MANAGING SASKATCHEWAN WETLANDS

A Landowner's Guide

Managing Saskatchewan Wetlands ~ A Landowner's Guide

by Denis Huel

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Who is this guide for ?

This guide has been produced for Saskatchewan landowners whose property contains wetlands. Wetlands were once regarded as wastelands, however, there is currently a growing awareness and recognition of the value of wetlands to landowners and society in general.

Saskatchewan's agricultural producers are the largest group of prairie region landowners. Together, as stewards of soil and water resources, they are responsible for managing an estimated 1.5 million wetlands covering 1.7 million hectares (4.2 million acres).

The intent of this guide is to:

- *promote an understanding and appreciation of the value of Saskatchewan wetlands;*
- *foster sustainable management of prairie land and water resources; and*
- *provide practical information to landowners on wetland management issues.*

When viewed in the context of our climate and geological history, it is evident that prairie wetlands are integral and irreplaceable parts of the Saskatchewan landscape. The challenge is to find a place for these wetlands in our social, economic and land-use systems - a place where their protection and conservation is assured by their inherent value. It is hoped that this guide will assist Saskatchewan landowners in the important task of managing this valuable resource.

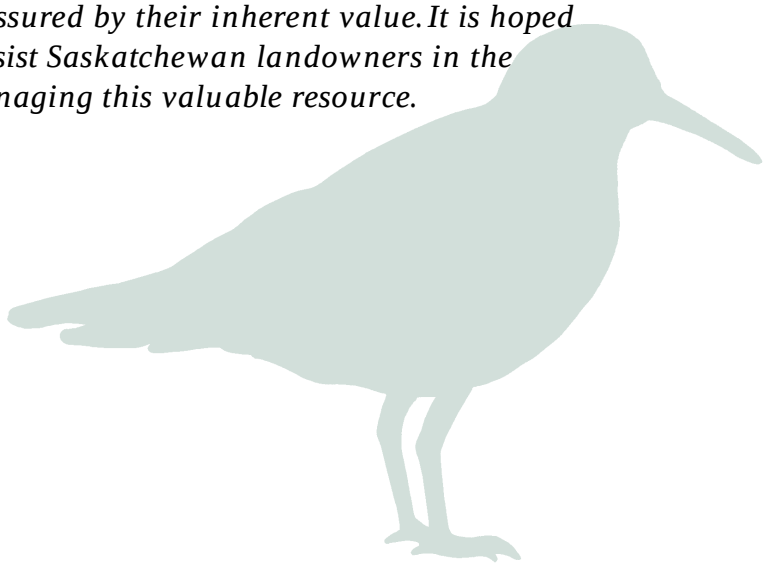
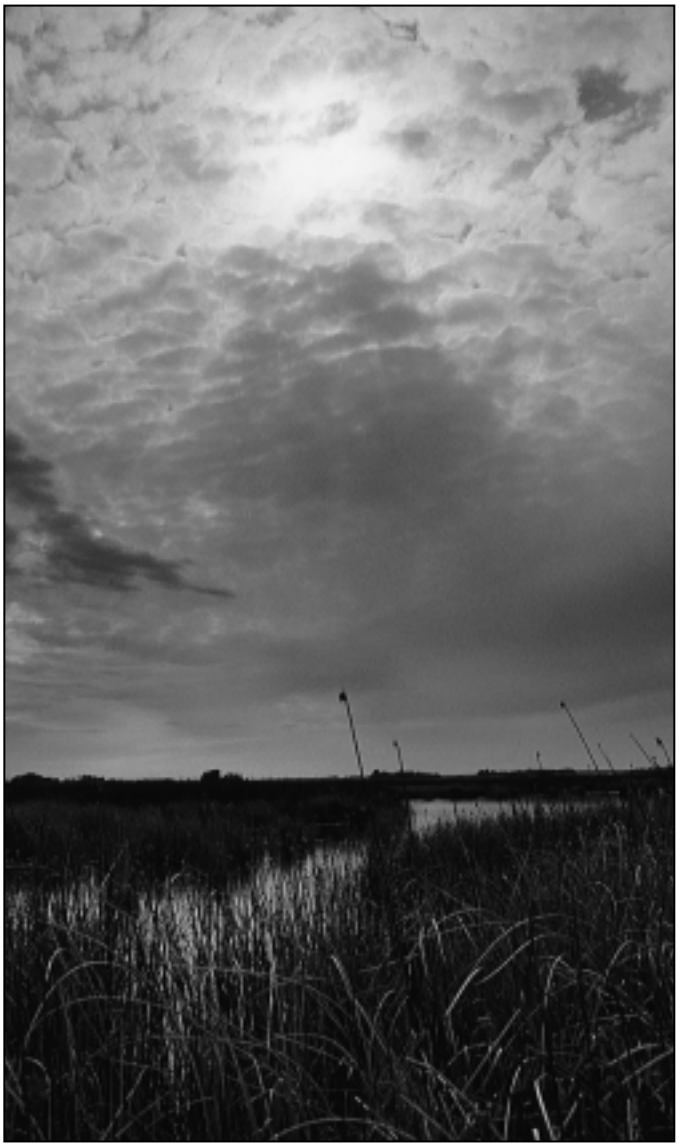


Table of Contents

Table of Contents of Case Studies

Farmers and Ranchers at Work

PART 1. SASKATCHEWAN WETLANDS



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Marsh area - Meacham, Sk.

INTRODUCTION

Prairie wetlands. Gems of blue water sparkling in the summer sun. Commonly known as potholes, sloughs and marshes, wetlands are important and distinctive features of the Saskatchewan landscape. Each spring after a long winter, prairie wetlands, refreshed with new supplies of water, virtually explode with life. Shorebirds, ducks, coots, gulls, and dozens of other bird species, return after months of absence to the wetlands where they will spend the summer and rear their young. Frogs silenced by the cold and snow once again sing their nightly chorus. While drought and winter may temporarily halt the symphony, it always returns, a never-ending drama repeated year after year. This is the cycle of a prairie wetland, a cycle of water and of life.

WHAT ARE WETLANDS?

Wetlands by definition are lands that are wet. They are low-lying areas covered by water often enough to promote and support the growth of aquatic plants and animals for part of their life cycle. They can be identified by their distinctive plant communities and soils which are the result of periodic or continued flooding. Included as part of a functional wetland are the transitional vegetative zones which separate the wetland from adjacent uplands.

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Yellowheaded Blackbird in cattails.

WETLANDS: MORE THAN JUST WATER

Although water is the defining feature, wetlands are much more than just water. Prairie wetlands are dynamic, functioning ecosystems.

As sources of water, forage, recreation, and wildlife habitat, Saskatchewan wetlands provide valuable benefits to landowners and society. Saskatchewan wetlands are vital components of complex and interconnected systems of surface, ground, and atmospheric water movements.

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Haying operation beside marsh.

Denis Huel

Grazing of uplands adjacent to wetlands.

Saskatchewan Wetland Conservation Corporation

High bird use of marsh near Kandahar-Quill Lakes.

Wetlands are home to a rich array of plants, animals, birds, aquatic invertebrates, insects, fish, and other creatures. As well, they provide habitat links for migratory birds.

Wetlands and their inhabitants have been part of the prairie landscape since its creation. Together they are all part of the same system, events, and processes that produced the rich and productive landscape we live in today.

WETLANDS, GLACIERS AND THE ORIGIN OF THE SASKATCHEWAN LANDSCAPE

Saskatchewan's landscape has its origins in the great sheets of ice that once covered the province. The combined action of the ice and water that was left behind as glaciers melted, created the landscape we see today. Across the province, the abundance, distribution, shape, and size of prairie wetlands has been largely determined by the characteristics of this glacial landscape.

Four times in the last several million years, huge glaciers, sometimes a mile or more thick, advanced from the north, covering the land, grinding, crushing, and obliterating all in their path. The last wave of glaciers began their retreat from the southern part of the province only 14,000 - 15,000 years ago.

Acting like huge conveyor belts, the glaciers left in their wake thick deposits of soil and rock debris. Water from the melting ice formed large glacial lakes. Meltwater rushing into the lakes carried enormous amounts of rock and soil. The coarser materials like sand and gravel quickly settled out upon reaching the water but the finer silts and clays were carried far out where they slowly settled, blanketing the lake bottom. Eventually the water drained as the ice retreated northward. These glacial lake beds with their level topography and clayey soils form the highest quality agricultural soils. These beds cover more than half the land surface of the prairie regions of Saskatchewan, Manitoba and Alberta. Most of the remaining regions were largely unaffected by the glacial lakes. These areas, termed moraines, are covered by gently to steeply rolling hills pitted with depressions. During periods of slow glacial retreat, gently rolling terrain was formed, while steeply rolling hills are the result of temporary halts in the retreat of the glaciers. Large chunks of ice buried in the newly deposited soil subsequently melted producing depressions. Moraines lack consolidated drainage systems and consist of numerous small independent drainage basins each receiving local run-off.

Moraines are characterized by high numbers of small-and medium-size wetlands or potholes.

Although highly variable, moraines average nearly 20 wetlands per square kilometer, with some areas having over twice that number. In contrast, the old glacial lake beds average only five wetlands per square kilometer, with a greater tendency for wetlands to be linked as part of regional drainage systems.

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Moraines are rolling landscapes dotted with wetlands.

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Farming flatlands of glacial lake bottoms.

Case study: A Lifestyle Shaped by the Land

Among the 'Sunken hills and Sandcastles' along the edge of the South Saskatchewan River, Ted and Olive Perrin have carved a lifestyle out of the landscape. South of Beechy, a small town on the northern fringe of the Missouri Coteau, the Perrins ranch 25,000 acres with their children, Pam and Neil Danroth and Shannon and Reg Schellenberg.

While a ranch of this size may seem unusual in a province known for its flat plains and wheat production, the Perrins will tell you its location is ideal for raising cattle.

