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South East Alberta Watershed Alliance

SEAWA State of the Watershed: 2011 Summary Report

SOUTH EAST ALBERTA WATERSHED ALLIANCE | SOUTH SASKATCHEWAN RIVER SUB-BASIN

seawa
South East Alberta Watershed Alliance

YOUR CONNECTION TO THE WATERSHED

The South East Alberta Watershed Alliance (SEAWA) is the South Saskatchewan River Basin Watershed Planning and Advisory Council (WPAC) for South East Alberta.

SEAWA Members include interested individuals throughout the watershed, communities, ranchers, farmers, industries, companies, governments, conservation groups, tourism groups and educational institutions.

For information about SEAWA and our Web-based State of the Watershed Report please refer to www.seawa.ca. Next steps for SEAWA include the development of an Integrated Watershed Management Plan (IWMP) for the watershed.

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Agriculture and Agri-Food Canada

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AACTI Alberta Association of Colleges & Technical Institutes

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THE SEAWA WATERSHED

This State of the Watershed Summary Report was created by the South East Alberta Watershed Alliance (SEAWA) as a companion to our new Web-based State of the Watershed (WSoW) Report and mapping tool. This booklet, the WSoW Report, and the WSoW mapping tool are intended to help water managers and users better understand the current condition of the South Saskatchewan River Sub-basin (SSRSB).

WHO IS SEAWA?

The South East Alberta Watershed Alliance (SEAWA) is a collaborative and multi-stakeholder, non-profit Society. Incorporated on May 15, 2008, SEAWA is a recognized Alberta Watershed Planning and Advisory Council (WPAC). Through its members, SEAWA creates and supports programs that encourage and advance the enjoyment, learning, protection, and responsible use of the waters of the South Saskatchewan River watershed.

WHAT IS THE SEAWA WSoW REPORT AND MAPPING TOOL?

The SEAWA WSoW Report and mapping tool is a new online, interactive and adaptive watershed management tool. It brings together current data and information about the basin's water quality and quantity, its landscape and biodiversity, and regional land use. It describes and assesses the current state of the watershed by major sub-watershed, identifies existing and emerging challenges and trends, and identifies gaps in data and knowledge.

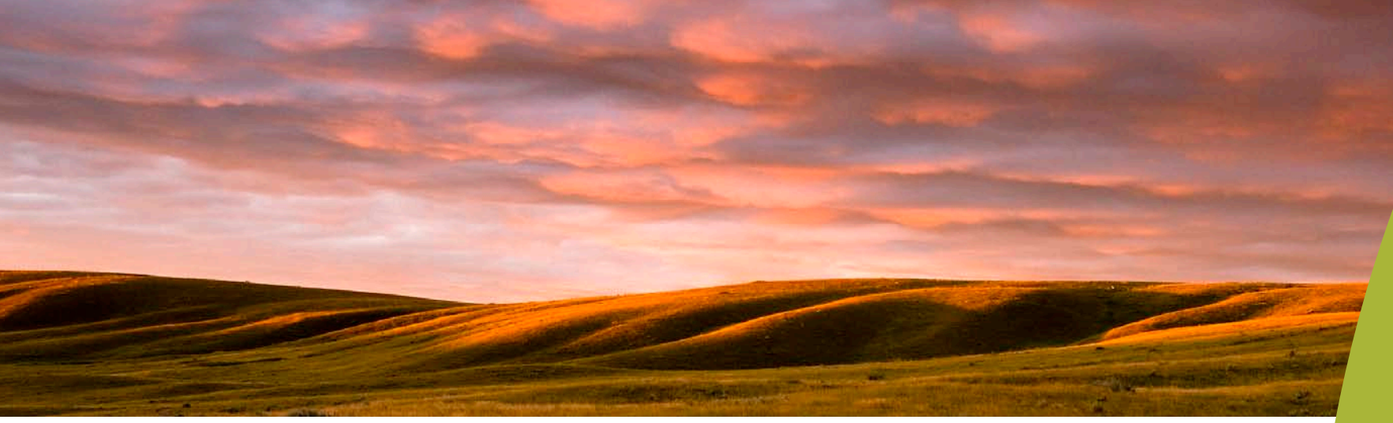
Through the WSoW Report, SEAWA is able to share the most recently available data and current knowledge about the health and condition of the entire basin.

The WSoW Report and mapping tool can be found on the SEAWA website, a place where people and organizations can become better informed and more actively involved in helping to manage the basin's water resources.

We encourage you to learn more about the SEAWA WSoW Report, and to share your water information, knowledge, stories, images and videos by going to: www.seawa.ca.

"SEAWA's research is meant to be community based – we try to employ people and volunteers who live in our immediate area since they're most familiar with it and they have the greatest concern with it. Our State of the Watershed Report is on the internet, with a web-based reporting tool which is interactive with maps, locations for sampling sites, and reports which are downloadable so that people can assemble information fairly easily and that should make it much more accessible to the public. And it's designed to serve everybody from school children through to scientists to academics – anybody who wants information about the South Saskatchewan River Basin."

Peter Wallis, PhD
Chair, State of the Watershed Committees
Dean of Science, Medicine Hat College



THE SOUTH SASKATCHEWAN RIVER SUB-BASIN (SSRSB)

OVERVIEW OF THE SOUTH SASKATCHEWAN RIVER SUB-BASIN

Although much of the water flowing in the South Saskatchewan River originates high in the Rocky Mountains of western Alberta, the South Saskatchewan River is a prairie river. Born where the glacier-fed Bow and Oldman Rivers meet at Grand Forks in southern Alberta, the river flows east and north through a wide valley carved deeply into gently rolling plains covered with grasslands. Three hundred and twenty kilometres from Grand Forks, on the Saskatchewan side of the provincial border, the South Saskatchewan River joins with the Red Deer River. Continuing east, the river creates a meandering path to join with the North Saskatchewan River forming the Saskatchewan River, which then crosses into Manitoba. After draining into Lake Winnipeg, water that began as meltwater from glacial ice, snow and rain eventually ends its journey in the Hudson Bay.

The landscape across this watershed is a testament to the power of ice, water and wind. Retreating glaciers left long narrow valleys carved into glacial debris by huge volumes of meltwater - post-glacial floods which initiated the formation of badlands in local coulees and valleys. The glaciers also left undulating plains pockmarked with depressions which evolved into shallow wetlands, as well as glacial sediments which were carried and shaped into fields of sand dunes by prevailing winds.

Superimposed upon this landscape, the SSRSB covers a drainage area of approximately 13,200 square kilometres (km^2). Because of its unique topography, only about 50% of that land area actually contributes water to downstream flow. A large part of the sub-basin is made up of smaller, internally draining, closed sub-watersheds. These areas receive runoff, but do not feed into the South Saskatchewan River.

Most of the SSRSB lies within the Dry Mixedgrass Natural Subregion of Alberta, a semi-arid prairie which supports many short-lived and deep-rooted grasses, shrubs and herbs adapted to summer droughts. In this region winters are short, cold and dry, and often punctuated by warm, westerly Chinook winds. Summers are long and warm, and this corner of the province enjoys the longest frost-free period, longest growing season, highest average temperatures, and the most sunlight hours in Alberta.

The average precipitation is less than 300 mm, the lowest in the province, and more precipitation falls as rain in the warm season than as snow in cold season. Given its unique climate and landscape characteristics, this region provides habitat for many species of plants and animals which do not occur anywhere else in Alberta.

The South Saskatchewan River follows a natural flow regime with high flows during spring runoff events, rising to a peak in June due to mountain snowmelt, and then dropping to its lowest flows in winter. The mean annual natural flow of the South Saskatchewan River at Medicine Hat is 7.0 billion cubic meters (m^3), but this value can vary considerably.

Annual runoff from the tributaries in the region is highly variable; the flow in the river is essentially the sum of the flows in the Oldman River and Bow River, and river flows can change dramatically from year to year in response to regional precipitation and water usage across southern Alberta.

LEARNING ABOUT OUR WATERSHED . . .

WHAT'S IN A NAME?

Large drainage basins are typically divided into smaller units, either "sub-basins" or "sub-watersheds," to make them easier to manage.

The Government of Alberta defines the larger basin formed by the Bow, Oldman, Red Deer and the Alberta portion of the South Saskatchewan Rivers as the South Saskatchewan River Basin (SSRB). As part of the SSRB, the Alberta portion of the South Saskatchewan River is considered a sub-basin: a smaller, regional drainage area that contributes to the broader basin.

Those who live in the SEAWA watershed typically consider their corner of south-east Alberta (the area that drains towards the South Saskatchewan River) as the South Saskatchewan River Basin.

For the purpose of the State of the Watershed Report, and to reflect hydrologic, not political boundaries, SEAWA refers to the Alberta and Saskatchewan portions of the basin as the SEAWA watershed, or the South Saskatchewan River Sub-basin (SSRSB). The SEAWA watershed has been further divided into six sub-watersheds based on the unique drainage patterns and characteristics of the regional landscape.

"The waters… are heavy this week with the dead land and the decay of a passing winter as they churn slowly toward the mighty gorge. And as they spill over they fall slowly, muddy and dark. And even in this springtime somberness, there is still enough of the spectacle in the spill and the spray to bring out tourists by the thousands to watch in awe the wonder of nature's creation. And as I pondered my mind raced back to other springs in other places across this broad country to recall for a moment the rejoicing of their sights and sounds. The first to mind was boyhood on the prairie with a springtime trip to the farm where behind the barn on an uncle's place… I heard the first call of the meadow lark and watched keen-eyed for the first adventuresome gopher's head to pop up from his winter's hole along the pasture field."

R.H.D. Phillips, CM, BA, LLD, FAIC, PAg – Editor and Publisher
April 1957 Canadian Press article

THE SOUTH SASKATCHEWAN RIVER SUB-BASIN (SSRSB)

Like quantity, the water quality of the South Saskatchewan River largely reflects what is happening in upstream basins. Treated wastewater effluent, stormwater, agricultural runoff and other human and industrial activities upstream can contribute to increased levels of minerals, nutrients, organic matter and sediments in the SSRSB.

The average population density of this primarily rural region is about five people / km^2. The largest regional users of water include the only large urban centre in this corner of the province, the City of Medicine Hat (which has its own power plant and draws water under its licence to support that facility), and agriculture. The development of irrigation throughout Alberta led to the construction of several reservoirs in the area, many of which are linked to the St. Mary River Irrigation District irrigation network. District and private irrigation are used to supply water for agriculture and a number of other uses including: commercial activities like golfing, parks and recreation; industry; oil and gas production; and habitat enhancement projects.

HISTORY AND HERITAGE

According to the Archaeological Survey of Alberta, there are more than 30,000 sites of archaeological interest within the province, representing at least 13,000 years of human habitation. Of those, approximately 1,200 sites lie within the SEAWA watershed. Many sites are found close to water, which is typically the case throughout southern Alberta and the prairies in general.

For early human inhabitants, rivers and tributaries provided pathways through an arid landscape. The river and its forested banks also provided water and shelter for humans and the wildlife they hunted; a pattern that did not change for thousands of years. The pre- or Protohistoric Period in southern Alberta (270 – 100 years ago) began with the arrival of explorers, horses and the European traders that followed soon after. With the arrival of horses indigenous people could travel and hunt more extensively. However, due to the arid nature of the area all game, including bison, remained within close reach of water and so the river continued to play a central role in the lives of indigenous people.

Early explorers also had close ties to the river relying on it for the same reasons as the indigenous people: food, water, and as a transportation corridor. An important, and rare, Protohistoric Period site in the SEAWA area is the Saamis Site in the wooded valley of Seven Persons Creek in Medicine Hat. Excavations have shown that the site dates from 1700 to 1725. Although Europeans began moving into the territory as early as 1670, Anthony Henday's journals from the mid-1700's are the first European records of the indigenous people in southern Alberta. One of the more important observations Henday made was regarding the number of indigenous people in the region. In the fall of 1754, he noted several thousand people in south-central Alberta.

The Historic Period in Alberta was a time period that began with the arrival of the North West Mounted Police in 1873 and the establishment of Fort Macleod the following year. Europeans had been in the region since the 18th century, but immigration was slow until the railroad made travel across the continent easier.

THE SOUTH SASKATCHEWAN RIVER SUB-BASIN (SSRSB)

The population in the south increased dramatically and large settlements began to be established. A foundation of farming and ranching was also successfully established, despite periodic droughts, severe winters and other natural and managerial challenges.

Rich in natural resources including natural gas, coal, clay, and farmland, the region was known in the early days as "the Pittsburgh of the West." Contact with European traders, explorers and settlers changed the lifestyle of the indigenous people rapidly – and irrevocably. With the decimation of the bison herds by the late 1870's, the traditional lifestyle of the indigenous people also disappeared. In less than 200 years, thousands of years of living as part of the natural balance was lost. The impact of modern human activity resulted in a significant change to the landscape.

