of this report is the entire North Saskatchewan Watershed within Alberta; including the main stem, the Battle River and Sounding Creek. The North Saskatchewan Watershed in Alberta drains 80,000 km2, approximately 12.5% of Alberta's landmass. The headwaters are at the Saskatchewan Glacier in the Columbia Icefields in Banff National Park and the river flows over 1,000 kilometres through five natural regions from its headwaters to the Alberta/Saskatchewan border. As part of the Nelson River Basin, the North Saskatchewan River joins with the South Saskatchewan River in the province of Saskatchewan and eventually empties into Hudson Bay.

Water quality in the North Saskatchewan River changes as one moves downstream due to inputs from natural and anthropogenic; point and non-point sources. Nutrients (notably phosphorus), bacteria and pesticides typically increase. Dissolved oxygen decreases downstream of larger urban populations.

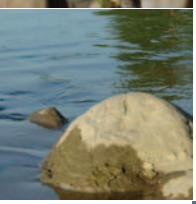

Land uses in the watershed include agriculture, resource exploration and extraction, forestry, recreation, urban centres and country residential development. The vast majority of human population in the watershed lives in the greater Edmonton area. The headwaters of the watershed are sparsely populated and remain primarily in a natural state within National Parks. Land uses such as seismic activity, pipelines, service infrastructure, road networks, forestry related activities, powerlines and other resource exploration and extraction activities occur in the Green Zone (crown land) and all have a cumulative effect on watershed health.

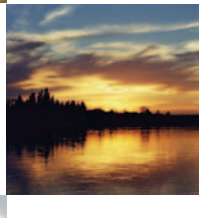
Water use along the North Saskatchewan River and its tributaries includes human consumption, waste assimilation, hydroelectric power generation, oil and gas extraction, mining, and agriculture. Several villages, towns, and cities in the watershed have either wastewater treatment plants or wastewater lagoons that discharge treated effluent into the North Saskatchewan River or its tributaries.

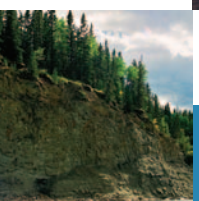
The North Saskatchewan Watershed includes about 3,600 kilometres of streams. Approximately one-half, mostly in the upper reaches, are suitable for trout and other cold water species. Downstream the river becomes warmer and the fish community shifts towards cool and warm water game fish such as walleye, pike, goldeye, mooneye and sauger. Lakes are not plentiful and lake fishing opportunities are somewhat limited. The larger cool water lakes primarily contain pike, perch, lake whitefish, and walleye.

1.3 INDICATORS

Fifteen indicators were chosen at a May 2002 workshop attended by NSWA partner experts to represent and describe watershed health. Indicators fall into four broad categories. Within these categories, the following indicators and metrics were used to guide data collection.










Metrics chosen for the State of the North Saskatchewan Watershed Report.

Indicator Category	Metric
Land Use	Riparian health
	Linear development (roads, seismic, pipelines, etc.)
	Land use inventory
	Livestock density
	Wetland inventory
Water Quality	Surface water quality index (AENV model)
	E. coli
	Phosphorus (TP, SRP)
	Pesticides
Water Quantity	Water allocations by sector
	Groundwater extraction
Biological Indicator	Aquatic macrophytes
	Fish (population estimates)
	Vegetation types (Alberta Vegetation Inventory)
	Benthic invertebrates

Significant knowledge gaps exist for some indicators initially chosen for this report. Few systematic assessments of bioindicators have been performed, and those that exist have not been converted to a compatible (digital) format for use in this report. Assessment of watershed health based on these is therefore limited. The Recommendations section of the report addresses how this might be resolved in the future.

1.4 WATERSHED SUMMARY

1.4.1 Headwater Subwatersheds

The headwater subwatersheds of Cline, Brazeau, Ram and Clearwater share features that are critical to source water quantity and quality in the watershed. The presence of glaciers, mountain snowpack, forests and natural wetlands ensure the supply of water to tributaries and the river main stem for the large population of the Edmonton area, especially during periods of low runoff. Glacial flour in headwater streams and rivers creates a naturally turbid environment for aquatic life.

Forest and perennial vegetation loss can place risks on this area's ability to continue to store and deliver water. Minimizing linear disturbance and uncontrolled access related to industry including resource exploration and extraction, along with sustainable forest practices in these areas will benefit forest structure, cold water fisheries productivity and natural biodiversity. These practices will also ensure that good quality water continues to flow to downstream reaches and users.