The summer range on the uplands is a wave of rolling hills pitted with pockets of water known as prairie jewels. The winter range, which is closer to home, is cradled by the valley bottom. In the coulees and draws of these riverbreaks, cattle seek refuge from prairie winds and forage on the native grasses which have been left untouched all summer.

From the lip of the valley above the ranch, peaked towers of a sandstone ridge overlook the waters of Bearpaw Bend. At a height reaching up to 75 feet high, these formations have been a longtime source of intrigue for ranchers and tourists alike.

"It's been named 'Sandcastles' for as long as I can remember," said Ted, noting a portion of the ranch is named 'Castleland.'

With roots planted in a family history forged by the landscape, Ted is familiar with the management practices which in turn have shaped the ranch.

"My uncle, Pete Perrin bought the place in 1943 and it was set up as the Perrin Ranching Company," he said, noting the owner before him founded the ranch because the land was too marginal for crop production.

"It's the only homestead that I know of that was never farmed. The homestead inspector told him it wasn't worth farming because it was too sandy. But if he 'proved it up' with cattle, he would help him get some lease to go with it," said Ted.

Located near the Matador Community Pasture, which is a remainder of the original Matador Ranch which extended from Texas to the Northern Great Plains, the Perrin ranch shares a unique history in the cattle industry. In a similar fashion, cattle were herded to utilize the grass.

"Forty years ago we would take them to the first pasture - then they would go to the next one and then they would end up at the buildings for branding," said Ted, noting the importance of maintaining a summer and winter range.

"The winter range has always been a winter pasture because of the shelter and the type of grass. The cattle might have only been in there in the summer two or three years out of the last 100 years," said Ted.

Equally important, Ted said management of the summer range included special consideration for the distribution of cattle. For example, several methods were used to lure livestock into a particular area that was not being grazed.

"It was high country but we did put a dugout up there. When the grass dried up in October, we also set up a molasses tank. That's how we utilized the grass," he said.

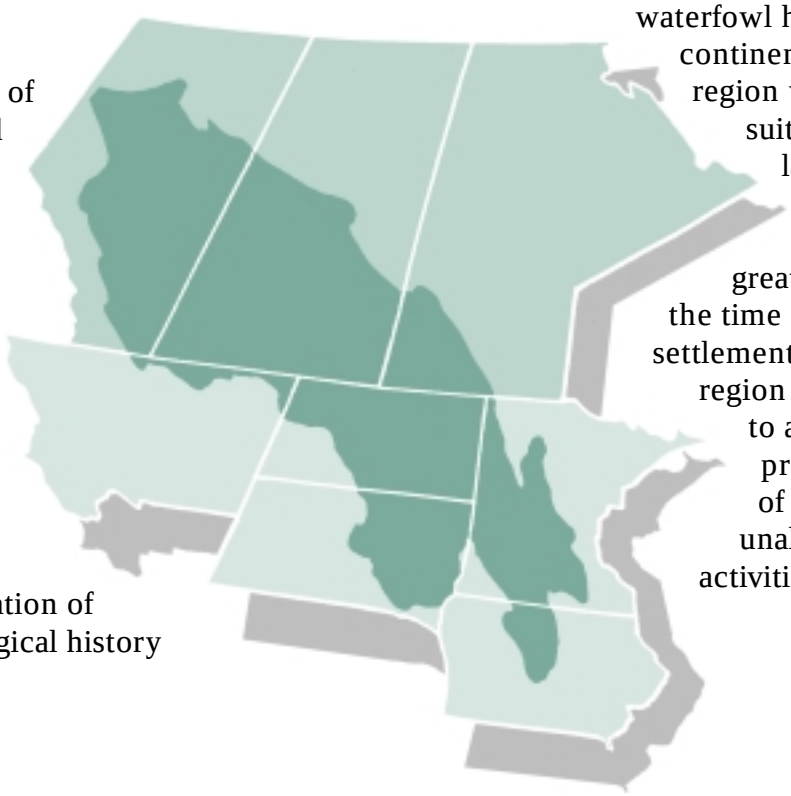
But like any progressive operation, the Perrin Ranch has been constantly evolving. While common sense and a hard day's work are the root of its success - the adoption of new management techniques are the key to its future. By implementing a rotational grazing system, developing watering sites and managing their stocking rates, the Perrins hope to preserve the tradition of ranching on the prairies for the next generation.

Olive Perrin

Ted Perrin of Beechy, Sk.

PRAIRIE POTHOLE REGION

Saskatchewan is prairie pothole country. Covering nearly 800,000 km2, the prairie pothole region is composed of the glaciated portions of five U.S. states and southern parts of the three prairie provinces. In Saskatchewan, it includes both the Aspen Parkland and Mixed Grassland Ecoregions, the agricultural areas of the province.



A unique combination of climate and geological history has combined to make the prairie pothole region among the most productive waterfowl habitats on the continent. However, the region with its fertile soils, suitable climate, and lack of major physical barriers to cultivation has been greatly transformed since the time of European settlement. Today most of the region has been converted to agricultural production with little of the land remaining unaltered by human activities.

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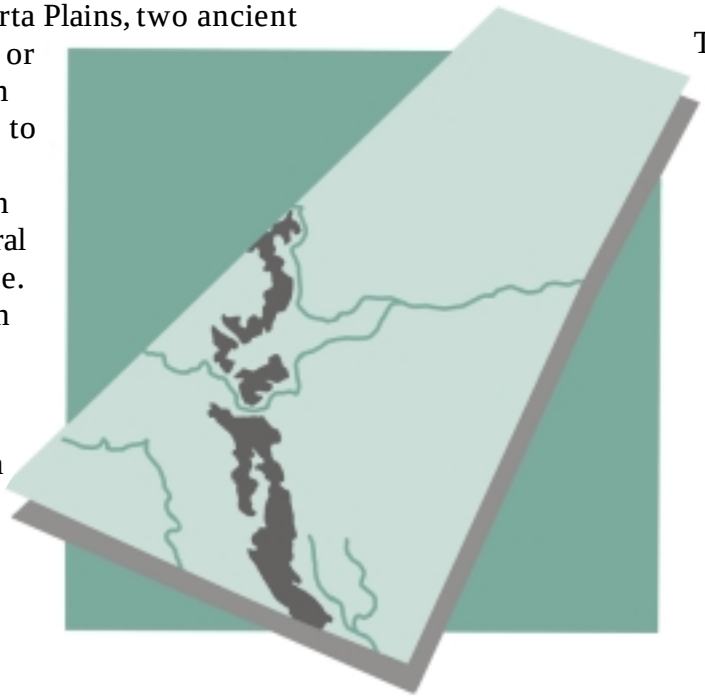
A typical prairie landscape of Saskatchewan.

MISSOURI COTEAU

Angling across the southern part of the province from south central to west central rises the Missouri Coteau. The Missouri Coteau, is a long, broad, slope or escarpment that marks the border between the Saskatchewan and Alberta Plains, two ancient landscapes. The Alberta or high plains stretch from the coteau region, west to the Rocky Mountains, forms most of the south western and west central portions of the province. The Saskatchewan plain forms the bulk of the province's agricultural region from east of the Coteau to the Manitoba escarpment situated approximately at the Manitoba border.

Scattered along the Coteau are areas of steep hilly uplands bearing names such as the Dirt, Cactus, Bear, and Eagle Hills. These hills were formed when the glacier retreat stalled for a geological moment, depositing deep layers of crushed rock and soil.



The Missouri Coteau with its rolling hills, high density of wetlands, and large tracts of native grassland provides nearly ideal waterfowl nesting habitat. The region is especially important to ducks like the northern pintail which prefer to nest in the relatively short vegetation of native prairie.

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Rolling hills are common in the Missouri Coteau.

Ducks Unlimited Canada

Pintail hen and drake.

SASKATCHEWAN'S WETLAND RESOURCES

WETLAND NUMBERS AND SIZE

Eleven percent of Canada's wetlands are present in Saskatchewan. Although wetland numbers and size change with the climate, it is estimated there are about 1.5 million wetlands covering 1.7 million hectares (4.2 million acres) in the agricultural region of the province. While plentiful in number, most Saskatchewan wetlands are small. Over 80 percent of the province's wetlands cover less than one hectare and less than one quarter of one percent of Saskatchewan wetlands are greater than 50 hectares in size.

Unfortunately, prairie wetlands are a diminishing resource, facing serious threats from drainage and degradation. Since the time of settlement, it has been estimated that Saskatchewan has lost 40 percent of its wetlands and half of those remaining are threatened.

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Cattails trap snow in wetland areas.

WETLAND DYNAMICS

Prairie wetlands evolved under a regime of fluctuating water levels. Although snow accounts for only 25 percent of precipitation, snow-melt can provide over 50 percent of run-off. As a result, water levels in wetlands typically peak in the spring and decline throughout the summer. In addition to seasonal fluctuations, water supplies to wetlands vary greatly from year to year. Years of drought might dry up all but the largest wetlands while heavy snow and rain can fill potholes and sloughs to the brim.

Rather than being destructive, this cycle of flooding and drying stimulates wetland seed germination. Wetland productivity is promoted when nutrients bound in soils and dead plants are then released. Because of the cyclical nature of precipitation and wetland water levels, most plants growing in Saskatchewan wetlands are adapted to periodic drought. They survive unfavourable climatic periods as persistent underground roots, rhizomes, bulbs, long-lived seeds or they have seeds that easily spread from remaining wetlands. Wetland plant communities can quickly develop in wetland basins, returning with the water after years of drought.

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In highly cultivated landscapes, wetlands may be the only areas covered by permanent vegetation.

WETLAND TYPES

Several types of wetlands are recognized based on water conditions and vegetation. Temporary, seasonal, and permanent wetlands are distinguished by the time they normally contain surface water. Temporary wetlands are flooded for a short time in the spring or after heavy precipitation. Seasonal wetlands normally have water present until mid-summer, while permanent wetlands are flooded year-round, except during extreme droughts. Because vegetation reflects average long-term water conditions, plant communities can be used to identify wetland types.