In 1883, when the Canadian Pacific Railway reached Medicine Hat and crossed the South Saskatchewan River, a town site was established using a name from Indian legends. With the railroad, government incentives, and the dream of the wilderness, homesteaders began arriving in great numbers. A number of large industries began to locate in the region drawn by cheap and plentiful energy resources. Coal mines, brick works, pottery and glass bottle manufacturing plants, flour mills and other industries became established.

The agricultural potential of the surrounding area, both in crop and livestock, and the well established transportation route made the region attractive as a service centre. Irrigation was attempted as early as 1888 by Sir Lister Kaye at the Stair Ranch near the current town of Redcliff, Alberta. This attempt involved hauling water in special tanks ordered from Winnipeg. The attempt was unsuccessful, as it required too much effort to haul the water out of the South Saskatchewan River valley, over the steep river banks, to the farms. Nonetheless, it was the beginning of what has become a vibrant irrigation industry.

AN INTRODUCTION TO PLANTS, FISH AND WILDLIFE IN THE SSRSB

The land and waters of the SEAWA watershed are home to a wide diversity of plants and wildlife. There is no denying that parts of the watershed have been profoundly altered by human activity, but because the region is largely rural and sparsely inhabited there are still large tracts of native prairie as well as permanent and temporary wetlands, coulees, and stream and river valleys that support a wide array of both aquatic and terrestrial species. And because of the unique climate of the Dry Mixedgrass Natural Subregion, into which the SEAWA watershed falls, there are numerous species of plants and animals that occur nowhere else in Alberta.

PLANTS IN THE SSRSB

Vegetation plays an important role in maintaining soil stability, preventing soil erosion and providing nutrients and habitat. Vegetation also intercepts and captures rainfall and then slowly releases it, a distinct benefit in the semi-arid prairie. Minor changes in topography or in soil texture or chemistry can produce significant changes in plant communities.

THE SOUTH SASKATCHEWAN RIVER SUB-BASIN (SSRSB)

The SEAWA watershed has a number of distinct environments including the highlands of Cypress Hills, scattered badlands and dune fields. Because the Cypress Hills were not overtopped by ice during the last glaciations, they provide ecologically unique and highly productive habitat for birds, mammals and plants.

While the ecology of the SEAWA watershed is predominantly grasslands, the ecology of the highlands is a bio-diverse mix of highly productive forests, wetlands and grasslands. According to Alberta Environment, the combination of plant and animal species living here is unlike any other in Canada. In general, the warm dry climate of the region promotes grassland communities composed of mixed height grasses, typically a combination of blue grama (a short grass) and needle-and-thread, western wheat, or June grass (mid-grasses).

Throughout most of the region low-lying areas such as depressions, ravines or coulees, and north or east-facing slopes have extensive areas of low shrubs including silver sagebrush, silverberry, buckbrush and prickly rose. Tall shrub and forest communities of willows, thorny buffaloberry and plains cottonwood are found adjacent to streams and rivers where high water tables provide enough moisture to support growth during hot, dry summers. These vegetative areas are termed riparian zone forests. Streamside or riparian forests are important to sustaining both terrestrial and aquatic species. Unfortunately, these are some of the most impacted habitats within the greater South Saskatchewan River Basin.

Cottonwoods in particular have a number of specific requirements for successful regeneration along prairie rivers and these requirements are no longer being met due to human impact on the frequency, level and timing of river floods, and physical impact on floodplains.

Studies conducted by Alberta Riparian Habitat Management Society (Cows and Fish) led to the classification of some riparian zones in our watershed as being in either healthy, healthy-with-problems, or unhealthy condition.

Badlands and dune fields also provide unique habitat, and many species found in these areas are classified as rare either because they are at their “bio-geographical” limit (found farther south, but nowhere else in Canada) or because the interaction between climate and landscape has produced a truly unique habitat found nowhere else. The primary threats to habitat, and thus to species, are outright loss of habitat, habitat fragmentation and the introduction of invasive or “exotic” species.

In sites upstream of Medicine Hat, a Cows and Fish study (2004) found extensive areas of the riparian zone where disturbance-caused species and invasive plants had become established. Downstream of Medicine Hat, invasive plants species were also found to have become established and widely spread within their riparian forests.

If we also consider the physical and ecological effects of development on water quality and quantity, and the risks of declining water supplies from climate change and natural hazards such as floods and droughts, it is clear the biodiversity of the basin is vulnerable.

THE SOUTH SASKATCHEWAN RIVER SUB-BASIN (SSRSB)

FISH IN THE SSRSB

There are approximately 65 species of fish in Alberta waters. Of these, 54 species (a mix of both native and introduced species) have established populations, and 11 species (introduced) are present in limited numbers. Fish may have been introduced through legal stocking or through illegal or accidental release.

Rainbow Trout, Northern Pike, Walleye, Sauger, and Goldeye are found in the South Saskatchewan River as are Lake Sturgeon, a less common species.

Sturgeon are scaleless fish that have inhabited the waters of the northern hemisphere since dinosaurs walked the earth. Despite their name, Lake Sturgeon are strictly a river fish in Alberta, and are found only in the North and South Saskatchewan River systems. Lake Sturgeon are slow growing, but because they can live beyond the age of 80, they can weigh more than 100 pounds. Alberta’s record-size Lake Sturgeon (105 pounds!) was caught in the South Saskatchewan River. It has been estimated there are less than 5,000 Sturgeon in Alberta and they are classified as At Risk in the current General Status of Alberta Wild Species Report, and are also classified as Threatened under Alberta’s Wildlife Act. Lake Sturgeon are also protected under Alberta Fisheries Regulations, which regulate fisheries harvest in Alberta. Fishing opportunities for Lake Sturgeon in the South Saskatchewan River throughout the year are on a catch and release basis only (0-limit).

A popular sport fish, Northern Pike are found throughout Alberta although distribution in the foothills and mountains is limited to a few lakes. Pike prefer shallow, weedy clear waters in lakes and marshes but also inhabit slow streams. Pike spawning occurs in areas of flooded vegetation in early spring, often when ice is still on the lakes. Northern Pike are a cool-water game fish, subject to current Alberta sportfishing regulations, and are classified as Secure in the current General Status of Alberta Wild Species Report.

Named for their big eyes, Walleye are the largest members of the perch family. Walleye begin moving toward their spawning areas in streams and on lake bottoms in late winter and early spring. Walleye prefer deeper waters, although they also inhabit shallows. Walleye are a cool-water game fish, subject to current Alberta sportfishing regulations, and are highly valued as a sport and food fish. Walleye are classified as Secure in the current General Status of Alberta Wild Species Report.

Sauger are not found in any Alberta lakes, but can tolerate silty water in many river systems, including the South Saskatchewan. Sauger are a cool-water game fish, subject to current Alberta sportfishing regulations, and are classified as Sensitive in the current General Status of Alberta Wild Species Report.

Goldeye prefer the quiet, slow-moving waters of large rivers and the muddy shallows of large lakes. They are among the most mobile of Alberta’s cool-water fishes. Goldeye spawn in the spring in slow currents over gravelly or rocky lake and river bottoms. Annual migrations of mature Goldeye can exceed 1,000 km. Goldeye are a cool-water game fish, subject to current Alberta sportfishing regulations, and are classified as Secure in the current General Status of Alberta Wild Species Report.

THE SOUTH SASKATCHEWAN RIVER SUB-BASIN (SSRSB)

WILDLIFE OF THE SSRSB

Few places in the world have as great a diversity of wildlife as Alberta. The province boasts 587 wildlife species, including: 411 species of birds; 93 mammals; 65 fish; 10 amphibians; and 8 reptiles.

Wildlife has intrinsic as well as economic value. Across the SEAWA watershed, wildlife adds to the quality of life of many residents. Activities such as hunting, fishing and wildlife watching contribute significantly to the regional economy. Many wild species provide ecological services as well, such as the role that insect pollinators play in maintaining wild plant communities and enabling crops to produce fruit.

Because the SEAWA watershed has a distinct climate and a number of unique habitats, many birds and animals found in the region do not occur anywhere else in Alberta or Canada. Sand plains and dune areas in particular contain many rare species, including Ord's Kangaroo Rat and Western Hognose Snake. Sandstone outcrops and badlands provide nesting habitat for Golden Eagles, Rock Wren, Ferruginous Hawks, Prairie Falcons and Mountain Bluebirds.

Marshes and wetlands provide important habitat for many species of resident and migrating birds. Pakowki Lake is a major stop on a North American waterfowl flyway and is considered internationally significant for its shorebird and waterfowl habitat. Riparian shrublands and forests also support a diverse bird and mammal community including: Brown Thrasher; Gray Catbird; Yellow-breasted Chat; Mourning Dove; Northern Flicker; House Wren; Northern Oriole; Deer Mouse; Nuttall's Cottontail; and White-tailed Deer. Oxbow lakes of meandering streams provide key habitat for breeding amphibians and reptiles including: Chorus Frog; Northern Leopard Frog; Plains Spadefoot Toad; and garter snakes.

Natural and cropped uplands provide habitat for a number of species, although the conversion of native prairie to an agricultural landscape has altered the make-up of plant and animal communities. Many species are sensitive to human disturbance and have a low or declining population, and are at risk, or may be at risk of disappearing. There are about 70 fish and wildlife species that are considered species at risk in Alberta's grasslands.

In addition to habitat loss and degradation, native species are threatened by over-harvesting, pesticides, isolation, persecution, invasive species and disease. Invasive species often have no natural enemies to limit their reproduction so they can spread easily and threaten the local ecological balance by causing habitat loss for native species or by out-competing them.

"When you have seen one ant, one bird, one tree, you have not seen them all. The one process now going on that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly our descendants are least likely to forgive us."

E.O. Wilson, PhD
Harvard University Professor
Pulitzer Prize winning author of The Ants and Naturalist

LEARNING ABOUT OUR WATERSHED . . .

WETLANDS

In Alberta, wetlands are typically defined as areas where the land is saturated long enough to have poorly drained soils, water-loving plants and biological processes suited to wet areas.

Wetlands provide some of the most productive habitat in the world and support a high natural biodiversity of plants and animals; they also play a large role in a watershed by protecting water quality and moderating water quantity.

All wetlands include a surrounding riparian area that is easily recognized by vegetation that is distinctly different from the adjacent upland or dryland vegetation.

Alberta's wetlands are used by about 250 species of birds. Other animals also depend on wetlands including 17 species of mammals, and 15 species of amphibians and reptiles. Wetlands are also important for fish, as seasonal, shallow wetlands connected to lakes offer fish spawning and rearing grounds. Last year was a good year for wetlands in the region and most, if not all, saw high water marks and related high productivity.

The SEAWA watershed is a showcase of ponds, sloughs and marshes of various sizes and degrees of permanence. While many may only be remnants of their former selves by next summer, others are more permanent and ecologically significant features of the SEAWA landscape.

BIODIVERSITY

The South Saskatchewan River Sub-basin is a mosaic of distinct physical habitats and the biodiversity of the watershed reflects the interaction between landforms, climate and regionally-adapted plant and animal species.

The size, distribution and health of aquatic plant, invertebrate and fish communities are dependent on the availability and quality of water in the river and its tributaries. The abundance, diversity and geographic extent of other plants and wildlife within the SSRSB are often limited by the riparian habitat adjacent to those water courses. Away from the river, the distribution of species may be controlled naturally by micro-climate or specific habitat requirements (such as sand hills), or by human impact on range or food supply.

The Alberta Biodiversity Monitoring Institute will release a Biodiversity Report for the South Saskatchewan Planning Region in 2011. It will include indicators relating to human development (our "footprint") as well as species and habitat indicators. The Biodiversity Report will focus on seven species indicator groups: winter mammals; grassland birds; native plants; non-native weeds; fish; soil arthropods; and species at risk. Habitat indicators will include: undeveloped habitat; land condition; wetland condition; and riparian systems. The ABMI biodiversity assessment will help to address and expand what has been identified as a significant gap in knowledge.

OVERVIEW: WATER ALLOCATION AND USE IN THE SSRSB

DEFINITIONS

Water allocations, or licences, in the Province of Alberta are determined by Alberta Environment, and are based on the expected maximum amount of water that an applicant may require annually and the amount that is available for use. In the past, these allocations were typically granted under the presumption of total consumption; mandated return flow was often not a condition of a water licence in the past but this is changing with new licences. Also, the cost of the licence, and therefore the water to the end user, as a rule has been based on the cost to collect, clean, store and/or distribute the water. The water itself has been essentially free. Until recently there have been few economic or other incentives to conserve water.

In general, three water use factors are considered in issuing licences for water allocations. Allocations reflect the amount of water that the licencee is expected to consume, plus losses due to seepage or evaporation, and in some cases an allowance for returning water back to rivers and lakes after use. The term "licenced water use" reflects those components of the allocation that are expected to be consumed or lost.

ALLOCATION = Water Use + Return Flow

WATER USE = Consumption + Losses (Evaporation and/or Seepage)

RETURN FLOW = Diversion – Water Use

In addition, the following definitions are often used to explain water and watershed management-related terms:

WATER ALLOCATION: The permitted volume, rate, and timing of a diversion of water outlined in a water licence. When water is permitted to be redirected for a use other than for domestic purposes, it is referred to as an allocation. Agricultural, industrial, and municipal water users must apply for a licence to use a set allocation of water.