Should ranching or other agricultural activities increase in the headwaters of the watershed, contributions of manure, pesticides and fertilizers should be regularly monitored. Management practices to protect riparian areas and minimize water quality impacts should be followed in these critical areas.


Water quality data indices are calculated in only a few locations in the watershed, and in the interest of source water protection, sound knowledge of flows and chemistry will become even more important in the future. Abraham Lake and the Brazeau Reservoir provide hydroelectric power generation and their dams augment winter flows for downstream residents, agriculture and industry. The headwaters are a key recreational and tourism area and as increasing activity has the potential to disturb landscapes (ski hills, golf courses, resort development) this could place more risk on watershed integrity at its source. While this area is very important in terms of source water protection, the largest basic digital (Geographic Information System - GIS) data gaps exist here.

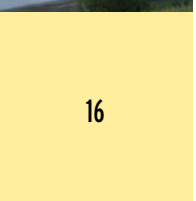
1.4.2 Middle Reach Subwatersheds

Compared to the headwaters, the subwatersheds in the central region of the watershed in Alberta have more agricultural activities, manure production, and urbanization. These land uses have the largest impact on overall watershed health. This area includes the Modeste, Strawberry, Sturgeon, Beaverhill and White Earth subwatersheds. Change in land uses from agriculture and natural landscapes to urban and industrial land uses increases the susceptibility of groundwater resources, surface water resources, soils, crops and native vegetation to absorb the impacts of natural and anthropogenic events such as drought, flooding, industrial spills and urban stormwater run-off. NSWA members have raised resource extraction in these subwatersheds, (gravel and coal) as an issue of concern.

Currently, human impacts on the watershed are addressed through treatment processes and the assimilative capacity of the North Saskatchewan, Sturgeon, Vermilion and Battle Rivers. Retention and restoration of riparian health and intact, functional wetlands are critical in providing good water quality and storing water on the landscape for the benefit of the entire watershed. The cumulative impact of land disturbance needs to be better addressed on a regional scale in this area of the watershed.

1.4.3 Eastern Subwatersheds

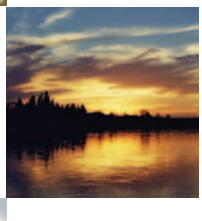
Water quantity and water quality impacts from the City of Edmonton concern the residents downstream in the northeast portion of the watershed. The Frog, Vermilion, Blackfoot and Monnery subwatersheds have some of the most altered landscapes in the watershed. This has impaired natural functions related to water storage, groundwater recharge, flood attenuation and base flow contributions to creeks and rivers. Livestock densities in these subwatersheds are moderate which implies livestock and manure management are very important considerations. The NSWA suggests that riparian health and wetland restoration should be future areas of focus to restore sustainability in these eastern reaches.

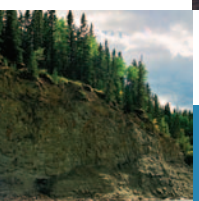


1.4.4 The Battle Subwatersheds

The Battle River subwatershed is comprised of the Bigstone, Paintearth, Iron, Blackfoot and Ribstone Creek basins. Having no mountain headwaters to provide a steady supply of glacial and snowpack meltwater, this area relies solely on spring runoff and rain events for most main stem flows. Land and water management practices in the Battle subwatersheds must ensure the sustainability and ecological integrity of this area.

Decreased flows in recent years have impacted municipal and industrial reservoirs along the Battle. There are significant areas of the subwatershed with high agricultural intensity, high livestock density, altered wetlands, poor water quality and low tree cover. Areas of recharge (wetlands) and contributions to river base flows by groundwater become increasingly important in these non-glacier fed watersheds. The results of riparian health assessments along the Battle River and its tributaries suggest that it is becoming important to fully assess the impacts of various land use practices.








1.4.5 The Sounding Subwatershed

In the southeast portion of the North Saskatchewan basin, most of the Sounding Creek subwatershed has the unique municipal designation of 'Special Areas'. These areas all experienced severe soil erosion during the Depression and drought of the 1930's. As a result, this subwatershed has unique jurisdictional and watershed challenges. It is considered a closed basin by provincial and federal governments, because it rarely flows into the Battle River at its confluence in Saskatchewan. Less than 1% of the subwatershed has tree cover and livestock densities are moderate.