Denis Huel

Permanent wetlands with emergent bulrushes and willows.

Saskatchewan Wetland Conservation Corporation

Semi - permanent wetland dominated by sedges.

Denis Huel

Semi- permanent marsh dominated by green smartweed.

Denis Huel

Seasonal or temporary wetland in the Missouri Coteau.

While wetland number and distribution is determined mainly by the physical characteristics of the landscape, climatic conditions have a greater influence on wetland type. Precipitation and evaporation interacting with the size and nature of the drainage basin determine water depth, permanency, and vegetation.

SALINE WETLANDS

Another special type of wetland is the saline wetland. Saskatchewan has substantial numbers of saline wetlands which are easily identified by the presence of extensive salt deposits on the soil surface and distinctive plant communities. Saline wetlands develop in basins where water enters the wetland via groundwater seepage and surface flow. In these basins, water can only leave through evaporation. Over time, dissolved salts, mainly sodium and magnesium sulfate, that are present in the water entering the wetland are concentrated and deposited on the soil surface.

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Saline wetlands may have gravelly, white beaches. Species commonly found here include saltgrass and Nuttall's alkali grass.

Ian W. Sadler

A nesting Piping Plover - an endangered species.

Wetland Wildlife - the Piping Plover

The Piping Plover is one of many unique species of wildlife which depends on Saskatchewan wetlands for survival.

A migratory shorebird, the piping plover, prefers to nest in the alkali shorelines of saline water bodies such as Big Quill Lake in central Saskatchewan. This lake, which is recognized as a Western Hemisphere Shorebird Reserve Network (WHSRN) site, encompasses a total of 24,000 hectares (58,000 acres) including the surrounding mud flats.

These mud flats, pebbled beaches and bare patches of ground provide attractive habitat for the Piping Plover enabling it to remain well hidden. A short, stocky bird with a black band around its neck and a band between its eyes - it has a light brown to grey colored back which helps it blend in with its surroundings. Likewise, it has darkly speckled, cream colored eggs which are difficult to distinguish from the piping plover's pebbled nest.

Despite its remarkable camouflage, this species faces many challenges to survive. Predation is a significant problem for these birds. Where water levels change nests are at risk to flooding. On the shores of Lake Diefenbaker nests can be lost when water levels start to rise in the spring. Small chicks may have difficulty getting out of holes left in the mud by large animals. On a global scale, habitat is threatened by the increasing pressures of development.

In 1985, the piping plover was declared an endangered species in Canada. In 1996, it was estimated to have a world population of less than 6,000 adults. Five per cent of these birds can be found in the Quill Lakes region.

Through the combined effort of land mangers and conservation agencies, management practices have been developed to provide habitat benefits for the piping plover.

WETLAND PLANT COMMUNITIES

Saskatchewan wetlands contain a wide variety of plant species. Not only does wetland vegetation provide forage for livestock, and cover and food for wildlife, it also protects soils and shorelines from erosion and filters out nutrients and residues to improve water quality.

Rather than a random mixture of plants, wetland vegetation is ordered according to the varying environmental conditions present. Individual species' tolerance to flooding, drought, and salinity separates them into specific habitats and locations within the wetland.

A typical Saskatchewan wetland might contain a variety of habitats. Water levels and flooding increase as one moves from the uplands to the deepest central portions of the wetland basin. Plant communities change in response to this gradient. This results in bands or zones of similar vegetation which surround a wetland, from an outer transition area to deeper water in the center. Vegetation in small, shallow, temporary, or seasonal wetlands is usually similar to vegetation occurring in similar moisture conditions around permanent wetlands. Large, permanent wetlands might contain the entire range of plants normally found growing in small wetlands.

Many prairie wetlands, especially in the parkland region, are surrounded by a border of shrubs, mainly willows. Grasses and sedges are important components of the vegetation in temporary and seasonal wetlands as well as the outer zones of permanent wetlands. Sedges are grass-like plants that are readily distinguished from true grasses by having stems that are solid and triangular in cross-section. Cattails and bulrushes have special adaptations to transport oxygen from the air to their roots enabling them to grow in continually flooded but shallow water areas. They can be found in borders of more permanent wetlands. Plants which float on the water surface or grow submerged in the water are found in deeper areas of permanent wetlands.

In saline wetlands, high levels of salt make it difficult for plants to obtain water from the soil. Plants that are adapted to these conditions are able to remove moisture from the soil without absorbing toxic amounts of salt. Species vary in their ability to tolerate salt, separating them into different areas of the wetland. Salt concentrations usually increase toward the center of the wetland where only the most salt-tolerant species may survive. Often plants are restricted to the less saline outer areas.

Denis Huel

Vegetative zones in a prairie wetland

A TYPICAL PRAIRIE WETLAND

Wetland Zones

Wet Meadow
The outermost and driest wetland zone. Flooding occurs for a short time in spring, much like a temporary wetland. Common plants include northern reedgrass, sedges, wild mint and dock. In the aspen parkland, willows are common in this zone.

Shallow marsh
Normally flooded until summer. Coincides with deepest part of seasonal wetlands. Vegetation includes a mixture of sedges, Baltic rush, spike rush, sloughgrass, whitetop, marsh smartweed, water-plantain and water-parsnip.

Deep marsh
Flooded with shallow water from spring to fall. Vegetation dominated by emergent vegetation, like cattails and bulrushes. Other common plants include pondweeds and coontail.

Permanent open water
Stable areas of open water whose depth may be greater than one meter. Vegetation, if present, is a combination of submerged and floating plants such as pondweeds, coontail and duckweed.

Saline Wetlands
Saline wetlands contain specially adapted vegetation that enables them to grow in the difficult conditions found there. Desert saltgrass, Nuttall's saltgrass, alkali cordgrass, sea-blite and red samphire are common inhabitants of highly saline prairie wetlands.

A Typical Prairie Wetland

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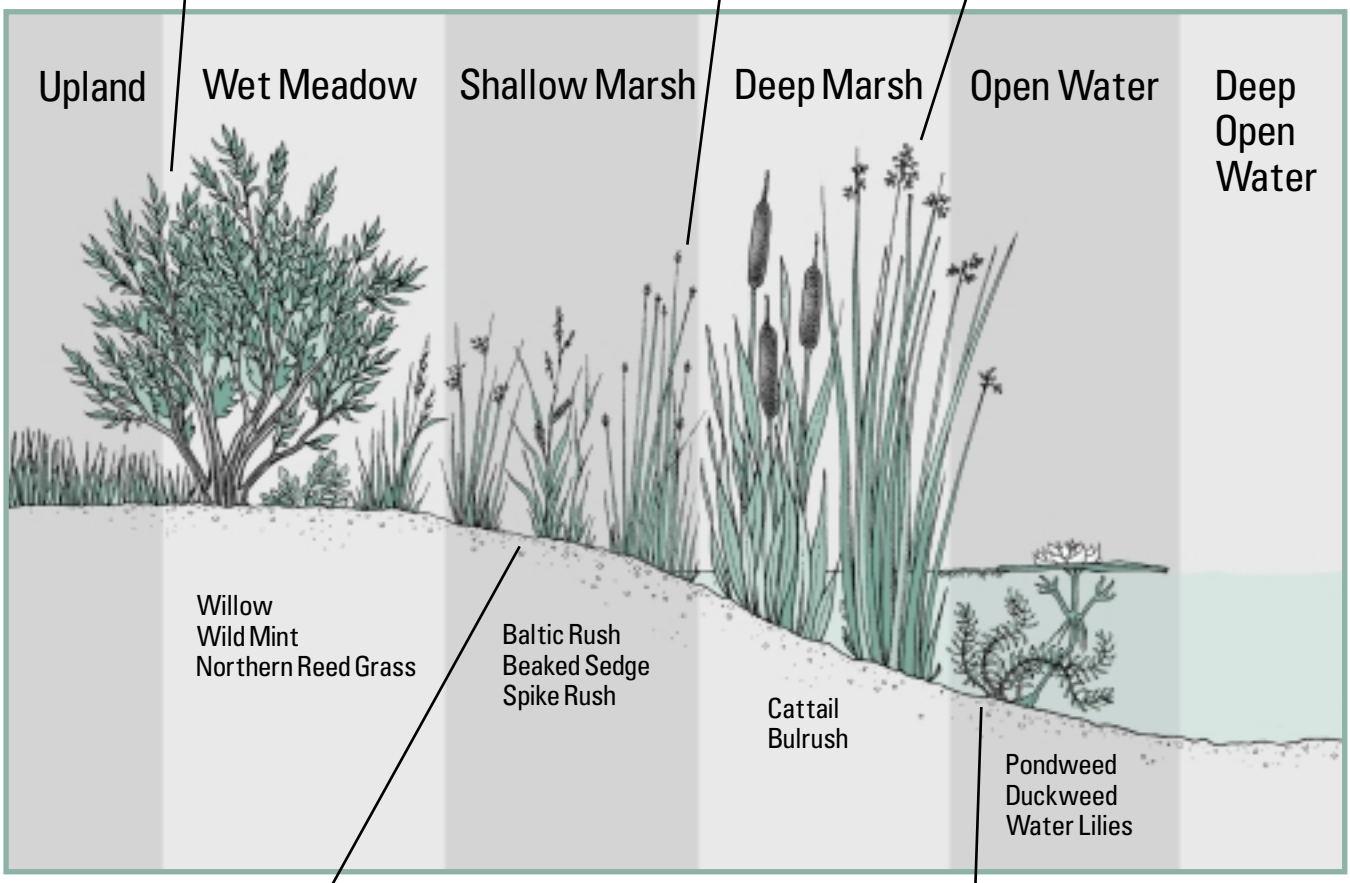
Willow

Sedges

Cattails and Bulrushes



Baltic Rush

Water Smartweed

F. A. Switzer

Denis Huel

WETLAND MARGINS

An important part of a functional wetland system is the surrounding border of vegetation that separates the wetland from adjacent uplands. Permanent vegetation in wetland margins provides wildlife habitat, traps snow and silt,reduces salt buildup on the soil surface, and improves a wetland's ability to filter and purify water before it seeps into the ground. Plant communities in transition areas usually consist of a mixture of moisture-loving grasses, broadleaved forbes, and shrubs such as willows. Groundwater movement from the wetland can keep these areas green and productive even during the dry summer months.