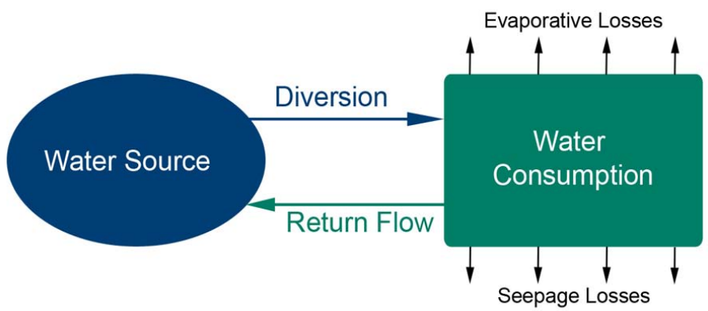


FIGURE 1: Water Allocations, Water Consumption and Use, Return Flows

OVERVIEW: WATER ALLOCATION AND USE IN THE SSRSB

WATER DIVERSION: The transfer of water from a stream, lake, aquifer, or other source of water by a canal, pipe, well, or other conduit to another watercourse or to the land, as in the case of an irrigation system. Also, a turning aside or alteration of the natural course of a flow of water, normally considered physically to leave the natural channel.

WATER LICENCE: A water licence provides the authority for diverting and using surface water or groundwater. The licence identifies the water source, the location of the diversion site, an amount of water to be diverted and used from that source, the priority of the "water right" established by the licence, and the conditions under which the diversion and use must take place

WATER USE (CONSUMPTIVE): The balance of water taken from a source that is not entirely or directly returned to that source. For example, if water is taken from a lake to feed cattle, it is considered a consumptive use of water.

OVERVIEW OF WATER ALLOCATION AND USE

Water management, regulation and governance in Alberta have a long and inter-related history involving public and private stakeholders. This history is a reflection of the economic development and water conditions and watersheds across the province.

In particular, issues surrounding water allocation legislation, policy and practice have been at the centre of southern Alberta's water debate for much of the past 15 years.

The allocation, management and protection of water is regulated under the Water Act (1999) which allows the Province of Alberta to grant rights to the diversion and use of this water. Since 1894, First-In-Time, First-In-Right (FITFIR) has been a key principle in granting and administering water allocations.

In 2007, the Government of Alberta effectively closed most of the SSRB to the issuance of new diversion licences because the basin was considered to be over allocated. To balance Alberta's variable water supply with our social, economic and environmental needs, the Water Act allows for water allocation transfers between users.

Alberta's historic water legislation and its accompanying licensing system have provided the security needed to support much of Alberta's economic growth, especially in southern Alberta. However, with increasing recognition of the need to develop a more deliberate and integrated approach to water management to address a multitude of uses with a watershed context, the effectiveness of water allocation legislation and policy is being revisited.

The Government of Alberta is currently undertaking a broad review on opportunities for improving water allocation and management in Alberta.

The goal of this review is to determine the scope of changes that can be implemented to not only meet current water needs better, but also to improve environmental performance and provide opportunities for continued economic development.

WATER ALLOCATIONS IN THE SSRSB

In 2010, total annual licenced surface and groundwater allocations in the SSRSB was 288 million m^3. These licences assume that up to 208 million m^3 will be used (consumption, plus evaporative and seepage losses), and includes a return flow allowance of 80 million m^3.

Surface water allocations comprised 97% of the total water allocations, while groundwater allocations represent the remaining 3%. Water allocations for municipal purposes are allowed up to 170 million m^3. Municipal allocations represent about 59% of all licenced surface and groundwater allocations in the SSRSB. Urban consumption accounts for 99% of this allocation, while the other 1% has been allocated to rural users (cooperatives, farmsteads, single or multi-family homes, and Hutterite colonies).

The City of Medicine Hat accounts for about 163 million m^3 of the water allocation for municipalities. The allocation for the City of Medicine Hat is larger than allocations of other Alberta cities of similar size, because the City has its own power plant.

The agricultural sector (irrigation and stock watering) accounts for 26% of total water allocations within the SSRSB, amounting to 74 million m^3 of water annually. The industrial-commercial sector accounts for about 11% of licenced water allocations, while other purposes account for the remaining 4% (12 million m^3 annually) of total surface and groundwater allocations.

Across the South Saskatchewan River Sub-basin, the level of water allocations has reflected about 70% to 80% of natural flows.

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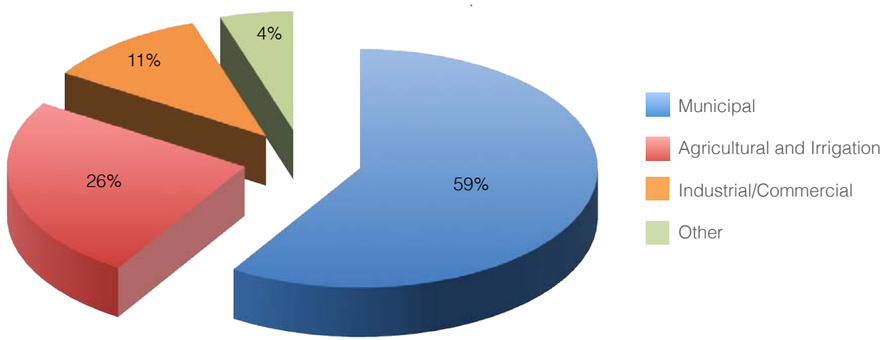


FIGURE 2: Water Allocations in the South Saskatchewan River Basin (source: Alberta Environment)

OVERVIEW: WATER ALLOCATION AND USE IN THE SSRSB

ESTIMATED WATER USE IN THE SSRSB

Not all water that is currently allocated within the SSRSB is either withdrawn or consumed. With respect to actual use, the exact volumes diverted and used are not precisely known because not all water users submit annual water use reports to Alberta Environment. Based on 2005 water use data, it was estimated that 66 million m^3 of water was actually used (amount of water diverted less return flow) in the SSRSB. This represents about 32% of water use that is allowed under existing licences and registrations.

The amount of estimated water use in the SSRSB comprised about 2% of the total estimated annual water use in Alberta, and only 3% of the total estimated annual water use in the South Saskatchewan River Basin.

Agriculture and irrigation accounted for about 42% of estimated annual water use (28 million m^3). The commercial sector accounted for about 2% of estimated use, while the industrial sector accounted for about 26% of estimated water use (17 million m^3). Municipalities, after accounting for return flows, accounted for about 12% of the annual estimated water use. The petroleum sector accounted for 7% of estimated water use annually. Other purposes and water uses accounted for the remaining 11% of estimated annual water use.

The 66 million m^3 of water that were estimated to have been used in the SSRSB would weigh approximately 145 billion kilograms (at an average temperature of 4°C), and would fill the equivalent of 26,400 Olympic sized swimming pools. That's a LOT of water!

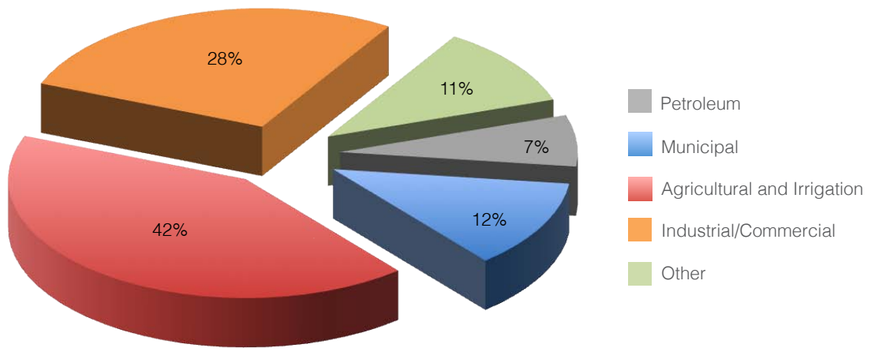


FIGURE 3: Estimated Water Use in the South Saskatchewan River Basin (source: Alberta Environment)

CONDITIONS, RISKS AND PRESSURES

While there are minor inflows of water to the mainstem of the South Saskatchewan River from small tributaries and from within sub-watersheds during spring runoff and following heavy rains, most of the water flowing in the river comes from the two upstream basins, the Bow and the Oldman Rivers.

LANDSCAPE CHANGES

The landscape of the SEAWA watershed has changed dramatically in the last 150 years. Natural grasslands have been converted to cropland, and wetlands have been drained or filled for agricultural development. The landscape has been fractured by roads, pipelines and river crossings for oil and gas development. While the region is still largely rural, urban centres have edged into native prairie and farmland.

Of particular concern are the effects of livestock activity, recreation and pipeline crossings on valuable, and limited, streamside forests and wetland habitats. Changes on the land affect the hydrologic regime of the basin by changing the storage of surface and groundwater, and by modifying surface water flow patterns. These physical and hydrological changes lead in turn to changes in the health, distribution and diversity of species on the land and in the water.

WATER QUALITY

Water quality along the mainstem of the South Saskatchewan River is largely determined by the water quality of the inflowing Bow and Oldman Rivers.

The major factors influencing the region's water quality are modifications in river flows by upstream reservoir operations and other diversions, as well as agricultural and municipal return flows.

At various times through the year, other factors play a larger, more local role influencing water quality. The contribution of surface runoff during the spring and early summer increases total suspended solids and turbidity and other water quality issues associated with those particles, and during periods when the relative contribution of groundwater increases, nitrogen, total dissolved solids and other parameters are affected.

Pharmaceuticals, hormones, and other known or suspected endocrine disrupting compounds have been detected in Alberta rivers. However, there is still limited research available on the regional implications of the presence of these compounds and additional monitoring of organic wastewater contaminants in the SSRSB is needed.

WATER QUANTITY

The mean annual flow of the South Saskatchewan River has been measured at Medicine Hat since 1913 (see Figure 4). While the long record of flow shows considerable inter-annual variability, the most obvious feature is the significant downward trend in the amount of water in the river.

This decline in recorded flow can be attributed almost entirely to an increase in the consumption and diversion of river water, primarily for irrigation upstream of the City of Medicine Hat.

CONDITIONS, RISKS AND PRESSURES

Annual precipitation has ranged from a high of 689 mm in 1927 to 186 mm in 2001, the driest year on record. The flow of the South Saskatchewan River reflects that variability. No place else in Canada, and few places on earth, have this much variability in both climate and annual water balance.

CLIMATE CHANGE

There is considerable climatic and hydrological variability in the SEAWA watershed, both within years and between years, and basin residents and aquatic ecosystems have, up until now, adapted to this variability.

If this variability is magnified through climate change there may come a point where natural systems can no longer adapt and environmental conditions will begin to degrade.

The mean annual temperature at Medicine Hat has risen since 1895 by approximately one degree, from about 4°C to about 5°C. Most of the warming has been in winter, and since the 1970's.

Precipitation recorded at Medicine Hat clearly shows large inter-annual variability and longer wet and dry cycles in winter.

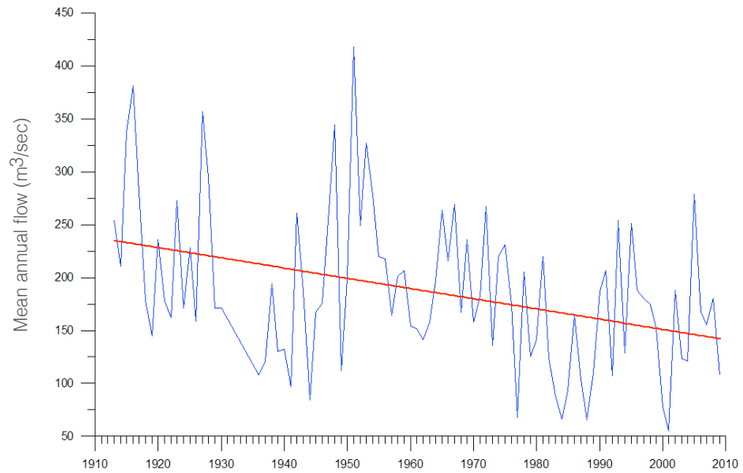


FIGURE 4: Mean Annual Flow Since 1913

Axelson, Sauchyn and Barichivich (2009) reconstructed the annual flow of the South Saskatchewan River at Medicine Hat using tree-rings. This proxy of streamflow extends from the years 1402 to 2002 (see Figure 5). The most prolonged wet period in this 603-year record extends from the 1880's to the mid-1910's, and on the graph below is represented by many consecutive blue bars and relatively few red ones. This was the period of homesteading, when the region was settled and agriculture became established. The long periods of sustained low flow, represented by consecutive red bars, generally predate European settlement of southern Alberta. The tree-ring record suggests the SSRB could be subject to droughts of greater severity and/or duration than those experienced over the past 120 years.