1.5 CONCLUSIONS

Fifteen indicators of watershed health were selected and ranked by a panel of experts and members of the NSWA for each of the 18 subwatersheds. These indicators were summarized and have yielded a subjective health rating. The overall health of the entire North Saskatchewan Watershed is generally fair (on a scale of excellent, good, fair and poor) and includes some subwatersheds where ecosystem function is significantly impaired by human activity. Through an adaptive process, the NSWA should re-evaluate these indicators based on the current report for relevance, and focus future data collection efforts and state of the watershed reporting where data gaps have been identified and indicators refined.

For the indicators where data were available and through the assessment methods used, the watershed is most healthy in the 4 headwater subwatersheds which include the Cline, Brazeau, Clearwater and Ram. East of the headwaters, where livestock density, human activity and populations are greatest, health tends to decline. Generally, the health of a subwatershed is worse in those subwatersheds where land use is more intensive and where riparian health scores and wetland cover are lowest.

Disturbances of note include the Capital Region's impacts on the river main stem from treated wastewater and stormwater outfalls. For example, the Alberta Surface Water Quality Index drops downstream of Edmonton due to increases in both *E. coli* counts and phosphorus concentrations. However, the impact of the City has been lessened considerably by the recent improvements in wastewater treatment technology (tertiary treatment including biological nutrient removal) and is anticipated to improve as the City of Edmonton moves forward with proposed stormwater treatment strategies.

The impacts of high agricultural intensity in the Bigstone, Iron, Ribstone, Blackfoot, Vermilion, Frog, Beaverhill, Modeste, Strawberry, Sounding and Paintearth subwatersheds may be reflected in higher phosphorus values, lower riparian health scores and lower wetland densities. In these subwatersheds, water quantity will continue to be an issue, as will water quality given the results of these indicators.

Pesticides were detected in several subwatersheds, but concentrations did not exceed the CCME Surface Water Quality Guidelines for the Protection of Aquatic Life. "*Based on the research and monitoring work conducted, the risk of water quality degradation appears to be significant for areas of the province where intensive agriculture is practised, as measured by fertilizer or herbicide inputs or by animal unit density*" (CAESA, 1999). However, several types of pesticides identified do not have established guidelines.

Existing or available data on biological indicators (aquatic macrophytes, fish population estimates, vegetation types and benthic invertebrates) and water quantity were least available for this study, and therefore not adequate to properly assess watershed health. Pharmaceuticals (animal and human) were found to be of concern to NSWA members. Their effects on humans and aquatic life are not well known or documented in the watershed and this presents a data gap for future consideration.


The NSWA, as Watershed Planning and Advisory Council for the North Saskatchewan River watershed in Alberta, will continue to lead State of the Watershed reporting in this watershed. It will also undertake integrated watershed planning by involving its members and watershed stakeholders in an ongoing, adaptive management and planning process. This State of the Watershed Report is a foundational document to be used by the NSWA to initially characterize and evaluate the overall health and issues of concern in this watershed.

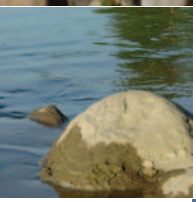
As all major watersheds in this province are unique, this new approach to planning and growth while considering the limitations of watersheds creates an opportunity. The North Saskatchewan Watershed, with a relative abundance of water compared to some other Alberta watersheds, is still able to effectively consider the needs of the aquatic, riparian and other hydrological systems as part of its future management planning. Through the IWMP the NSWA in consultation with the residents and stakeholders in the watershed, must decide on the balance between society's needs, and the needs of the natural systems which support social, environmental and economic health. It is hoped that this document, and future reports of this kind will provide an assessment of just how well our planning, implementation and actions improve the 'state of the watershed'.

1.6 RECOMMENDATIONS

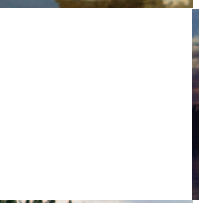
The following recommendations are a result of report data analysis, NSWA member and public comments, examining the needs of future State of the Watershed Reports and information required for wise use and management of the North Saskatchewan Watershed. These recommendations are for the review and consideration by NSWA members, NSWA partners and watershed stakeholders. The recommendations are:

i. To support municipal government initiatives that promote wise use and management of their portion of the watershed such as urban sustainability initiatives (Smart Growth), conservation planning, riparian area protection zones, wetland restoration and upgrades to wastewater and stormwater treatment.

ii. To encourage municipal governments to incorporate watershed function in planning and development policy reviews. Riparian areas, native and perennial tame vegetation, and wetlands are key elements in watershed protection. The NSWA should work with and encourage municipalities to develop and implement land use policies that protect these features.