Denis Huel

The wetland margin separates the water from the upland vegetation.

WETLAND FUNCTIONS

Wetlands function as a physical part of the larger landscape.These primary functions are:

WATER STORAGE

Prairie wetlands receive and store surplus water from periods when it is abundant, as after spring snowmelt and during times of heavy rain.This water is then available to plants and animals during dry periods. Wetlands serve to moderate the effects of normal fluctuations in precipitation which is a feature of the prairie climate.

FLOOD CONTROL

Wetlands store water, slowing its discharge into streams and rivers, prolonging the flow and reducing the intensity of flooding. Peak levels of flooding in downstream waterways are lower in watersheds which have many wetlands.

Extensive wetland drainage aggravates or even creates flooding problems for areas receiving drainage water. The volume of water a river carries might not significantly increase but the timing of the flow can change. In areas of wetland drainage, water flow is concentrated during a much shorter period increasing the intensity of flow and damage caused by flooding.

GROUNDWATER RECHARGE

Seepage from wetlands helps maintain water levels in aquifers which supply water to wells for domestic and livestock use. Wetlands connect surface and underground water systems. Depending on soil permeability and topographical position of the wetland, water can infiltrate to aquifers or flow to surface wetlands from underground reserves. Groundwater discharge can stabilize water levels in some wetlands during times of little or no run-off.

Groundwater recharge can be greater from seasonal and temporary wetlands than permanent wetlands. Draining wetlands lowers the water table sometimes reducing water yields of nearby wells.

SEDIMENT AND RESIDUE TRAPPING Run-off from fields or other areas can contain soil, fertilizers, pesticide residues, and other contaminants which can end up in lakes, streams and groundwater. Through a variety of natural processes, wetland environments remove many of these pollutants. In fact, the effect of wetlands on water quality is so dramatic that artificial wetlands are sometimes created specifically to treat domestic, municipal, and industrial wastewater.

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Healthy wetland margins perform many functions.

SHORELINE PROTECTION
Healthy vegetation in wetland margins and shorelines help to maintain the integrity of the shoreline. Healthy root systems bind the soil together and prevent erosion caused by wave action.

NUTRIENT CYCLING AND STORAGE
Wetlands trap nutrients in run-off and store them in plants and soils, preventing long distance transportation and removal from the local landscape. Cycles of flooding and drying release stored nutrients, fertilizing wetland plant communities.

PRIMARY BIOTIC PRODUCTION
All living things require energy to live. Originally this energy comes from the sun, however, only plants are able to convert the energy of sunlight directly through the process of photosynthesis. All other life is dependent on the energy captured and stored by plant growth.

The water and nutrients in wetlands make them the prairie's most productive ecosystems. The lush growth of wetland plant communities provides the energy to maintain complex food chains and supports literally hundreds of species of insects, birds, mammals, fish, amphibians, reptiles, and other creatures large and small. A major difference between wetland vegetative production and terrestrial growth is that in wetlands there is more debris build up and greater levels of decomposition and relatively less grazing and foraging.

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Emergent vegetation such as bulrushes and cattails absorb energy from waves preventing shoreline erosion on larger wetlands and lakes.

THE PRAIRIE WATER CYCLE

Wetlands function as part of a broad, complex and intricate system of water movement. Recognizing this is important to understanding the effect of wetlands and wetland loss on water supplies.

The oceans are the primary source of water to the world's land areas. In Saskatchewan, we underestimate the influence oceans have on our climate. Water evaporating from the oceans is carried long distances in large scale air movements. In western North America, the prevalent flow of air should bring moisture from the Pacific Ocean. However, as moist Pacific air reaches the west coast, it is forced upward by the mountains, cooling it and causing most of the water present to fall out as rain or snow.

Generally, precipitation decreases further away from the ocean. Saskatchewan's long distance from the ocean and the presence of the western mountains combine to produce a "rain shadow" or an area of low precipitation over the prairies. By the time air masses reach the prairies, they have often been stripped of much of their moisture. While limited in quantity, the prairies still depend on this supply of water from the ocean.

...AND RECYCLE

Wetlands and surrounding plant communities are important links between atmospheric, surface and groundwater movements. Evaporated water is available once again to fall as precipitation. As crops and other plants grow, they dry out the soil but most of this water simply passes through the plant to the atmosphere to again fall as rain. Water received from the ocean can be evaporated and fall as rain many times before finally returning to the ocean. This "recycled" water can form a large part of the moisture present in summer showers and thunderstorms. Even though Saskatchewan is a long distance from the coasts, most of the water in lakes and rivers ultimately flows back to the oceans. Draining wetlands into these streams and rivers hastens the departure of this valuable but limited resource from the prairies, reducing its potential to cycle and recycle.

The effect of individual wetlands on climate is small, however, the cumulative effect of extensive wetland loss and de-watering of the landscape is potentially serious. Large-scale elimination of wetlands has the potential to reduce regional precipitation.

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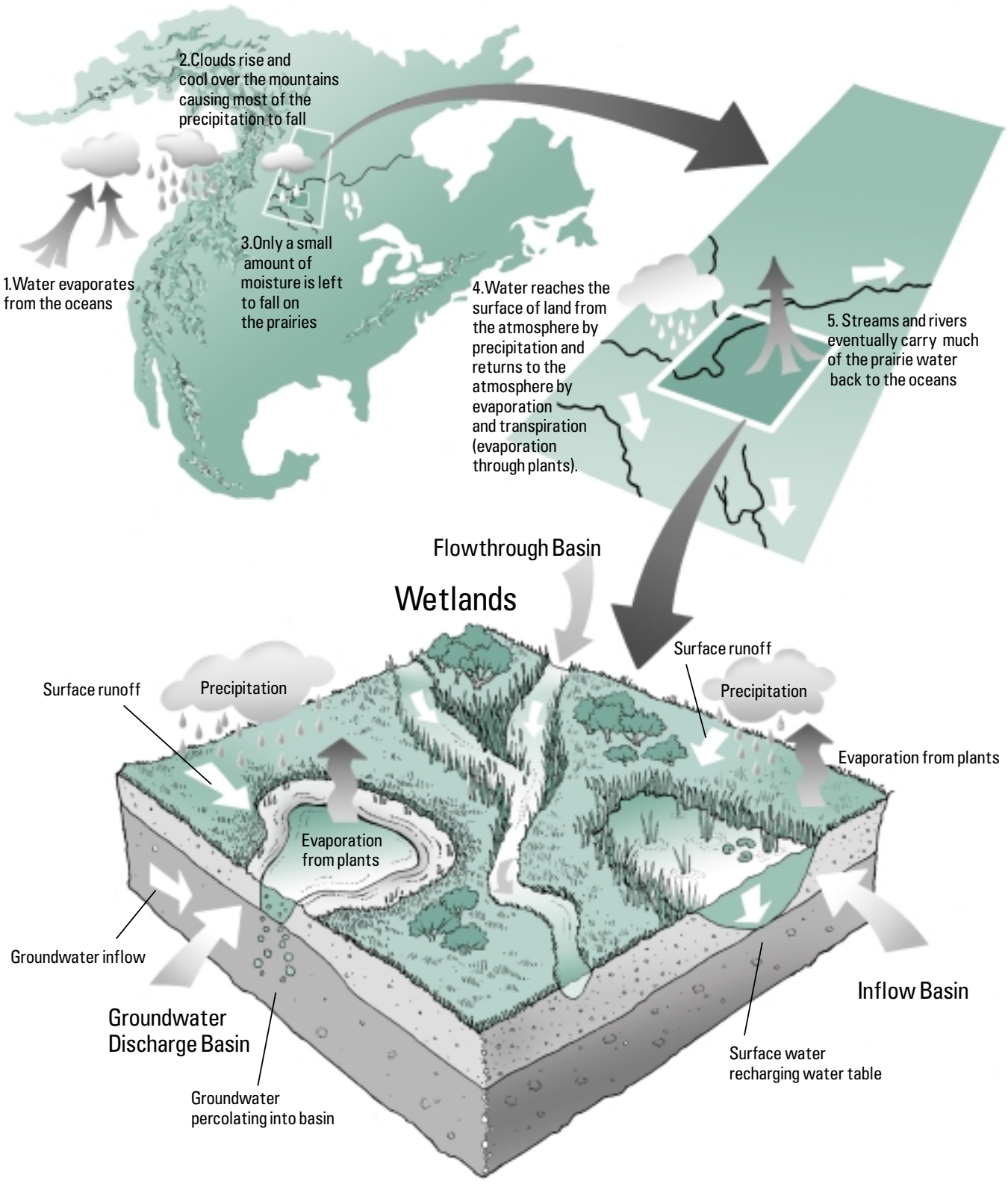
Summer Thunderstorm

The Prairie Water Cycle



THE VALUE OF WATER

Wetlands supply water for domestic use, livestock, wildlife, irrigation, industry, and recreation. Most residents of Saskatchewan live in a semi-arid climate, which means the wind and sun can evaporate more water than we normally receive as precipitation. Because of high temperatures and low rainfall, moisture deficits are common and most extreme during the latter part of summer.

Water supplies in most areas are rarely abundant, occasionally sufficient, but usually scarce. However, because of cool temperatures in autumn, winter, and spring, or occasionally heavy summer precipitation, temporary water surpluses are created. This surplus is stored in lakes, wetlands, groundwater, and the soil. It is used by plants and animals including crops and livestock during times when little precipitation falls.

About 90 percent of Saskatchewan farms rely on wells to provide some of their water supply. Local wetlands have a role in assuring adequate supplies of good quality water are available.