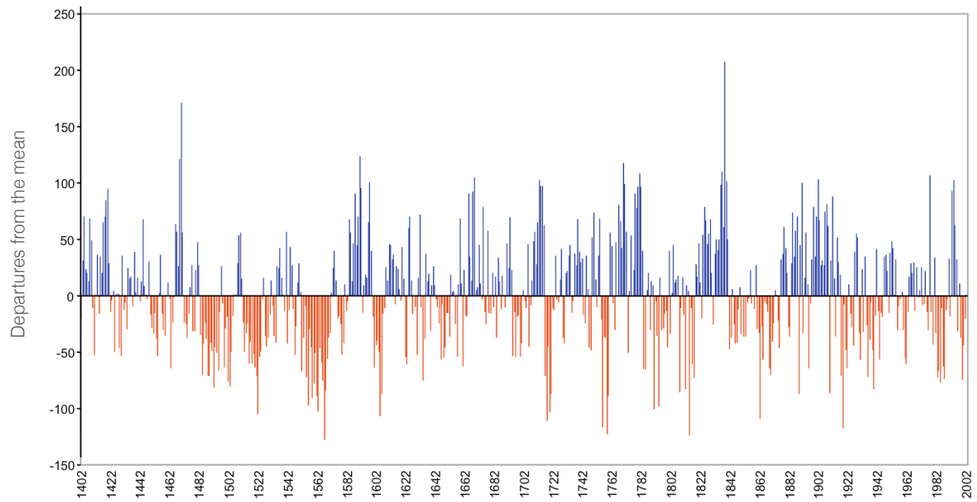


FIGURE 5: The Annual Flow of the South Saskatchewan River at Medicine Hat, Reconstructed from Tree Ring Data

THE FLOOD OF SPRING 2010

FLOOD. Not a word one typically associates with Medicine Hat, but the spring of 2010 turned out to be anything but typical. While relentless rain caused havoc in a wide swath across southwest Saskatchewan and southeast Alberta, Medicine Hat and Cypress County seemed to bear the brunt of the disaster. For three days in June rising flood waters caused chaos throughout the region. Ruined roads, washed out bridges and railways, flooded basements – the list of destroyed or affected property was long. Just how much water was there? At Ross Creek and Highway 41, the flow peaked at 160 m^3 per second (cms) (normal flow is 5-8 cms). At Seven Persons Creek, the flow peaked at 135 cms (normal flow is 3-6 cms), and the South Saskatchewan River peaked at 2,300 cms (normal flow 150-300 cms).

CONDITIONS, RISKS AND PRESSURES

AGRICULTURAL ACTIVITY

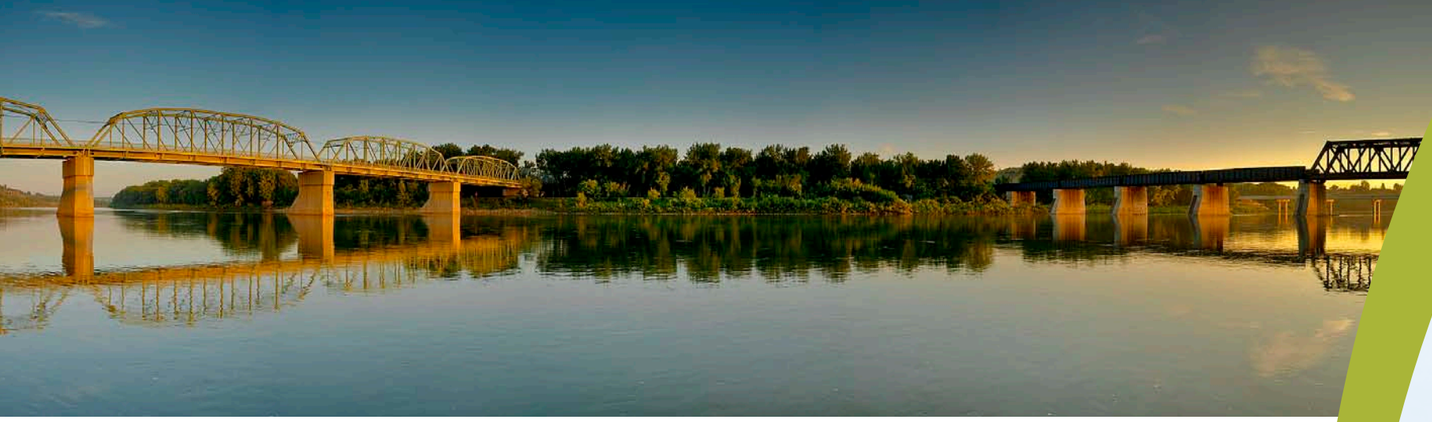
Agricultural activities take place on most of the land within the region and some of these activities pose a risk to surface and groundwater quality and quantity. Potential threats to water quality can come from intensive livestock operations, manure storage and application, pesticide and fertilizer application, livestock grazing and wintering sites, and tillage and cropping systems. Livestock activity in riparian areas can cause degradation of the riverbank, and affect both water quality and the regeneration of critically important riparian forest species such as the plains cottonwood.

RIPARIAN FORESTS

The management of riparian forests and wetland areas is a major issue throughout the SEAWA watershed. These ecosystems have been impacted by recreational activities, agricultural and residential development, as well as the re-management of water flows and levels. A great deal of attention has been paid to the decline of cottonwood forests. However, the density of cottonwood trees has traditionally been sparse along the South Saskatchewan River. There are thin bands of cottonwoods upstream and downstream of Medicine Hat, but the only large stands occur at the confluence of the Bow and Oldman rivers, within Medicine Hat, and at "Sherwood Forest" in CFB Suffield. While cottonwoods are a star attraction across the region's semi-arid landscape, there are also other tree, shrub and herbaceous riparian communities that provide similar ecological goods and services. Spring-fed woodlands, wetlands, and drainage channels all contribute to water quality and provide critical habitat for fish and wildlife.

WATER MANAGEMENT

Agricultural and urban water use, upstream dams and climate change have all impacted the natural flow of the South Saskatchewan River. There is no longer any debate, the South Saskatchewan River has been over-allocated. Across southern Alberta, water allocations range from about 20% of natural flows in the Red Deer River sub-basin, to almost 70% of natural flows in the Oldman River and Bow River sub-basins. And, as much as 70% to 80% of natural flows across the South Saskatchewan River Sub-basin have been allocated. However, water supplies are sufficient to meet reasonable needs, if managed wisely. Alberta has placed a cap on new water licences in the South Saskatchewan, Bow and Oldman sub-basins, and they are now considered fully allocated. Nonetheless, the current water-supply situation still needs to prompt questions about water supplies under future climate change scenarios, and raises concerns about the environmental effects of existing and proposed development and diversions.



CONDITIONS, RISKS AND PRESSURES

ACTIONS AND RESPONSES

Today's water challenges and opportunities clearly impact many different jurisdictions, stakeholders and communities. Addressing the protection, allocation and management of water resources requires creative and coordinated efforts. Through a growing number of public and private sector programs and partnerships, some of which are unique, SEAWA is making it easier to share water data, research opportunities and best practices.

Knowledge of our watershed's health is the foundation of effective decision-making. SEAWA's new WSoW Report and mapping tool was created to improve access to, and sharing of, all water related data and information on the South Saskatchewan River Sub-basin. Through this new and innovative WSoW Report and mapping tool, the general public, stakeholders and resource managers are now able to engage in informed discussion, and through these discussions, make meaningful recommendations for improvements to the basin's management.

Enhancing the sustainability of industrial development and agriculture can, with care, protect our watersheds and improve our environmental performance. For example, the environmental sustainability of farmed areas cannot be considered without first considering the factors that affect environmental, social and economic aspects of agricultural production.

In this regard, SEAWA is promoting the adoption of best practices across the agricultural sector, such as protecting the quality and productivity of farmed soils, reducing soil erosion and salinity, conserving and restoring soil organic matter, protecting quality of surface and groundwater, preserving and restoring riparian zones, and maintaining or improving the quality of rangelands. Careful attention to these factors will inevitably lead to a better match of land use to the region's land and water capability.

SEAWA distributes a quarterly newsletter to advance awareness of the issues and work being done across the basin and has held workshops, forums and conferences to improve knowledge of the region's groundwater resources and best practices. SEAWA regularly conducts bus and river tours to provide residents with a real and interactive experience with the watershed, and continually engages local students in research projects relating to watershed resources and challenges. Through online social networks and other programs, SEAWA is also reaching out and engaging the region's youth in stewardship activities. Collectively, the improvements and opportunities that emerge from SEAWA's programs and projects support the goals and principles of other key policies and approaches, including Alberta's Water for Life Strategy and the South Saskatchewan Regional Plan being developed under the Land-use Framework.

"Knowing only the boundaries of its banks a river sustains, nourishes and sculpts what it touches. At times the river may overwhelm its banks but more often it is inviting and inspiring. We think we know the river but we are just beginning to understand its profoundness and yet, at the same time, we are beginning to understand its fragility."

Brad Sukarukoff
SEAWA Watershed Technical Coordinator

LEARNING ABOUT OUR WATERSHED . . .

INSTREAM FLOW NEEDS

The "instream flow" of a stream or a river refers to the amount of water flowing past a set point over a given period of time and is usually expressed as cubic metres per second.

"Instream Flow Needs" (IFN) are the flows needed to maintain aquatic ecosystems at a particular, desired level. Recommendations have been established for IFNs for rivers in Alberta to address long-term protection of aquatic ecosystems as well as the maintenance of water quality, riparian areas and physical river processes such as river channel form and function. Ideally, the IFN of a river will be considered before water is allocated for other uses.

WATER CONSERVATION OBJECTIVES

Water Conservation Objectives (WCOs) are different from IFNs. Under Alberta's Water Act, a WCO defines the quantity and quality of water to remain in a river to fulfill management, conservation and economic requirements.

WCOs can be defined as a single value minimum rate of flow or as a variable flow over a period of time. Unfortunately, establishing a WCO for a river does not guarantee the flow will be met because existing allocation licences have a higher priority under the First-in-Time, First-in-Right water licence system in Alberta and they are under no obligation to meet WCOs or other instream requirements.

GROUNDWATER

Groundwater is found within the pore spaces in soil and in fractures or openings in geologic formations.

There can be complicated deep flow pathways involved in the movement of groundwater but essentially, it is replenished or "recharged" from the surface and frequently returns to the surface via springs, streams, wetlands, rivers and lakes. In addition to providing a safe and secure water source for local rural residents, groundwater plays an important role in providing base flow for creeks and rivers, especially in arid regions such as south east Alberta. This is noticeable locally in the winter months in Medicine Hat when mineral concentrations increase under the influence of groundwater flow and the river water becomes "harder."

Groundwater moves slowly and continually. Contaminants can enter the ground and make their way into water-bearing aquifers, and then in turn, to wells or surface water. Watershed managers are interested in understanding the areas where groundwater reserves are recharged and where they discharge to the surface because these areas are at greater risk of becoming negatively impacted from development. Watershed managers are also interested in the quality and quantity of groundwater reserves as climate change and overuse increase pressure on surface water supplies.

Numerous groundwater maps and reports have been generated for most of the SEAWA watershed but there is a need to compile this information to provide more detail about the extent, the quality, and the current use of groundwater in the watershed. SEAWA recently commissioned a report to provide a snapshot of the resource in the watershed, with a discussion on the hydrogeology of the region, local groundwater use, risks and pressures, and recommendations for future monitoring and management. The report will soon be available in the SEAWA WSoW Report website.

SOURCE: Partners FOR the Saskatchewan River Basin

THE SASKATCHEWAN RIVER BASIN: THE BIG PICTURE

The SSRSB is one of a dozen watersheds that comprise the Saskatchewan River basin. Originating on the eastern slopes of the Rocky Mountains of Alberta and Montana, the Saskatchewan River basin extends from the continental divide through Alberta, Saskatchewan and Manitoba to Lake Winnipeg, the 11th largest freshwater lake in the world, by surface area. The name Saskatchewan is taken from the Cree Indian word, kisiskâciwanisîpiy, meaning swift-flowing river. Although it is part of the larger Saskatchewan-Nelson system, which flows into Hudson Bay, the Saskatchewan River system itself is the fourth longest in North America. The river travels about 1,940 km from the Rocky Mountains to Lake Winnipeg. It drains a surface area of some 405,864 km^2 – almost the size of France.

The key vulnerabilities in the Saskatchewan River Basin relate to physical and ecological effects of landscape modification, water supplies to meet human and other needs, effects of urban development on water quality, natural hazards (e.g., floods and droughts), and invasive species. Natural grasslands and parkland have given way to agricultural development, foothills have been disturbed by oil and gas exploration, and wetlands have been drained. These changes to the landscape have affected the hydrologic regime, through changes in storage of surface and groundwater, and in modifications to flow patterns. Physical and hydrological changes have also led to biological change, through changes in aquatic, riparian and terrestrial habitat. (SOURCE: The State of the Saskatchewan River Basin, *Partners FOR the Saskatchewan River Basin*)

OVERVIEW: STATE OF THE WATERSHED REPORT

WHAT IS A WATERSHED?