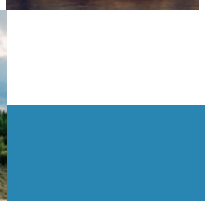


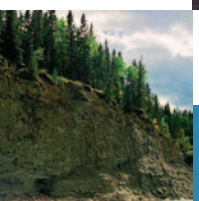
iii. To discuss with the federal, provincial and municipal governments the provision to the public of digital data collected and created with public dollars. A major constraint of this project was obtaining digital data from government and the lengthy process that this required.



iv. To encourage the federal, provincial, municipal governments and Non-government Organizations (NGO's), industry and others, to undertake a review of their respective non-digital data sources and translate these to geo-referenced digital data for the purpose of GIS layer completeness (i.e. water quality and fisheries data).

v. To create a water quality working group to identify all agencies and volunteer organizations currently collecting water quality information in the watershed to ensure that monitoring efforts are adequate to address watershed health. This could be accomplished through a series of workshops or forums. This group could also share water quality data and ensure a consistent approach to data collection, and create a water quality report using existing data from throughout the basin. This would have value in further understanding the watershed's water quality not based solely on the Alberta Surface Water Quality Index (ASWQI).








vi. To encourage the provincial government and research organizations to systematically assess a suite of biological indicators in order to properly evaluate this aspect of watershed health. Alternatively, the NSWA should consider an initiative to collect biological indicator data that were absent from this report.

vii. To work with the Cows and Fish Program, and other riparian assessment experts, to develop a collective GIS-based riparian assessment process that is objective, universal, unconstrained by sharing issues and more accessible to the public. As a component of this, the NSWA should consider undertaking a thorough review of acceptable riparian buffer widths for all land uses, and determine best practices to be consistently incorporated into government land management practices and policies.

viii. To gain a better understanding of the cumulative impact of land disturbance, comprehensive assessments of provincial river basins should be a component of the province's 'state of the environment' reporting.

ix. To work with other Watershed Planning and Advisory Councils on adopting a consistent wetland classification system and scale (e.g. Stewart and Kantrud or Cowardin) to be used throughout the province. The NSWA should then encourage and support conservation groups and agencies to collect wetland digital data using this consistent classification system.

x. To undertake with other agencies and partners a comprehensive wetland resource inventory, including drained wetlands, as a key component of a complete land use inventory for the North Saskatchewan Watershed. This is an essential tool that would enable planners to effectively address source water protection, water storage and restoration needs in the watershed. A priority for the inventory would be areas of medium to high agricultural intensity and land drainage.

xi. That the provincial government develop and implement a Wetland Policy through the Alberta Water Council that effectively addresses both wetland loss and restoration.

xii. To encourage the province and research organizations to undertake research in the area of glacier recession and snow pack change in the North Saskatchewan Watershed. This research should then be linked to climate change models for predictive scenarios.

xiii. To encourage and support the province to fund groundwater quantity and quality assessments for major groundwater sources in the watershed. This should include an assessment of groundwater quantity to ensure adequacy and scale of existing data.

xiv. To support and encourage federal and provincial governments to continue to invest in research of emerging issues such as waterborne human and livestock pharmaceuticals. Research should focus on beneficial management practices to decrease their concentrations at the source (such as livestock waste and municipal wastewater treatment facilities) and increase proper disposal.

xv. To encourage all levels of government to support and promote management practices that result in increased biodiversity in the watershed.

xvi. To develop a system to record and track improvements to watershed protection and continue to evaluate the effects of these improvements through regular state of the watershed reporting.


xvii. The indicators of watershed health used in this study were selected and ranked by the NSWA. NSWA should re-evaluate these indicators based on the current report for relevance, and encourage the focus of future data collection efforts by all partners in the watershed, where data gaps have been identified.

xviii. In future 'State of Watershed' reporting, the impact of resource extraction practices needs to be assessed relative to watershed health.