WETLANDS AND AGRICULTURE

Saskatchewan's pothole region coincides with areas of intensive agricultural production. As a result, agricultural activities have had the largest impact on Saskatchewan wetlands. Wetlands can benefit agricultural producers and rural residents in a variety of ways. They provide water to livestock producers, recharge groundwater reserves, increase crop productivity in adjacent areas, and can reduce soil erosion and salinity problems.

However, sloughs and potholes are often viewed as impediments to crop production. Wetlands reduce cropland acreage, decrease efficiency of field operations, and contribute to crop depredation by waterfowl which can occasionally be extensive. In addition, frequent combinations of low commodity prices and high input costs have put tremendous pressure on producers to increase productivity and reduce costs. For these reasons, draining and converting wetlands to crop production continues to be the most serious threat facing Saskatchewan wetlands.

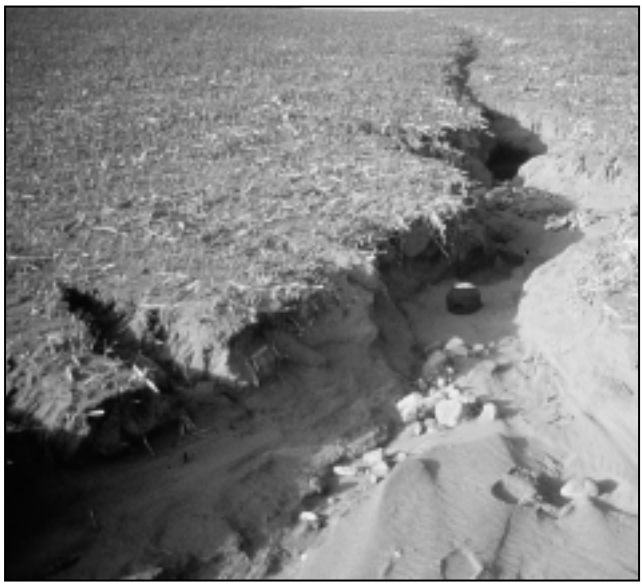
Besides draining, there are other effects of agriculture on wetlands. Temporary and seasonal wetlands are often cultivated during fall tillage operations. If the spring, is dry they may be seeded but often they are too wet and the plants which were not killed by the tillage grow back. Desirable and productive wetland plant communities which could be hayed or grazed are lost and producers receive few benefits for their efforts.

Saskatchewan Wetland Conservation Corporation

Checking establishment of forage seeding in a previously cropped pothole area.

When plants in wetland margins are removed by cultivation or overgrazing, snow trapping is reduced and the wetland is deprived of some of its water supply. Erosion from surrounding cropland can fill in wetland basins and salinity problems develop or increase.

EFFECTS OF AGRICULTURAL ACTIVITIES ON WETLANDS



Saskatchewan Wetland Conservation Corporation

EROSION *from cultivated areas can transport soil, fertilizers and pesticides to wetlands, filling wetland basins, reducing the productivity of croplands and polluting water supplies.*

Denis Huel

DRAINAGE *eliminates wetlands, lowers water tables, increases run-off and erosion and reduces productivity of adjacent areas.*

Denis Huel

CULTIVATION *of wetland margins reduces the capacity of wetlands to trap snow and filter water, and can result in increased soil salinity. Cultivating through temporary wetlands eliminates plants which may provide quality hay.*

Denis Huel

OVERGRAZING *and trampling of wetland margins by livestock compacts soils and damages plant communities, reducing productivity and lowering water quality.*

Denis Huel

Cultivating too close to the wetland limits its ability to filter and trap sediments and provides little cover for wildlife.

WETLANDS FOR WILDLIFE

Saskatchewan wetlands provide water, food, cover and nesting habitat for all kinds of prairie wildlife. Over 150 species of birds and animals are known to make their home in Saskatchewan wetlands. Even birds and animals that live on dryland may require wetlands for water or other resources. Often, no wetlands means no water and no wildlife.

Different habitats supply different resources, some producing food and others nesting cover or protection from predators. In addition, habitat requirements vary between species and the needs of individual birds or animals often change with the season. The characteristics of individual wetlands which influence their use by wildlife include size, type, plant communities, land-use of adjacent uplands, and salinity. In general, a mix of temporary, seasonal, and permanent wetlands, along with permanent upland habitat, provide the most productive wildlife and waterfowl habitats. Small, shallow wetlands warm up sooner in spring, providing early food sources for migrating waterfowl when large wetlands remain frozen. Permanent wetlands are required for the rearing of young by most species of shorebirds, waterfowl and other waterbirds from herons to gulls. The unique characteristics of saline wetlands are especially important to shorebirds.

Across the prairies, loss of wetland and upland habitat has reduced the numbers of many kinds of wildlife. During the late 1980's, the combined effects of years of drought, agricultural drainage, and loss of upland nesting habitat reduced populations of some waterfowl to less than half their historical average. However, since the mid-nineties, above average precipitation and run-off have raised water levels and increased the number of wetlands. Combined with on-going habitat conservation, the result is increasing populations of waterfowl and wetland wildlife.

Saskatchewan Wetland Conservation Corporation

Avocets feeding on saline wetlands.

Directly and indirectly, Saskatchewan wetlands and wildlife generate millions of dollars in tourism and recreation revenues. Waterfowl hunting, outfitting and the developing eco-tourism industry provide enjoyment, business opportunities and incomes for many Saskatchewan residents.

Saskatchewan Wetland Conservation Corporation

Hunting and ecotourism benefit with healthy wetland habitat.

Ducks Unlimited Canada

MUSKRATS *An important inhabitant of prairie wetlands is the muskrat. With its prolific nature and voracious appetite, the muskrat has the power to shape wetland vegetation and habitats.*

Feeding primarily on underwater parts of bulrushes and cattails, muskrats create areas of open water in what would otherwise be densely vegetated wetlands. This results in a mosaic of water and wetland vegetation that is especially attractive to waterfowl. In addition, muskrat houses are used as nesting platforms by Canada geese and a variety of other birds.

F. A. Switzer

Case study: Beaver - Who's Habitat Is It?
The beaver is making a comeback. These animals were nearly extirpated by the end of the 19th century from unmitigated trapping following the arrival of Europeans. Like the bison that once covered the plains, beaver dams once covered nearly every stream and river system on the North American continent north of the Mexican border. Beaver numbers are estimated to have been between 60 and 400 million. Most streams and smaller rivers must have looked very different then. The entire flood plain of low gradient drainages would likely have been covered with a mosaic of wetlands and ponds which supported a dense and diverse variety of willows, shrubs, and riparian plant communities.

In the same way livestock producers have learned to improve range conditions by understanding the dynamics of native prairie and the tremendous herds of bison that once grazed them, we cannot hope to fully understand our stream systems without recognizing the beaver and its place in their development and transformation. In general, the more intensively managed the land, the more troublesome the beaver is perceived to be. Overall, however, streams with beaver have a higher resistance to disturbance and are healthier than those without.

Influences on Stream Systems, Water Quality and Plant Communities
Beaver ponds store vast amounts of water near where it falls or melts, reducing damaging runoff and associated downstream flooding and streambank instability. This stored water seeps slowly downstream providing a more constant flow throughout the year, particularly important during the summer and fall months when many streams otherwise dry up. In addition, plant communities adjacent to ponded areas benefit from subirrigation. Beaver dams trap incredible amounts of sediment. Tons of soil washed downslope from erosion of damaged uplands may be captured and filtered. Water running downstream from beaver dams runs clearer. The trapped sediments serve as nutrient sinks which enrich the water with microorganisms and aquatic plant communities. This, in turn, benefits the establishment of stabilizing willows and shrubfields.

Beaver are at the center of an extremely complex ecological system which is not yet well understood. Generalizing broadly, the two kinds of beaver habitat on the prairies are willow habitat and aspen habitat. Willow habitats are enhanced and spread by beaver activity in both the short and long-term. On the other hand beaver may "eat themselves out" of an aspen habitat. From our short-term, human perspective, this "clearcutting" may be disturbing. On an ecological scale, however, this activity may lead to a positive long-term result. Aspen is a short-lived species that requires complete overstory removal such as fire and perhaps beaver activity to regenerate a healthy stand. By removing the aspen, raising the water table and moving on, beaver may actually play an important role in the rejuvenation of decadent aspen stands.

Nature's Hydrological Engineers
In the late 1800s and early 1900s, with the loss of the beaver, the water table dropped. The shrub communities which were dependent on saturated soils perished. Livestock were introduced and crops were planted on the newly exposed flood plains. The integrity of the streambanks was destroyed. With no dams in place to stop spring runoff, the drainages were scoured and destabilized. Stream channels cut the banks. Sediment filled the streams. The increased scouring power of the sediment - laden water and the unchecked flows served to further destabilize streambanks in an unending spiral of destruction.

While beavers are often viewed as a nuisance, these animals have the potential to provide landowners with the means to solve some chronic degradation issues. In Wyoming, beaver are being put to work to restore badly degraded rangelands. Most of the land (approximately 80 percent) is privately owned. Among the successes of beaver reintroduction were stabilization of gully-eroded headwaters, creation and enhancement of wildlife habitat and fisheries, improved water quality, greater number and distribution of livestock watering access points, and improved forage production. Overall, beaver have shown to enhance biological productivity of headwater areas and livestock grazing distribution.

Saskatchewan Wetland Conservation Corporation

Beaver

What To Do About the Problem Beaver

Tolerance is tough to come by when beaver are cutting down that stand of aspen or the cottonwood viewed from the home or flooding that hay meadow. Solutions to these problems are not that easy. The offending animals may be trapped and killed or moved off the property. This solution is only temporary since new beaver will likely move in the very next season. Dispersing two-year-old beaver have been known to travel 100 miles, though seven to ten miles is more common. Similarly, removing dams is the most widely used but least effective method of trying to get rid of beavers. Beaver respond by repairing the dam the next day.

While unlimited beaver populations can be detrimental, understanding the importance of these animals in creation of rich and healthy riparian habitats may help the landowner consider more creative solutions that, in some instances, could permit cohabitation of human and animal. After all, if the landowner is facing stream degradation issues, the beaver may be just what's needed.