Most creeks, streams and rivers, no matter how small, are part of a network of channels that drain surface water from the land and carry it to the sea. A WATERSHED carries water "shed" from the land after rain falls and snow melts and drains it towards a wetland or a lake or a stream or a river. Other terms that are used to describe a watershed are drainage basin, catchment basin or area, and river basin.

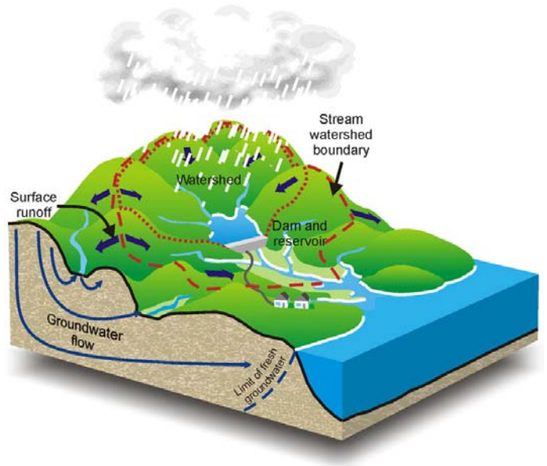


FIGURE 6: The Elements of a Typical Watershed

Although people tend to first think of a central river, a watershed is more than just a river: it includes the uplands and shorelines and fields and coulees in an area separated topographically from adjacent watersheds by a geographical barrier such as a ridge, hill or mountain.

Watersheds come in all shapes and sizes, and cross municipal, provincial and national borders.

Scientists now recognize that one of the best ways to protect our natural resources is to understand and manage them on a watershed basis. Provincial leaders agree and support the idea that managing their use locally is an effective and efficient way to sustain the regional economy and health of the environment. This "watershed approach" to management is a way of integrating land, water, wildlife and people as parts of a system which need to be considered together for the health of the environment as a whole.

WHY IS OUR WATERSHED IMPORTANT?

We all live, work and play in our watershed.

The SEAWA watershed provides clean water for drinking, and supplies water for agriculture and industry. It also provides lakes and streams for boating, fishing and swimming; hills and fields for hiking, sight-seeing and hunting; and, it provides food and shelter for wildlife.

It is important to understand that what we do on the land affects the watershed, and if we maintain the health of our watershed, we will reap the economic, social and environmental benefits it provides for many years to come.

STATE OF THE WATERSHED REPORT

A State of the Watershed Report is a compilation and scientific interpretation of data and information that results in conclusions about the condition of the watershed.

SEAWA is currently developing its live Web-based State of the Watershed Report, an important first step in developing strategies to improve and protect the watershed.

Often the first question asked when discussing local issues and opportunities related to a water body is "What is the current condition of my lake or stream?" This inevitably leads to additional questions, such as "How does this compare to conditions in the past? What factors are contributing to the current condition?" These questions are essentially asking "What is the state of my watershed?" To answer this question, one must conduct an overall assessment of the watershed.

State of the Watershed assessments should contribute to:

- An understanding of how natural features and processes influence watershed conditions;
- Insights into the linkages between watershed health and land and water uses;
- Identification of watershed risks and an evaluation of the individual and cumulative effects of water and land management practices; and
- The validation of public perceptions relating to stressors and conditions within the watershed.

Documenting watershed assessment findings in a State of the Watershed Report may substantiate or negate real and perceived concerns, identify information gaps, and lead to recommendations on the collection of additional data that is not currently available.

The Report can function as a catalyst to establishing a new community-based watershed group. It can provide an already established group with the information needed to recognize watershed risks, problem areas and activities. It can allow groups to set priorities, develop specific preservation and restoration goals, target rehabilitation and protection activities, and develop implementation plans for protecting and improving watershed health.

Since the State of the Watershed Report is a detailed record of current conditions and characteristics of a watershed, it also has the potential to serve as a benchmark to measure future environmental change, and help in developing monitoring programs to assess the progress of stewardship efforts.

The process of drafting a State of the Watershed Report may also provide a number of additional or unanticipated benefits. The assessment process not only brings together relevant information, it brings together people who will become instrumental in the development and implementation of subsequent plans and activities.

The process helps to engage knowledgeable people, locate valuable information sources, and perhaps even alert stakeholders to interests or issues which may not originally have been considered by the group.

STATE OF THE WATERSHED INDICATORS

WATERSHED INDICATORS

Healthy watersheds consist of a number of inter-related components which perform a variety of functions which keep the ecosystem in balance. The broad and complex nature of interactions within these systems makes it nearly impossible to measure watershed health directly, or to measure every component of that ecosystem.

Because of this, a set of defined and easily measurable attributes (State of the Watershed Indicators) which reflect the conditions and dynamics of the broader ecosystem is used to provide information about the conditions and trends within a watershed.

Indicators can be a measure of a single parameter, also known as a metric (e.g., phosphorus, nitrogen) or an index that incorporates a number of metrics (e.g., the River Surface Water Quality Index or the River Flow Quantity Index).

The goal is to establish scientifically based thresholds for each of the watershed indicators, as well as linking each indicator with as much relevant and recent data as possible.

Over the long term, the indicators will form part of an adaptive management reporting system based on the most current data available. Adaptive management is a proactive process that optimizes decision-making, and aims to improve management and reduce uncertainty through performance assessment.

INDICATOR CONDITIONS

A range of values has been established to illustrate and report on the condition of SEAWA's indicators, from **NATURAL** to **GOOD** to **FAIR** to **CAUTIONARY**. In general, these conditions have been color-coded as follows:

NATURAL (blue icon) – The conditions for this indicator are considered to be in a natural state.

GOOD (green icon) – Cumulative impacts are considered to be minimal, and the indicator is in a desired state.

FAIR (yellow icon) – Conditions are shifting away from a desired state, but have not yet reached a cautionary threshold.

CAUTIONARY (red icon) – Conditions have deteriorated such that the indicator is in an undesired state, and is no longer within desired threshold levels.

The environmental implications and corresponding management actions differ for each of the above conditions. For example, management actions may include reductions in wastewater loading to meet quality triggers or limits, implementation of best management practices to address non-point source problem areas, or some combination of actions depending on the situation. When the recorded value for an indicator changes such that the health of the watershed has been improved, the status associated with that indicator might be upgraded, resulting in the icon for that indicator changing from **CAUTIONARY** (red icon) to **GOOD** (green icon).

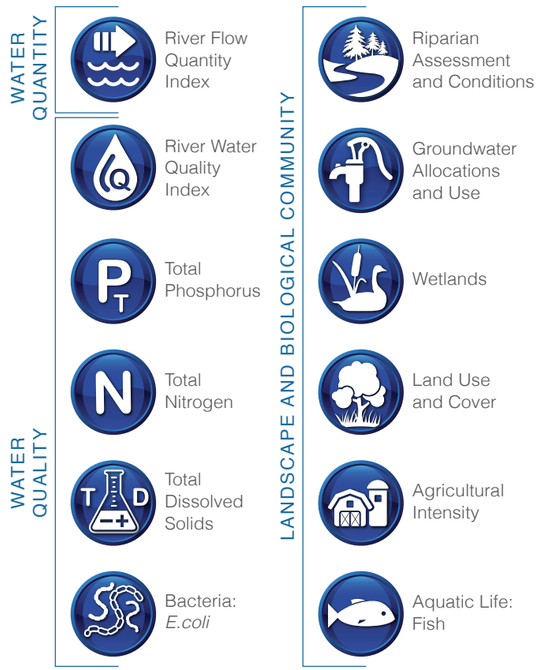
THE SEAWA INDICATORS

The SEAWA indicator icons are shown at right.

The River Flow Quantity Index is based on the assumption that a natural average flow regime can be expected to occur about 90% of the time. During the other 10% of the time, the river regime will be naturally at an "above average" or "below average" state (but, these are still considered natural fluctuations and are expected from time to time). However, there will also be some periods where the actual recorded flow of the river will be "outside of its normal natural range" and experience significantly higher or lower levels of flow. At this point we could expect to see ecological impacts to the existing aquatic ecosystem becoming more permanent, particularly if conditions are persistent and are not single-year or infrequent occurrences.

With the exception of the River Water Quality Index, the indicators for water quality are based on the number of times that recorded measurements over a one year period "exceeded" SEAWA's Water Quality Objectives (WQOs) for that indicator at that location. The condition of these water quality indicators is based on the following approach:

- 0% of recorded measurements exceeded the WQO level = **NATURAL** (blue icon)
- 0.1% to 10% of recorded measurements exceeded the WQO level = **GOOD** (green icon)
- 10.1% to 50% of recorded measurements exceeded the WQO level = **FAIR** (yellow icon)
- more than 50% of recorded measurements exceeded the WQO level = **CAUTIONARY** (red icon)



Data gaps: Missing or incomplete datasets due to infrequent or inconsistent monitoring and sampling practices, and the absence of scientifically-based indicator thresholds.

SOUTH SASKATCHEWAN RIVER WEST SUB-WATERSHED

The South Saskatchewan River West sub-watershed extends from where the South Saskatchewan River begins at Grand Forks, at the confluence of the Bow and Oldman Rivers, to Redcliff in the northeast and Chin Coulee to the south. This primarily rural, agricultural sub-watershed stretches across Cypress County, the County of Forty Mile No. 8 and the MD of Taber, and includes the towns of Bow Island and Redcliff, as well as the hamlets of Grassy Lake and Burdett.

This region is recognized as having the province's best climate. It has long warm summers with the longest frost-free period and the most sunlight hours, and short winters punctuated by warm chinook winds.

While there is some dryland farming, highly productive irrigated agriculture dominates this semi-arid region and a network of reservoirs and irrigation canals supply water for agricultural, domestic, commercial and recreational use. Irrigation infrastructure also provides valuable bird and wildlife habitat. The St. Mary River Irrigation District controls several lakes and off stream reservoirs within the sub-basin including: Yellow Lake, Sherburne (Grassy Lake) Reservoir, Forty Mile Coulee, and Sauder Reservoir (Rattlesnake Lake), a very popular fishing and camping spot.

In another nod to the value of agriculture in this region, the Bow Island provincial grazing reserve covers just over 14,000 hectares of flat, gently rolling grasslands in this sub-watershed.

Formed in 1965, it was originally part of Alberta Agriculture's irrigation settlement program but the grazing reserve also provides a number of recreational opportunities. The uplands are used for hunting and the riverside forests and river are used for hunting, fishing and canoeing.

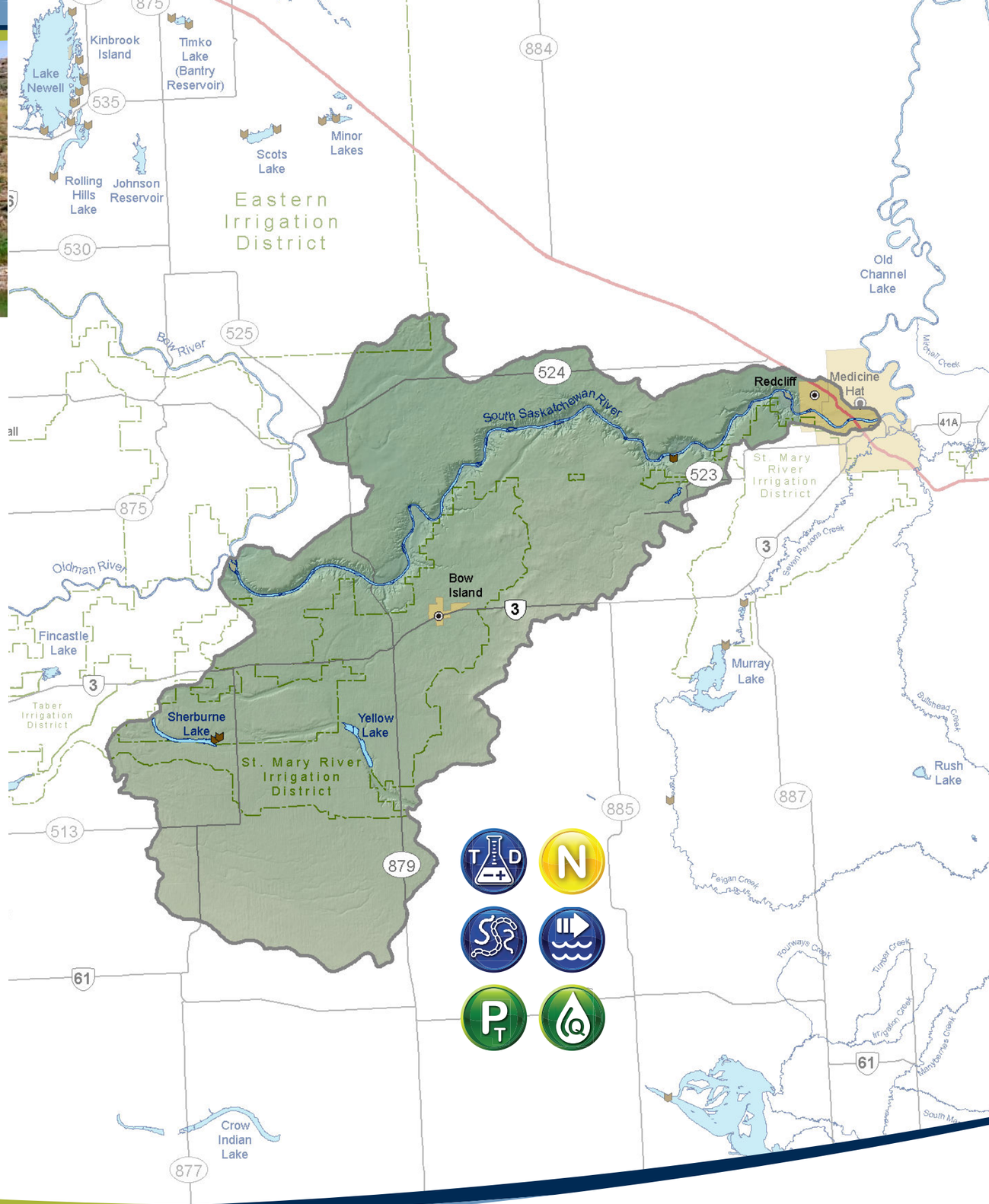
The South Saskatchewan River West sub-watershed reflects the most monitored region of all the six SEAWA sub-watersheds, and is the most immediately impacted by the upstream conditions from the Bow River and Oldman River.