If the primary concern is loss of trees, protecting individual and groups of trees by wrapping them with hardware cloth may be the best solution. This may seem to be a lot of work. In the long run, however, once those trees are protected, the battle need not be waged year after year as new populations of beaver move in. If flooding is a concern, ponds may be maintained at tolerable levels by installing drain structures in the beaver dams. By taking a few steps to help solve these problems, watershed and wildlife benefits associated with the beaver can be realized.

EDUCATION

Wetlands offer opportunities to view wildlife and learn about our natural heritage. Programs are available that assist youth, educators and others to learn about Saskatchewan's wetland environments.

The GREENWING youth education program is offered by Ducks Unlimited Canada. Individual memberships include a copy of the Marsh World booklet and a subscription to Puddler or Conservator magazines. As members, young people have a chance to take part in field days and outdoor wetland conservation and enhancement activities like building and placing bird nesting boxes. School presentations introduce students to wetlands and wildlife. For example, the Willowbrook Wildlife Federation sponsored the grade 5 and 6 classes of Willowbrook School to become Greenwing members, one of the first clubs to be involved with the Greenwing project.

PROJECT WILD, PROJECT WET, and WONDERS OF WETLANDS are environmental education programs that teach youth respect for wildlife, native lands and water. These programs, offered by Saskatchewan Environment and Resource Management (SERM), provide materials and information to teachers and youth group leaders through training workshops. The material emphasizes hands-on active learning and is recognized by Saskatchewan Education. PROJECT WILD was introduced in 1985 and is in widespread use in Saskatchewan. PROJECT WET and the supplementary program WONDERS OF WETLANDS were introduced in 1996.

Ducks Unlimited Canada

Case study: Nature's Classroom

Build it and they will come.

That's what Grade 5 and 6 students of Willowbrook School are learning about artificial nesting structures placed in wetland areas.

Through a field trip traditionally held in February or March, students from this east central Saskatchewan community join members of the Willowbrook Wildlife Federation in refurbishing 350 nesting tunnels and baskets. So what are nesting tunnels?

Used in areas where upland nesting habitat is limited, these structures are mounted on steel poles which are placed in sloughs and marshes. To provide valuable protection for species such as the mallard, the tunnels are made of flax straw rolled up in wire. With an inside diameter of eleven inches, the tunnels measure three feet in length.

But to remain effective, the structures need to be maintained and relined with hay every one to two years. And that's where the students of Willowbrook School fit in.

Joining parents, teachers, and Federation members, students venture out across the frozen water of a prairie wetland for a day of learning in nature's classroom.

Principal Brian Beck said he's happy to see the students' eagerness to participate. Through a 'hands on experience,' they learn more about the habitat needs of wildlife and the role of conservation.

"They really get excited about finding stuff in the nesting tunnels - whether it's an unhatched egg or whether its egg shells," said Beck. "When the kids find these and can actually say, 'This nest was used and this is what happened,' it just makes it all real. There was evidence of what had been in there and the kids are quite fascinated."

Danny Mikkonen, president of the Willowbrook Wildlife Federation explained members are pleased with the feedback. To make the exercise more educational, they invite a biologist to speak to the students.

But the students learn from the members as well.

Saskatchewan Wetland Conservation Corporation

Nesting tunnel.

Since the Willowbrook Wildlife Federation was one of the first clubs to become involved in building and placing nesting structures, members have found out what works and what doesn't.

For example, Mikkonen said they started with nesting baskets in 1993 and then began using nesting tunnels in 1995. "The tunnels are not only more attractive to ducks - but they are not damaged by geese the way the baskets were," he said, adding baskets still being used have been modified with domes.

"The duck use has really improved with the tunnels," said Mikkonen, noting they now have 150 of these structures.

He also added further improvements which have been made include the placement of nesting tunnels. If the nesting tunnels aren't high enough - they may be flooded in the spring.

"We try to keep them about three to four feet above the ice when we install them," said Mikkonen, noting each tunnel is mounted on a three foot pipe which slides over a ten foot steel post.

In the meantime, Willowbrook is flooded with interest in wildlife conservation.

While the hamlet only has a population of approximately 35 people - the local wildlife federation boasts a membership of 170 with room to grow.

By making the nest basket and tunnel refurbishing a community event, school children and their wildlife mentors have shown that wildlife and education are a natural fit.

"We just have a really good relationship with members of the Willowbrook Wildlife Federation. They manage to bring this type of environment to the school in a way that's still beneficial to the students," said Beck, adding the outing, which includes snowmobiling and a bonfire, makes the experience a memorable one for the children.

"It's something the students really looked forward to. As soon as the snow starts to fly, they ask if we're going."

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Willowbrook students help set a nest basket.

PART 2. DEVELOPING A WETLAND MANAGEMENT PLAN

Developing and implementing a wetland management plan is an important start for landowners wanting to benefit from wetlands, while conserving and protecting them for future generations.
A management plan outlines the direction and actions which are required to assure wetlands remain healthy. A comprehensive management strategy will help you reach your goals and objectives while protecting the benefits that wetlands bring.


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The number and size of your wetlands should be inventoried prior to designing a management plan.

Wetlands function as integral parts of the general landscape. Understanding how wetlands work, as explained in Part 1, is essential to the process of developing a wetland management strategy. Most actions taken by landowners to protect wetlands involve not just the wetland itself but also adjacent upland areas. Managing the use of surrounding land will not only increase and maintain the productivity of these areas resulting in more profitable and sustainable farm production, but also reduce any negative effects that land-use practices can have on wetlands.


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Assess wetland and surrounding land use.

Preparing a management plan involves four basic steps. Use your pull out assessment and management plan on pages 33 to 35.

Step 1. Perform an inventory and assessment of your wetland resources.

Step 2. Define your values, goals and objectives.

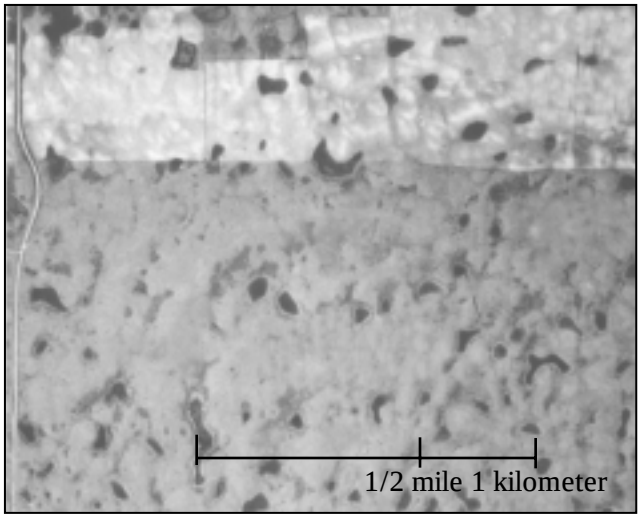
Step 3. Implement a course of action that will protect wetlands and meet objectives.

Step 4. Monitor the effectiveness of your actions.

STEP 1. A WETLAND INVENTORY

Because management decisions will be made according to the specific characteristics of your land and water resources, a simple but thorough description and documentation of these resources is necessary. This inventory should include both the extent and type of the wetlands as well as the condition or health of your wetlands and surrounding areas. In addition, specifics about land-use practices should be identified.

An air photo of your land is a valuable and interesting tool when performing an assessment or when preparing a management plan. A bird's eye view of your land will enable you to easily count wetland basins, accurately estimate area and sketch out management scenarios. In most cases, air photos of individual townships are available for agricultural regions of Saskatchewan from the Geomatics Division of the Saskatchewan Property Management Corporation. Save the original air photo and use photocopied enlargements to mark wetlands and wetland types, fences, land-use patterns, water flow, and anything else of interest or concern.



Airphotos can give you a bird's eye view of your land base.

Your inventory should include the following information.
(A worksheet has been included to assist you)

a) **Wetland resources**.
- Number of wetland basins?
- Total area of wetlands in acres or hectares?
- The portion of wetlands which are temporary, seasonal, and permanent.
- Are wetlands part of a regional water system or are they isolated potholes?
- Are wetlands saline or freshwater? (Look for salt deposits)

How healthy are your wetland areas?

The health of the wetlands refers to the ability of the wetland to perform the functions which were outlined in Part 1. The assessment of health is based on a number of physical, hydrologic and vegetative factors. Of these, the types and species of plants provide the greatest insight into the health of the wetlands. It is, therefore necessary to be familiar with the common wetland species. Plant identification field books are available from extension offices as well as book stores and libraries. Extension agrologists with various agencies are available to assist you with assessment and planning.

When going out to assess wetland health, you can look at either a representative area of the wetland or a critical area. The representative area should tell you what the general health of the wetland is while an assessment of a critical area may involve looking at a known problem area. The reasons for deciding what to assess will be based on how familiar you are with your wetlands and your objectives for managing these wetlands. In either case, you should be taking notes as you walk about your land. It is also important that when assessing your wetlands, the areas which you are looking at are in the same field or pasture. For example, if a fence crosses through a wetland, assess one side and then the other.

Some of the factors that are used to indicate wetland health are listed below.
Not all factors will apply in all situations.

- How much of the ground is covered by plant growth or vegetative cover. If less than 85 percent, determine why.
- How much of the shoreline is protected with vegetation that has a deep binding root mass? Species with good root systems include all woody vegetation, cattails, bulrushes, sedges among others. A good objective would be to have at least 85 percent of the shoreline covered with these types of species.
- How much soil in the wetland areas is exposed as a result of human or land-use practices? More than five percent exposed soil would be considered a problem.

Healthy wetland - showing good vegetation cover and woody vegetation.

- How much of the shoreline is altered by human or land use activity?
  Aim to have less than five percent of shoreline in an altered form.
- Is there extensive pugging or hummocking present? Pugs are the tracks left by large animals in soft soil and hummocks are the mounds observed next to the pugs.
- Are there any invasive or noxious weeds such as leafy spurge, purple loosestrife or scentless chamomile present? Any amount of these type of weeds may prompt you to take some action to control them.
- Are undesirable plants dominant in the vegetative zones? These are the types of plants that would increase in abundance in response to disturbance. These may include weedy annuals, low-producers such as Kentucky blue grass, smooth bromegrass, foxtail barley, dandelions, quackgrass or strawberries.
- Is there a diversity of sizes and species of trees and shrubs present? The roots of shrubs and bush hold the soil together and prevent erosion and it is important that young plants are present to replace the older shrubs as they die out. It is important to note that in some situations, the soils, water levels or other factor may prevent woody vegetation from growing on this site.
- Is woody vegetation being browsed too heavily? If there is a high level of utilization of the previous year's, or older, growth, regeneration of shrubs and trees may be impaired.
- Are there high levels of dead or decadent woody vegetation? This may arise from over browsing, change in groundwater tables, the presence of disease or insects or climatic change but in a situation where woody vegetation should be present, this may indicate a decrease in wetland health.

- Is there artificial drawdown of the water? Some wetlands have been modified with dikes and water control structures in order that water levels can be altered. Extensive drawdowns of water does not allow for the maintenance of healthy wetland vegetation. Where there is excessive shoreline exposed due to water drawdown, it is subject to degradation and de-stabilization.
- Are there any overflow structures and how stable are they? Man-made overflow structures are susceptible to erosion if they are not stable.

b) **Upland resources**:

- Are surrounding areas cultivated, grazed, hayed, or idle?
- How large is the land base? What is the size of individual fields or paddocks?
- Do wetlands provide grazing, hay, water, or recreation?
- Has drainage affected wetland water supplies? If yes, how?
- How does topography and soil type affect adjacent land use?

If land is cultivated:

- How close does cultivation come to wetlands?
- Have old depressions and wetlands been removed?
- What are crop production practices and rotations?
- Is soil erosion occurring?
- Are areas of salinity developing or present?
- Are there areas where crop production is marginal?
- Are there areas which could be seeded to forages to make field operations more efficient?

If the uplands are grazed:

- Is the pasture native or seeded?
- For native pasture, what is the rangeland condition?
- If seeded pasture, how is plant vigor? Is soil protected by plant litter? Are plants present which weren't seeded? (Various guides are available to assist in the assessment of range and seeded pastures.
- What is the pasture grazing plan? When are pastures or paddocks containing wetlands grazed and how heavily?
- Do stocking rates match forage availability?
- Is grazing pressure uniformly distributed or are the wetlands more heavily used than the uplands?
- Where do livestock water?
- Does run-off from livestock holding and wintering areas or feedlots reach wetlands?

c) **Wildlife habitat**:

- What kinds of birds and animals are commonly present?
- Are semi-permanent and permanent wetlands present nearby where waterfowl can rear young?
- Is upland nesting habitat for waterfowl available?
- Are there any non-cultivated natural areas? If so what portion is grassland, shrubs and trees?

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d) **Additional information**:

- Are wells which supply domestic or livestock water present nearby?
- List anything else that is unique to your situation.

Pull out Assessment of Wetlands

Wetland Inventory

Values and Goals

What do you value about your land?

_____
_____
_____
_____

What do you want to achieve? (Be specific)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Your Resources

Native Prairie _____ acres
Condition - poor, fair, good, excellent

Tame Pasture _____ acres
Condition - poor, fair, good, excellent

Cultivated Land _____ acres

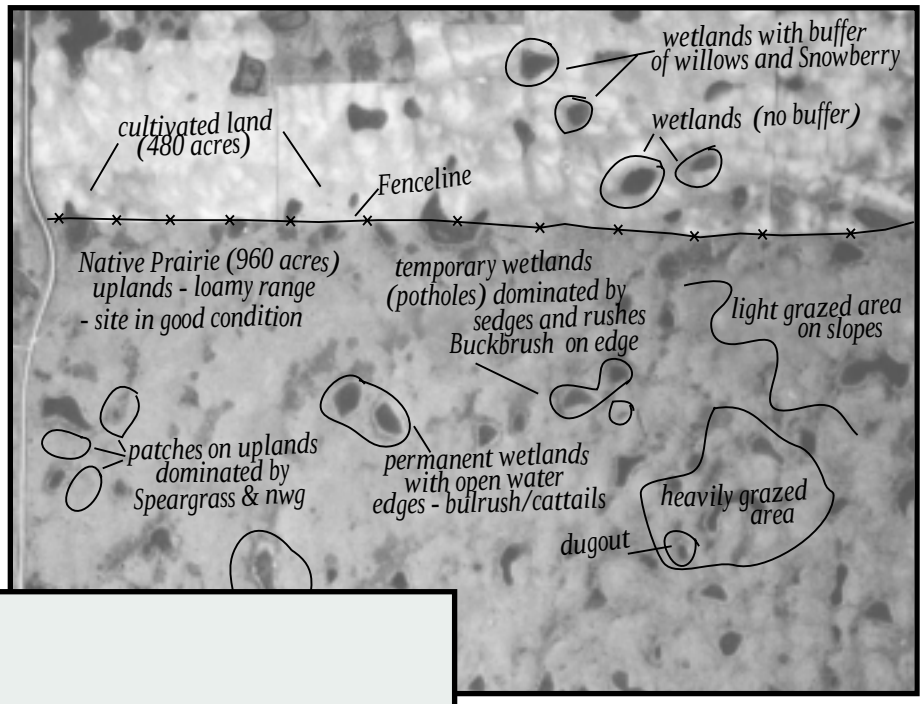
Wetlands _____ acres

# of Wetlands _____

Wetland types ☐ Temporary ☐ Seasonal
☐ Permanent ☐ Freshwater ☐ Saline

Example

Air Photo Map - Like the example shown to the right, an air photo map is a helpful tool to help identify and record land features and wetland inventory.



Place your aerial photo map here.

Your Air Photo Map - Use this area to place your air photo and identify the features in your own wetland inventory.

Things to identify

How Healthy are your Wetlands?

Use the Checklist below to help gauge improvement following implementation of the Plan.

Plant cover of wetland margin _____%

Shoreline with deep binding rootmass _____%

Exposed soil in wetland margin _____%

Exposed shoreline _____%

Pugs or hummocks present _____%

Invasive weeds? _____%

Undesirable plants? _____%

Diversity of shrubs and trees? _____%

Browse on woody plant _____%

Dead or decadent woody vegetation? _____%

Artificial control of water levels

☐ none ☐ minor ☐ extensive ☐ extreme

Stability of man-made structures ☐ none

☐ unprotected ☐ stable ☐ well protected

Comments / Problem Areas

_____

_____

_____

_____

_____

_____

_____

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Knowledge of vegetation is important for assessment of wetland conditions.

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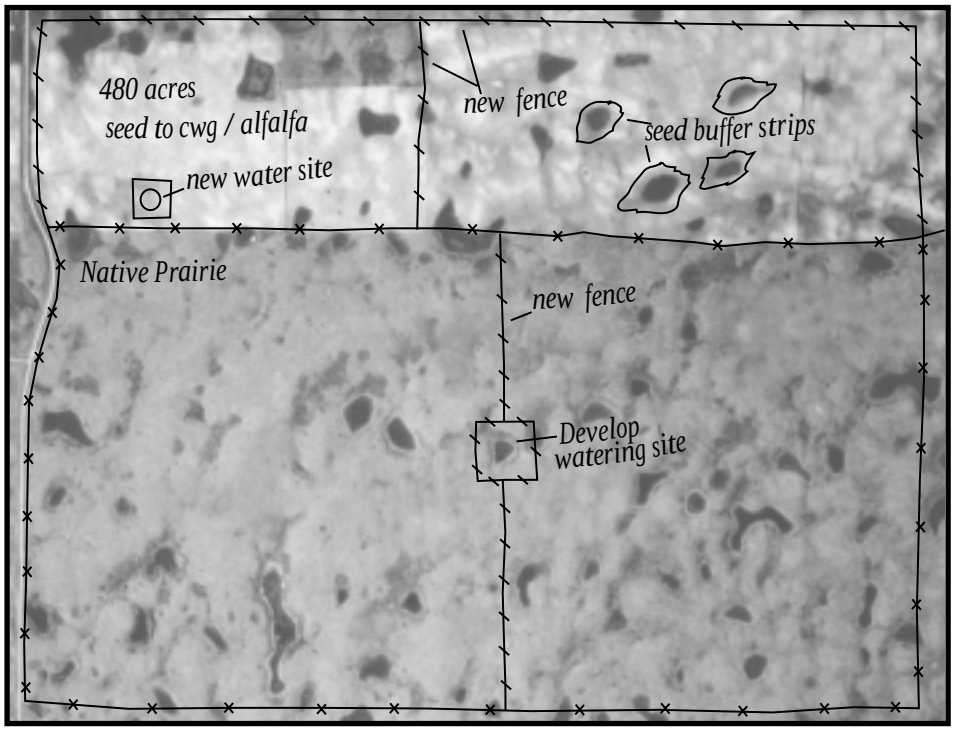
Willows are species that are adapted to wet conditions.

Sample Management Plan



Goals

1. Improve cattle distribution and reduce impact on wetland vegetation.

2. Maintain 150 cow/calf herd.

3. Maintain pasture in good condition.

Plan

1. Convert 240 acres of cultivated land.

2. Fence three miles around new seeded land.

3. Cross fence native prairie into two fields based on wetland density.

4. Seed buffer strips on remaining cultivated land and fall graze stubble - or spring graze summerfallow.

5. Develop water systems at two locations.

6. Graze tame pasture - then native - then stubble.

Your Management Plan

Your Goals

1. _____
2. _____
3. _____
4. _____
5. _____

Plan Implementation

1. _____
2. _____
3. _____
4. _____
5. _____

Notes

STEP 2. DEFINING VALUES, OBJECTIVES AND GOALS

Clearly defining what you value about your wetlands and what your management objectives are, is necessary to develop an effective management plan. Your values and objectives will help you set realistic management goals. Your goals will relate to your assessment of your wetland and upland resources. These goals will provide a sense of direction, guide the actions you need to take and are a basis by which you can measure success.