Water quantity (River Flow Quantity Index) and water quality (River Water Quality Index) are monitored and measured by Alberta Environment – on the South Saskatchewan River, upstream of Medicine Hat. At this location, Alberta Environment also monitors a variety of individual water quality variables such as Phosphorus, Nitrogen, *E.coli,* Total Dissolved Solids, among others.

WATER QUANTITY INDICATOR

The River Flow Quantity Index measurements for the past two decades indicate that the average Fall-Winter-Spring seasonal flows (October to April) have been within the expected variations of natural flow, and have been rated as being in "Natural" or "Good" condition.

However, the summer seasonal flows (May-October) have shown a great deal more variation, and the recorded flows of the river have fallen outside of expected variations of natural flow – an indication of flood or drought conditions – in over half the years measured.



SOUTH SASKATCHEWAN RIVER WEST SUB-WATERSHED

WATER QUALITY INDICATORS

The River Water Quality Index is based on the average of four sub-indices calculated annually for:

- Bacteria (2 variables measured monthly)
- Metals (up to 22 variables measured quarterly)
- Nutrients (6 variables measured monthly)
- Pesticides (17 variables measured four times during open-water season)

Since 1998, the River Water Quality Index measurements indicate that overall water quality has been rated as being in “Good” condition. However, the sub-indices for both Nutrients and Pesticides have typically under-performed against the overall index, and have historically been rated in “Fair” to “Marginal” condition.

Since 2000, there is also some evidence of a positive trend (reduction) in recorded measurements of Total Dissolved Phosphorus, and to a lesser degree Total Phosphorus, upstream of Medicine Hat.

Why is this happening? Over time, levels of Total Dissolved Phosphorus have been significantly reduced by tertiary treatment at wastewater plants, such as those operated in Calgary and Lethbridge. Total Phosphorus, which includes Total Dissolved Phosphorus and forms of soil-bound Phosphorus which are generated from urban stormwater runoff, is still not fully controlled or treated. Other sources of Total Phosphorus come from sedimentation, erosion, and agricultural practices, but urban development and growth is the main contributor – the more hard surface and pavement – the more stormwater runoff, and hence the more Total Phosphorus which enters the river.

Alberta Environment has imposed a mandatory Total Phosphorus mass loading level within the Calgary reach of the Bow River. In response, the City of Calgary is retrofitting its stormwater retention and settling basins, and along with other stakeholders, has imposed requirements for stormwater treatment ponds on all new developments, but the benefits of these actions are still to be fully realized.

As a by product, these actions also help to reduce other pollutants, such as heavy metals oil and grease, from also making it to the river in as much quantity as occurred previously. The net result is the river’s health is improving, and this is measurable.

With the exception of Total Nitrogen, most other water quality indicators in the sub-watershed have been rated as being in “Natural” or “Good” condition. This means that measurements of the various indicators recorded over a one year period did not exceed the water quality objectives for those indicators.

Total Nitrogen (total inorganic and organic) which is the sum of the different forms found naturally in the water, including nitrate, nitrite and ammonia, consistently ranked poorly. Nitrogen enters surface waters naturally through the air and surface runoff, or through human activities such as wastewater discharges and agricultural practices. Elevated concentrations can result in the excessive growth of algae and aquatic plants.

In general, the condition of the water in the mainstem of the South Saskatchewan River which runs through this sub-watershed reflects the condition of the water upstream, and influences the condition of the water downstream.

LEARNING ABOUT OUR WATERSHED . . .

OUR NEIGHBOURS UPSTREAM

At an elevation of 740 meters above sea level, the South Saskatchewan River Sub-basin originates in mixed grasslands at the confluence of the Bow and Oldman Rivers.

THE OLDMAN RIVER WATERSHED

The watershed drained by the Oldman River and its tributaries covers about 23,000 km^2 in southwestern Alberta and 2,100 km^2 in northern Montana. Its natural flows are highly variable, both geographically and temporally, and from year to year. Annual unit runoff yields can range from more than 900,000 to less than 10,000 m^3 / km. The waters of the Oldman watershed are highly regulated and extensively used. There are three major onstream storage reservoirs with a total storage capacity of about 970 million m^3. Nine of Alberta’s 13 irrigation districts are sourced from waters of the Oldman watershed.

THE BOW RIVER WATERSHED

The Bow River watershed covers more than 25,000 km^2, and is approximately 645 km in length. With approximately 1.2 million people, and a population density of 41 residents / km^2, the Bow River basin is the most highly populated river basin in Alberta. The hydrology of the Bow River is significantly affected by thirteen dams, four weirs and eight reservoirs, making it the most managed or regulated river in Alberta. The Bow River is the largest tributary of the South Saskatchewan River, contributing nearly 43% to its 9.5 billion m^3 of average annual flow.

Both of these watersheds reflect large diverse land and water systems which vary greatly, both in terms of land and water resources, and impacts from human activities. In their upper sub-basins, water quantity and quality is good, and riparian ecosystems are generally healthy.

However, as water flows east, water quality begins to deteriorate, available supplies diminish, and there are several issues of concern with riparian, wetland and ecosystem health and habitat.

OUR NEIGHBOURS DOWNSTREAM

After it flows east from Medicine Hat, the South Saskatchewan River turns northeast to the Saskatchewan boundary. The river receives some tributary flow from small streams rising on the slopes of the Cypress Hills, and shortly after crossing the interprovincial boundary, it is joined by the Red Deer River.

Flowing east, the river enters Lake Diefenbaker – a 225 km reservoir created by the Gardiner and Qu’Appelle Dams. This large reservoir can store 9.4 billion m^3 of water, more than the median annual flow of the river, and more water than all the reservoirs in Alberta combined.

The river flows northeast from the reservoir through moist mixed grasslands to Saskatoon, and continues through aspen parkland and the boreal plain to its confluence with the North Saskatchewan River. In Saskatchewan, the river flows through a region of very low runoff. On average, the local runoff contributes only 2% of the natural flow into the river. The total drainage area for the South Saskatchewan River in Saskatchewan is 35,000 km^2.

Straddling the provincial borders of Manitoba and Saskatchewan, the Saskatchewan River Delta is rich in biodiversity. The largest inland river delta in North America, totaling approximately 9,500 km^2, it provides important habitat for hundreds of species of birds, mammals and fish. The Saskatchewan River Delta flows into Lake Winnipeg in Manitoba and, through the Nelson River, drains into the Hudson Bay.

SOUTH SASKATCHEWAN RIVER CENTRAL SUB-WATERSHED

The South Saskatchewan River Central sub-watershed extends north of Medicine Hat and encompasses an area roughly bounded by Highway 524 to the south, Highway 884 to the west and Highway 41 to the east. At its northern edge it aligns with the Red Deer River Sub-basin, south of Highway 555. It is also one three sub-watersheds that straddles the border between Alberta and Saskatchewan. Within this sub-watershed, the river runs north, and then northeast until it crosses into Saskatchewan and joins with the Red Deer River near Estuary, Saskatchewan. The sub-watershed lies almost entirely within Cypress County, but the City of Medicine Hat lies along the southern edge, and a small portion at the northern edge lies within Special Areas No. 2.

While the ecology and landscape are similar to others within the SEAWA watershed, there are some notable exceptions. Like other sub-watersheds, the gently rolling plain is blanketed with a layer of coarse glacial till or fine-textured ancient glacial lake deposits, and is carved by coulees formed by glacial meltwater, but the rare, desert-like, active and stabilized sand dunes of the Middle Sand Hills are unique to this area.

The region has the lowest level of precipitation in Alberta and the climate is classified as sub-arid to semi-arid due to strong winds, high summer temperatures and minimal precipitation. There are many small closed drainage systems collecting water in seasonal marshes or sloughs, but only a few small surface water bodies. These include: Dishpan Lake; White Horse Lake; Red Deer Lake; Easy Lake; and a small oxbow lake north of Medicine Hat called Old Channel Lake.

The South Saskatchewan River Central sub-watershed reflects the second most monitored region of all the six SEAWA sub-watersheds.

Water monitoring is performed by Environment Canada on the South Saskatchewan River at Highway 41 downstream of Medicine Hat and near the Alberta-Saskatchewan border. River flow and quality are monitored as part of Alberta's commitment to the provincial water-sharing agreement "Master Agreement on Apportionment." The Prairie Provinces Water Board (PPWB) administers the Master Agreement on Apportionment, signed on October 30, 1969 by Canada and the provinces of Alberta, Saskatchewan, and Manitoba. The Agreement provides for an equitable sharing of available waters for all eastward flowing streams that cross interprovincial boundaries, including interprovincial lakes. It also serves to protect interprovincial aquifers and surface water quality.

Over the last 40 years, the combined daily recorded flows for the South Saskatchewan and Red Deer Rivers at the Alberta-Saskatchewan border have exceeded the minimum flow requirement of 42.5 m^3 per second (1,500 cfs). Even during the severe drought of 2001, Alberta still managed to deliver a small surplus of water above the required flows. River flow data recorded at Highway 41 suggests that flows follow a somewhat natural pattern throughout the year. However, winter flows are supplemented and are somewhat higher than natural, while April to October flows are somewhat lower than natural, with less gradual transitions between high and low flows. This reflects upstream water usage within the SEAWA watershed, as well as water storage, diversion and usage conditions in the Bow River and Oldman River basins.

The Master Agreement on Apportionment also has water quality objectives for 28 parameters for the Red Deer and South Saskatchewan Rivers. The water quality objectives are set to protect water for various uses including protection of aquatic life, treatability of water for drinking water, agricultural uses (irrigation and livestock watering), recreation and consumption of fish. Water quality information is used to monitor long-term trends, and the annual results do not trigger operational responses.

The South Saskatchewan and Red Deer Rivers generally have a high degree of compliance with the water quality objectives, but the South Saskatchewan River has among the best compliance water quality records of all the rivers monitored by the PPWB. The South Saskatchewan River had 100% adherence in 2009, as compared to 98% in 2008. In 2008, only five exceptions were reported for the South Saskatchewan River for a number of metals (chromium, copper, nickel, zinc) and a detection of fecal coliform bacteria. Non-compliance tends to arise during periods of high river flows and in wet years. High flows are associated with higher sediment loads, and wet years can result in material which had accumulated on the landscape in drier years being flushed into the rivers. This results in elevated metals and fecal coliform bacteria levels.

SEVEN PERSONS CREEK SUB-WATERSHED

The Seven Persons Creek sub-watershed is located primarily south and west of Medicine Hat and includes parts of the City of Medicine Hat, Cypress County and the County of Forty Mile. The sub-watershed also includes a small piece of the County of Warner and a small portion of the M.D. of Taber along the western edge of a narrow band that stretches towards Lethbridge. The topography of slightly-rolling grassy hills and deep coulees is similar to other regional watersheds; land that was glacially scoured and subsequently shaped by huge volumes of meltwater which occasionally cut through the glacial debris to form long and narrow, now typically dry, flat-floored valleys. In this corner of the province several of these long glacial spillways – including Forty Mile, Verdigris, Chin and Etzikom Coulees have been dammed to form off stream storage reservoirs. There are a number of other water bodies within the watershed including Cavan Lake Municipal Recreation Area, Elkwater Lake at the base of Cypress Hills, and Bullshead Reservoir west of Elkwater.

The sub-watershed includes the north-western slopes of the Cypress Hills, a dramatic feature of the southern prairies widely noted as the highest point in Canada between the Rocky Mountains and Labrador. The West (Alberta) Block of the Cypress Hills acts as a “continental divide.” While streams on the northern slopes flow towards the South Saskatchewan River, Battle Creek flows east from its source in the Alberta portion of the hills, then south-eastward in Saskatchewan, feeding eventually into the Mississippi River system in the United States.

The ecology of this sub-watershed is predominantly grasslands because it is located in the Dry Mixedgrass natural sub-region of Alberta. However, the highlands of Cypress Hills are a bio-diverse mix of highly productive forests, wetlands and grasslands. According to Alberta Environment, the combination of plant and animal species living there is unlike any other in Canada.

Forty-seven mammal species, including moose, elk (Wapiti), white-tail and mule deer, pronghorn, red fox, porcupine and bobcat also live within Cypress Hills, as well as three important amphibian species – boreal chorus frog, tiger salamander and Alberta’s largest and most threatened frog, the Northern Leopard Frog. More than 700 species of plants thrive in Cypress Hills, including 18 species of orchids.

Other environmentally significant habitats have been recognized in this region for several plants, birds and wildlife. These include Ferruginous Hawks and Burrowing Owls, and the Northern Leopard Frog, Great Plains Toad and Short-horned Lizard, Alberta’s only native lizard species. Red Rock Coulee Natural Area, south of Medicine Hat, is designated as a natural area mainly because of its geological significance.

Landscape pressures mirror those of other sub-watersheds and are primarily related to agricultural development and oil and gas development. Oil and gas activity impacts the landscape through road construction, alteration of native habitat, introduction of invasive species and creek crossings. Livestock activity and recreation have also affected the integrity of stream banks.

PAKOWKI LAKE SUB-WATERSHED

The Pakowki Lake (Pakowki) sub-watershed lies north of Milk River and south-west of Cypress Hills in a long narrow band stretching east from the town of Raymond in the County of Warner, to the hamlet of Manyberries in the County of Forty Mile.

The ecology and geography is similar to other watersheds within the region – a gently rolling landscape of dry mixed-grass prairie carved by occasionally deep coulees. However, the hydrology of this sub-watershed is quite different from the other watersheds in southern Alberta. It is a large internal drainage basin – a closed hydrologic system also known as a non-contributing, closed or endorheic basin.

Pakowki Lake is the largest water body in southern Alberta, and at its maximum the lake can cover more than 123 km^2. Pakowki is an ephemeral or intermittent lake, and most years open water covers a much smaller area.

The only permanent surface water channel that feeds into Pakowki Lake is Etzikom Coulee – a large glacial spillway which collects water from across the sub-watershed – but the lake is also fed by smaller, intermittent streams and coulees including Irrigation Creek, Erickson Coulee, Ketchum Creek, Canal Creek, Bond Coulee, and Bryant Coulee.

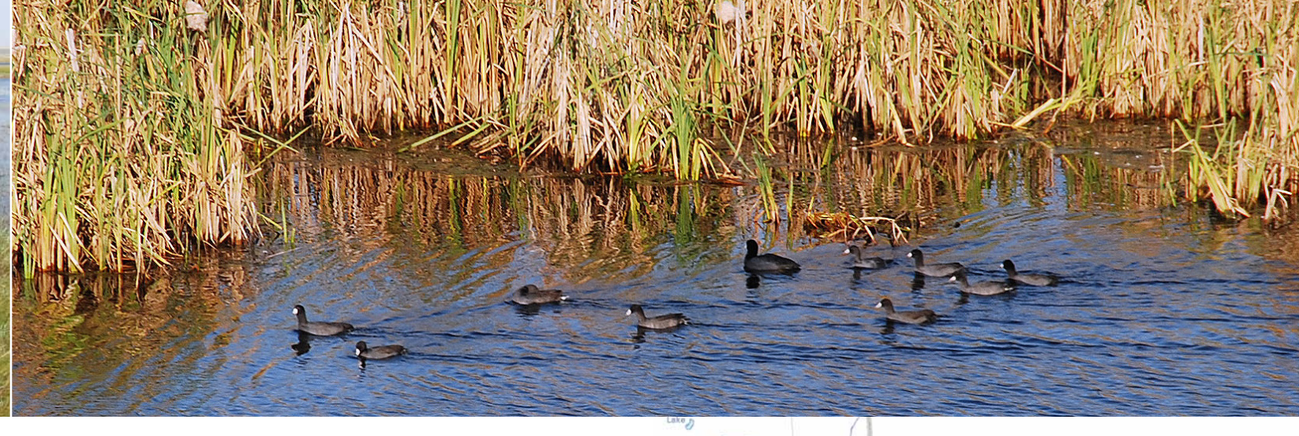
Pakowki Lake does overflow in times of extreme flooding, discharging through a channel that flows into the Milk River six kilometres to the south. There are several other large water bodies within the sub-watershed including the Milk River Ridge Reservoir, an artificial lake developed along Nine Mile Coulee south-east of Lethbridge, and Crow Indian Lake, a swollen section of Etzikom Coulee.

During high water years, Pakowki Lake is a very productive waterfowl area. The lake is a major stop on a North American waterfowl flyway and is considered internationally significant for its shorebird and waterfowl habitat.

The International Union for Conservation of Nature has classified Pakowki Lake as a Category IV Habitat/Species Management Area. Pakowki Lake is also listed by Bird Studies Canada and Bird Life International as globally significant for congregatory species and waterfowl concentrations, and nationally significant for congregatory species and shorebird concentrations.

The area was designated an Important Bird Area (IBA) in early 2000 to identify it as a globally important conservation priority. Part of the lake is designated a Provincial Game Bird Sanctuary. Alberta Wilderness Association (AWA) has classified a “Pakowki Lake Area of Concern” of approximately 380 km^2 in this sub-watershed, contiguous with two other AWA Areas of Concern: Milk River–Sage Creek and Cypress Hills.

Pakowki Lake is fed by intermittent streams, and it is particularly susceptible to drought conditions. Its productivity has declined in recent years due to prolonged drought. Landscape pressures mirror those of other regions and are primarily related to agricultural development (drained wetlands, cultivation of native grasslands, altered shorelines); and oil and gas exploration and development.



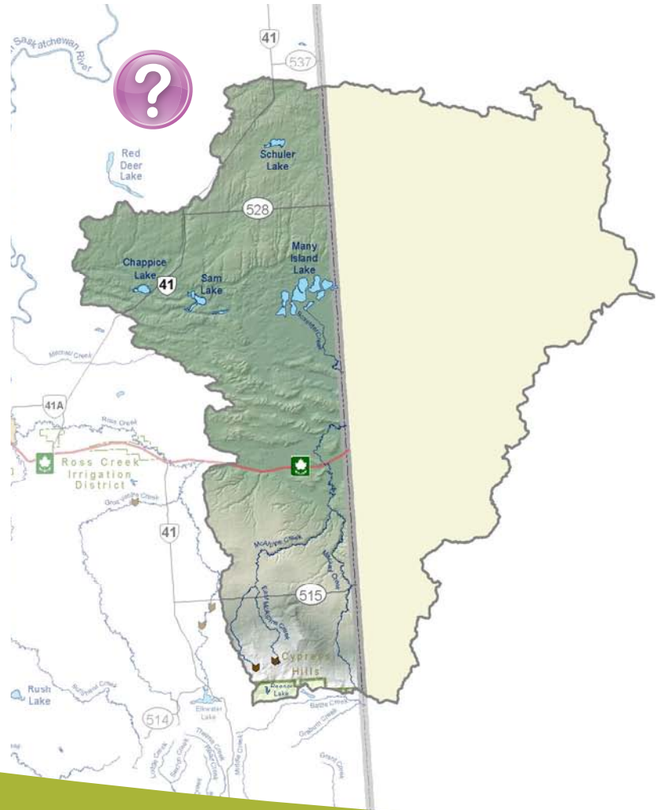
MANY ISLAND LAKE SUB-WATERSHED

The Many Island Lake sub-watershed straddles the Alberta / Saskatchewan border and extends north from Cypress Hills to the hamlet of Schuler. Bordered on the northwest by the South Saskatchewan River Central sub-watershed and on the southwest by the Seven Persons Creek sub-watershed, the Alberta portion of this sparsely-populated sub-watershed lies entirely within Cypress County. The Many Island Lake and Pakowki Lake sub-watersheds are considered closed basins.

A number of creeks on the north slope of Cypress Hills drain into Many Island Lake including Mackay Creek, Boxelder Creek, and McAlpine Creek which has been recognized as a provincially ranked Environmentally Significant Area (ESA). Boxelder Creek crosses provincial boundaries and is managed under the Master Agreement on Apportionment between Alberta and Saskatchewan. Variable, but permanent, lakes within the sub-watershed include Chappice Lake, a groundwater-fed saline lake that provides globally significant waterfowl habitat and critical nesting habitat for vulnerable, endangered or threatened grassland birds. Sam Lake has been recognized as a biophysically important ESA for its bird habitat value, native prairie, priority plant species, wildlife habitat and extensive saline springs and seepage.

Many Island Lake has been identified as a national level Environmentally Significant Area (ESA) and has been protected as a provincial bird sanctuary since 1917. Ducks Unlimited Canada (DUC) opened its first office in 1938 and its first task was to investigate Many Island Lake.

The lake was drying up as a result of an increased demand on inflowing creeks from settlements, compounded by the drought of the 1930's. By 1936, its water level fell to such an extent that closure of the sanctuary was considered. One of DUC's first wetland restoration projects in Canada involved building a dam at the outlet of the lake, which raised the level and restored waterfowl habitat.



SOUTH SASKATCHEWAN RIVER EAST SUB-WATERSHED

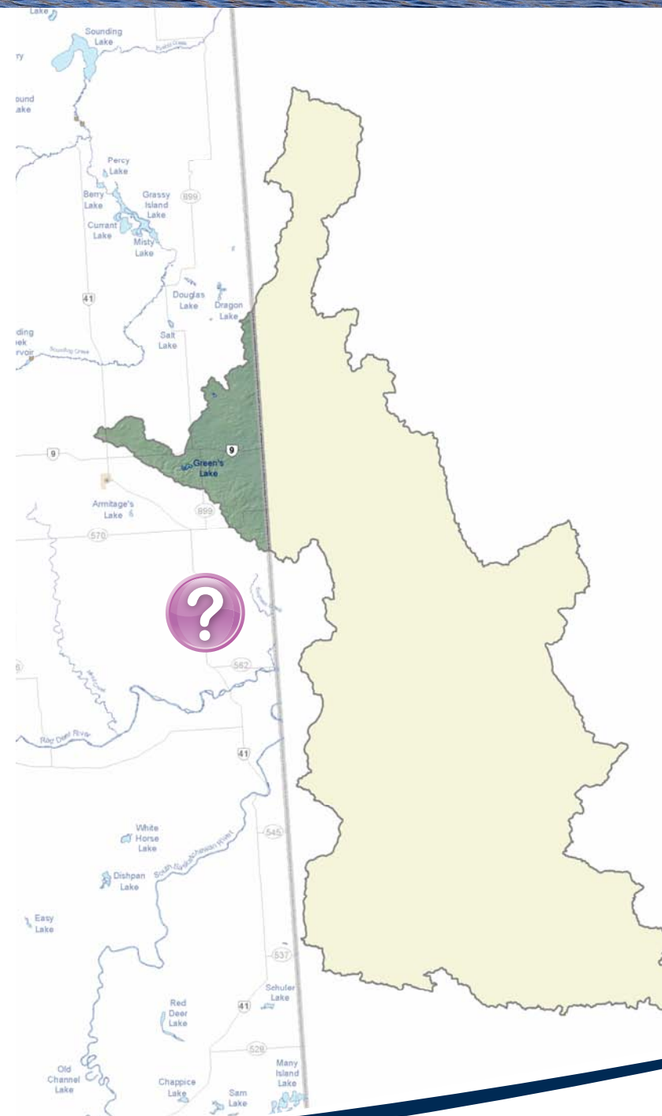
The Alberta portion of the South Saskatchewan River East sub-watershed is located almost entirely within Special Area No. 3, a rural municipality in the east central region of Alberta. A small portion lies within the MD of Acadia No. 34 north of Empress near the Alberta / Saskatchewan border. The landscape and ecology of this sub-watershed are similar to others in the region.

While Green's Lake is the only named water body (on the Alberta portion of the sub-watershed), the retreat of glaciers at the end of the last ice age resulted in a gently-rolling land surface pock-marked with countless depressions that have evolved into shallow, unnamed wetlands or "prairie potholes" of various permanence and size.

The wetlands support a high natural biodiversity of plants and animals. According to Alberta Environment, over 150 species of birds depend on wetland environments in Alberta for at least some part of their life cycle while many others, though not wholly dependent on wetlands, use these areas for feeding, nesting or cover.

Winters are cold and dry in this sub-watershed and precipitation is low, averaging just over 300mm per year; most of it falling in the summer months. This semi-arid region supports a largely rural population on mixed ranching and grain farms.

Farming in this area is primarily dryland, in contrast to the heavily irrigated southern sub-watersheds. The hamlet of Sibbald and the town of Leader are two of the communities in this sparsely populated region; the town of Oyen lies to the west.



SUMMARY: SEAWA STATE OF THE WATERSHED REPORT

The marshes, aquifers, creeks, streams, lakes and rivers which make up the South Saskatchewan River watershed have supported and influenced human history and development in the region for many centuries.

But economic development and human activities are having a cumulative impact on that most precious resource – water. A sustainable future in the basin requires that we plan for and begin to address some difficult issues related to the management and use of water.

As people who are proud to live and work in this unique watershed, and as stewards of this shared environment, it is our responsibility to monitor, manage and protect our water resources.

We face many challenges and opportunities. Our rapidly growing economy and population demands much of the land and water. Our climate is changing and the future of our water supplies is uncertain. To act wisely, we need first to understand our basin.

WHAT THIS REPORT TELLS US

Agriculture, energy, and economic development over the last century have transformed southern Alberta. However, water remains a significant limiting factor to population growth, economic development and environmental protection in the SEAWA watershed, as well as others in the South Saskatchewan River Basin.

In most of the sub-watersheds across our basin, the average annual flow of the South Saskatchewan River is adequate for licencees and environmental requirements. However, in certain years, or during certain periods of the year, the flow is not always adequate to meet environmental needs and satisfy the demand from all of the licenced diversions.

Historically, water quality has been relatively good, albeit not excellent. Upstream of the SEAWA watershed upgrades to municipal wastewater facilities and stormwater management practices have improved some water quality indicators, such as phosphorus.

There is a need to improve our ability to monitor and manage known water quality variables such as nutrients and pesticides, as well as emerging variables such as pharmaceuticals.

Some significant (and several minor) data and information gaps exist in many of the SEAWA State of the Watershed indicators. This is especially so with indicators and conditions relating to our landscape and the biological community, including wetland and riparian areas, biodiversity and groundwater.

Going forward, SEAWA believes it is critically important to address these data and knowledge gaps in order to develop a strategic and systematic approach towards the sustainable management of this watershed.

There is a significant and growing demand for improved flood and drought management planning. Through its partnerships and programs, SEAWA has been leading the development and implementation of many new innovative projects and programs to share knowledge and improve water management practices across the region.
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MAKING PROGRESS

The SEAWA Watershed Planning and Advisory Council (WPAC) was built on a foundation set by the Citizens Water Study Group in 2006. This led to the establishment of the watershed stewardship group Prairie River Stewards, and then to the Initiator's Group and in turn to SEAWA.

As an important partner and supporter of Alberta's Water For Life Strategy, SEAWA is delivering on its mission to bring together diverse partners to plan and facilitate the sustainable use of the South Saskatchewan River Sub-basin.

SEAWA is working to advance the values and opportunities that will bring about a new and healthy relationship between our natural environment and human society.

As a WPAC, SEAWA is committed to stimulating new thinking and innovative opportunities for improved water management, flood and drought planning, as well as water conservation, efficiency, and productivity. Providing an improved understanding of the current State of the Watershed is a vital first step towards developing an adaptive management framework which enables the research, actions, and best practices needed to improve the health of our watershed.

SEAWA has expanded its membership from 80 to 380 members, with an additional 500 followers on our new Twitter feeds. SEAWA's outreach and education programs include the UpStream Quarterly newsletters, sector workshops, annual watershed tours and South Saskatchewan River trips, as well as sponsorship of Youth Range Daze, and participation in many tradeshows, conferences and workshops.

The SEAWA Board put an emphasis on regional collaboration and hosted the "Below Your Watershed – Understanding the Groundwater Connection" conference, and the "WPAC Summit on a Summit" in Cypress Hills in 2010. All of this work supports the Integrated Watershed Management Planning process with our partners throughout the watershed.

NEXT STEPS

Over the next year, SEAWA will continue work to complete its State of the Watershed Report and expand its Web-based State of the Watershed tool. The focus of this work will be on addressing current data and information gaps by supporting new research projects, data sharing initiatives, and community outreach programs.

SEAWA will also begin to develop an Integrated Watershed Management Plan (IWMP) in an effort to determine local goals and priorities, and outline actions needed to manage the land, water and related resources of the SEAWA watershed. Stakeholders from all sectors of the community will be asked to come together to identify land and water-related issues in the watershed. They will then help to determine priorities, projects and policies to address the issues and identify how land and water management can be carried out cooperatively within the SSRSB. The planning process will be broad and inclusive, will combine the needs of diverse watershed stakeholders, and will recognize a balance between ecosystem, community and economic health.
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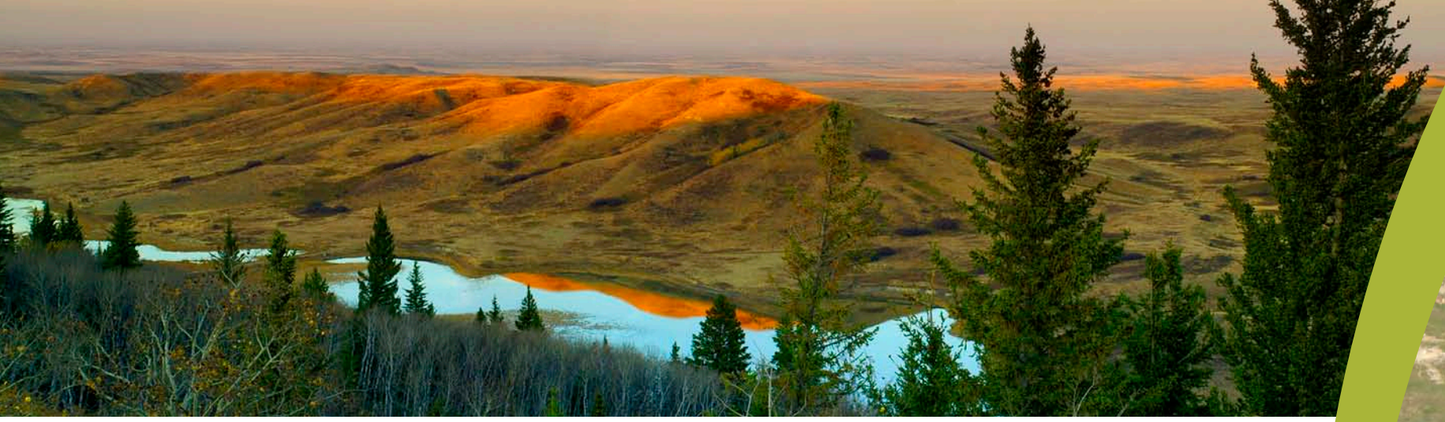

FUTURE OPPORTUNITIES

Fortunately, there are many reasons to be optimistic about the future health of our environmental and water resources.

There is a significant and growing awareness among public and private stakeholders of the role that they, individually and collectively, can play in supporting the development of new programs and opportunities for sustainable development, enhanced conservation and stewardship, and effective decision making.

For example, Alberta's Watershed Planning and Advisory Councils (WPACs) are now collectively working together on initiatives and opportunities to improve their ability to collaborate on common activities and challenges. While recognizing the uniqueness of each organization, they are also focused on identifying common challenges, and where WPACs may be able to improve how they work together to more effectively and efficiently achieve their individual goals and priorities.

The Government of Alberta is now reviewing policy opportunities on how land is to be developed, and how water is to be allocated and transferred.

Through public forums, Albertans will have the opportunity to provide their feedback on how our land and water resources can be better managed to accommodate human needs, the economy, and the environment.

A lack of monitoring data and scientific-based thresholds has resulted in significant gaps in our understanding of several important watershed health indicators. SEAWA is committed to addressing these monitoring and data gaps in the coming years, and is confident that this work will help in the sustainable development and management of the watershed.

SEAWA has learned that some of our most valuable insights and opportunities come from our members and from the public.

We challenge you to consider the issues and success stories we've shared, and to help create a sustainable future for the South Saskatchewan River watershed.

- What do you see in your area of the watershed?
- What will be the major water issues in the next 20, 50 or 100 years?
- What actions are needed now and in the future?
- How can we work together to protect our biodiversity and aquatic ecosystem, and our livelihoods?

We encourage you to send us feedback, and if you or your organization would like to share any water information, knowledge, stories, images or videos, please contact us at SEAWA.

Finally, we invite you to join us – together we can influence what the river and watershed will look like for years to come.

SEAWA Watershed – You can make a difference.
If you live, work or play in the watershed it's yours to enjoy, protect and cherish.

ACKNOWLEDGEMENTS

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The SEAWA Web-based State of the Watershed Report is managed by the SEAWA State of the Watershed Steering and Technical Committees:

- Dr. Peter Wallis – SoW Committees Chair; Dean of Science, Medicine Hat College
- Gary Bierback – St. Mary River Irrigation District
- Grayson Mauch – City of Medicine Hat
- Herb Scott – Cypress County
- Stuart Murray – Murray Lake Ranching
- Mike Maxwell – Métis member
- Jennifer Nitschelm – Alberta Agriculture and Rural Development
- Major (ret.) D. Davies OMM CD
- Russ Golonowski – Canadian Fertilizers Limited
- Ryan Davison – Agriculture and Agri-Food Canada
- Marc Dubord – Cenovus Energy
- Monique Dietrich – Alberta Environment
- Audrey Goodwin – Alberta Environment
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- Gerard Klotz – Medicine Hat College
- Shanna Mohns – Medicine Hat College
- Maggie Romuld – SEAWA Watershed Project Coordinator
- Bob Phillips – SEAWA Executive Director

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SEAWA BOARD OF DIRECTORS

The SEAWA Board of Directors provided guidance throughout this project and they are acknowledged for their input:

- Doug Jones – SEAWA Chair, Canadian Badlands
- Gary Bierback – SEAWA Vice-Chair, St. Mary River Irrigation District
- Peter Wallis – SEAWA Treasurer, Medicine Hat College
- Grayson Mauch – SEAWA Secretary, City of Medicine Hat
- Frank Wetsch – SEAWA Past Chair, Public Member
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- Floyd Haas – Licencees – Non-Irrigators
- Bill Dearborn – Community Supporter, Federal Representative
- Stuart Murray – Rancher
- Russ Golonowski – Canadian Fertilizers Limited
- Herb Scott – Cypress County
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- Dan Davies – Public Member
- Audrey Goodwin – Alberta Environment
- Mike Maxwell – Métis Member
- Melinda Arthur – Medicine Hat College

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SEAWA Watershed Profiles: Researched by Maggie Romuld, M.Sc. Bio-Geography; SEAWA Watershed Project Coordinator.

SEAWA Watershed Report 2009-1: Geography of the SSRB. Researched by Lu Mueller, University of Victoria, Geography student.

SEAWA Watershed Report 2009-2: Land Use Planning and Water Licensing / Allocation in the SSRSB. Researched by Conor Ruzycki, Engineering student, University of Alberta.

SEAWA Watershed Report 2009-3: Microbial Water Quality in Surface Water of the SSRSB. Researched by Alexis Adams, Medicine Hat College student transferred to University of Alberta, Immunology.

SEAWA Watershed Report 2009-4: Assessment of Riparian and Wetland Habitat Status in the SSRSB (Draft). Researched by Keiko Yoshioka, Medicine Hat College student.

SEAWA Watershed Report 2009-5: Surface Water Quality in the SSRB. Researched by Cynthia Organ, Hyperion Research Ltd.

SEAWA Watershed Report 2010-6: The Potential for Sustainable Ecotourism on the South Saskatchewan River. Researched and compiled by Craigh Hyslop, University of Calgary. Contributors: Russell Krasnuik, Jo-Anne Reynolds, Rob Gardner, Erin Vossler and the Medicine Hat College Ecotourism and Outdoor Leadership Program.

SEAWA Watershed Report 2010-7: The Impact of Agriculture on Water Quality in the SSRSB. Researched by Cathy Linowski, B.Sc., Medicine Hat College instructor.

SEAWA Watershed Report 2010-8: Lake Sturgeon "Nameo – Buffalo of the Water" in the South Saskatchewan River (Draft). Researched by Sharon Cranston, Reclamation Technician, Medicine Hat College student and Keith Wilson, Hyperion Research Ltd.

SEAWA Watershed Report 2010-9: Water Quantity in the SSRSB. Researched by Conor Ruzycki, Engineering student, University of Alberta.

SEAWA Watershed Report 2010-10: Information on Pharmaceuticals, Personal Care Products, Endocrine Disrupting Compounds and Phthalate Esters in Our Water. Researched by Morgan Basiuk, Medicine Hat College student, pre-Med.

SEAWA Watershed Report 2010-11: History and Archaeology. Researched by Dr. Thomas Hulit, Redcliff.

SEAWA Watershed Report 2010-12: South East Alberta Climate Change – Fact or Fiction? Researched by Catherine van der Sloot and Rachel Brown, McCoy High School, Medicine Hat students.

SEAWA Watershed Report 2010-13: Climate Trends and Projections for the SSRB. Researched by Dr. Dave Sauchyn, Prairie Adaptation Research Collaborative, University of Regina.

SEAWA Watershed Report 2011-14: Plains Cottonwood Forests Along the South Saskatchewan River (Draft). Researched by Cynthia Organ, Hyperion Research Ltd.

SEAWA Watershed Report 2011-15: Groundwater. hcl consultants with Ryan Davison and Marc Dubord.

Video Presentation 2010. Adam Shumate, Students in Research, Addison Mohns.

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