Saskatchewan landowners are as diverse as the wetlands. Everyone will have his/her own reasons for conserving and protecting wetlands. Some of the more common reasons are:

- Livestock forage
- Water for livestock or other uses
- Salinity and erosion control
- Wildlife habitat
- Balance of wildlife and livestock
- Recreational opportunities and aesthetics

If resources and time are limited, you may want to prioritize your values and objectives and split your goals into short- medium - and long-range so that you can work at the most important first. Once this is completed, you can work at finding solutions and strategies.

STEP 3. MANAGING YOUR FARM OR RANCH IN POTHOLE COUNTRY

Agricultural producers are the largest group of wetland landowners. The majority of wetlands exist as part of an agricultural landscape and most management plans will reflect this. The information gathered in Steps 1 and 2 will assist you in deciding upon the best set of land-use and management practices for your particular situation and operation.

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Grazing management has a direct impact on wetland condition.

Many actions landowners take to protect and conserve wetlands involve not only the wetland but adjacent uplands. Managing your activities in these areas will benefit not only wetlands but protect the long-term productivity of cropland and pastures.

Following are management considerations for various land-use activities and landowner goals.

GRAZING MANAGEMENT AND WETLANDS

Wetlands found on range and pasture lands are valuable assets. Like other riparian systems, wetlands are often four to five times as productive as surrounding uplands. If grazed appropriately, wetlands and wetland margins produce large quantities of forage. Wetland sedges and grasses are palatable to livestock and make good quality hay. Periodic flooding and groundwater movement keeps these areas productive and excellent sources of late-season forage and hay, even during droughts. Although wetlands might cover only a limited area of rangelands, their potential productivity warrants special attention to their specific management needs.

Case study: Elfros Grazing Co-op

When the Elfros Grazing Co-op implemented a pasture rotation based on wetlands - the benefits to livestock producers quickly became evident.

Henry Bzdel, a rural municipal councillor who serves on the pasture committee, said the development of offsite watering systems was just one of the improvements to contribute to the health of the cattle.

"This is great! Before, the cattle just drank from the creek and sloughs. Now the cattle are out of the muck, there's less problems with hoof rot, and the udders stay clean for the calves," said Bzdel.

Pasture manager, Stacey Oliver, said he noticed the cows prefer to drink from the watering site. "They'll walk a long ways for that water," he said.

According to Bzdel and Oliver, the new grazing plan has not only benefitted the livestock - but it has made the job of managing the cattle easier as well.

The Elfros Grazing Co-op leases a 2,500 acre pasture which is largely comprised of marshes and saline lowlands. It is situated near Little Quill Lake in central Saskatchewan, which is part of the Western Hemisphere Shorebird Reserve Network.

In the past, pasture riders found the task of checking cattle was often difficult. Not only were cattle scattered throughout a large area divided by wetlands, the boggy soils made the terrain difficult to cross - even by horseback.

Poor livestock distribution and overstocking also resulted in parts of the pasture being overgrazed. Without adequate rest within this pasture, problem weeds such as gum weed and foxtail barley had been moving in on dominant species such as salt grasses, northern reed grass, slender wheat grass and Kentucky blue grass.

"The best grass was overgrazed and the cows wouldn't eat the poor stuff. So all of a sudden weeds start taking over," said Bzdel. Oliver added, "But now, we can move the cattle to the grasses that are good at a certain time of year."

So how did they do it?

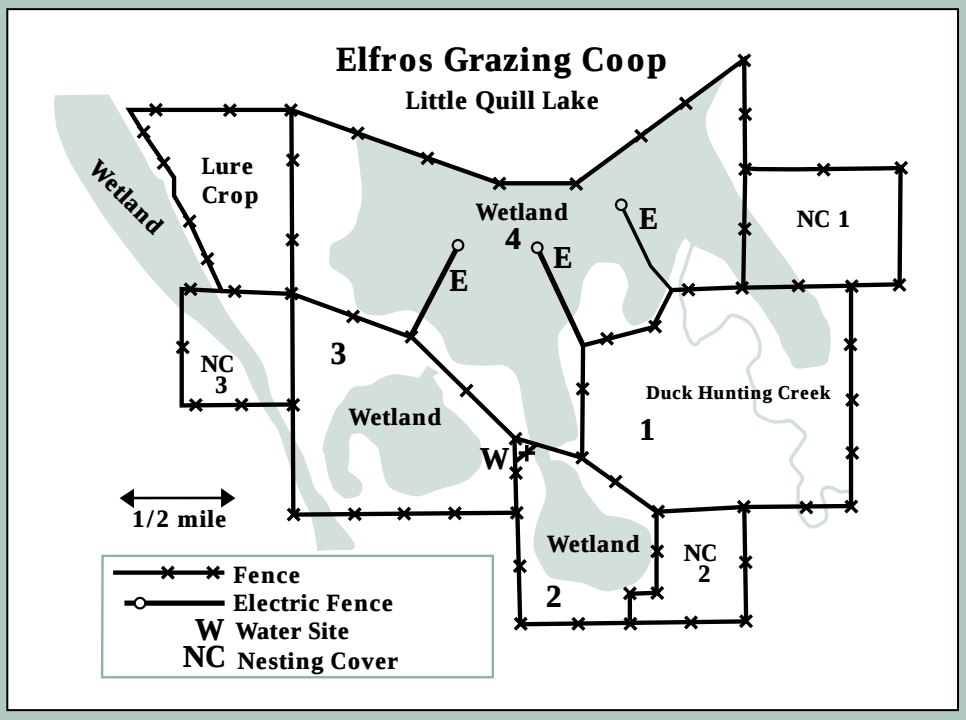
In 1995, the Saskatchewan Wetland Conservation Corporation conducted an assessment of the pasture. Tom Harrison, rangeland specialist for the Wetland Corporation, said the unique features of this pasture and the surrounding area provided the framework for the grazing plan that was implemented in 1996. "It's a real mosaic of habitat," said Harrison. "It's got a little bit of everything. One wetland, which is permanent, attracts waterfowl. Another, which is only temporary, attracts shorebirds. On top of this, it includes riparian areas, native pasture, tame pasture and adjacent cropland."

This is what they looked at:

- A large dam built by Ducks Unlimited in the 1950s was reconstructed in the early 1970s. It created a large wetland at the north end of the pasture. During peak water levels, it overflows into Little Quill Lake.
- From the east side of the pasture, Duck Hunting Creek drains into the large wetland near Little Quill Lake.
- Dikes and dams were used to create two other wetlands. While one is adapted for shorebirds and may dry up, the other, which attracts waterfowl, always has water in it.

To manage these areas, the existing pasture was split into four main fields and grazed with a once over rotation.

"One field was basically established around the creek; one field was around the shorebird wetland; one field was around the waterfowl wetland and one around the big wetland," said Harrison.



The Elfros Grazing Coop Pasture Plan

By incorporating adjacent nesting cover fields owned by Ducks Unlimited Canada - as well as a lure crop belonging to Saskatchewan Environment and Resource Management - the size of the pasture increased to 3,000 acres.

The planted nesting cover fields had never been grazed because they were seeded for the purpose of providing waterfowl habitat. The lure crop, on the other hand, is used to attract waterfowl during harvest. The cattle are allowed to graze this field when most producers in the area are finished combining.

Noting that the addition of these fields has reduced the impact of livestock around the big wetland, Bzdel said, "That has taken the pressure off our existing pasture. I believe that's why it's recovering as fast as it is.

"The north side of the pasture is a tremendous nesting area. It's kind of a lowland and it's wet. It's not a very good pasture for the simple fact that the cows are walking in the mud. When Ducks Unlimited told us we could use some of their quarters in exchange for resting some of that nesting land - it worked out well."

Other changes which contribute to the pasture's improvement include a reduction in the stocking rate and a shortened grazing season. At the present time, 200 cow-calf pairs occupy the pasture from June 1 to October 1. In the past, cattle grazed continuously from late May until November.

From a range management standpoint, the vegetation is improving. After three years of monitoring, there has been good recovery. "While we found there haven't been changes in species composition - there's big increases in the amount of plant litter that's out there. There's less bare soil. So overall, there is a trend toward improving the health of the pasture," Harrison said.

Bzdel concluded, "The people who had cattle in there said they came out in good shape."

Saskatchewan Wetland Conservation Corporation

Manager, Stacey Oliver and R. M. Councillor, Henry Bzdel are happy with the pasture improvements.

Keeping wetlands healthy and productive requires producers to manage the use of wetland plant communities by grazing livestock. Preferably, this will be part of a larger grazing system which also includes upland pastures. Good management of grazing lands will optimize use of forage resources while protecting the health of pastures. The benefits of well-managed grazing systems include: improved forage production and range condition, increased livestock gain and economic return, better wildlife habitat, and protection of soil and water quality.

Controlling the timing, intensity and frequency of grazing is necessary to maintain wetland and pasture health. Management considerations for livestock producers who are grazing pastures with wetlands include:

i) STOCKING RATES AND CARRYOVER

It is important to balance forage production with livestock use and nutrition requirements while leaving sufficient carryover to maintain plant and ecosystem productivity. Carryover maintains plant vigor, protects the soil, conserves moisture and provides cover for wildlife. Overgrazing results in reduced productivity and promotes replacement of desirable forage plants with unpalatable and less productive grazing - resistant types.

When setting stocking rates, make sure they are based on the area which is actually grazed. Slope, aspect, plant communities, type and class of livestock, and distance to water - all affect grazing patterns and can result in uneven or patchy use by livestock. The varied environments present in rolling pothole country requires extra monitoring to ensure overgrazing is not occurring in parts of the pasture. Wetlands are especially attractive to livestock during the warm summer months.

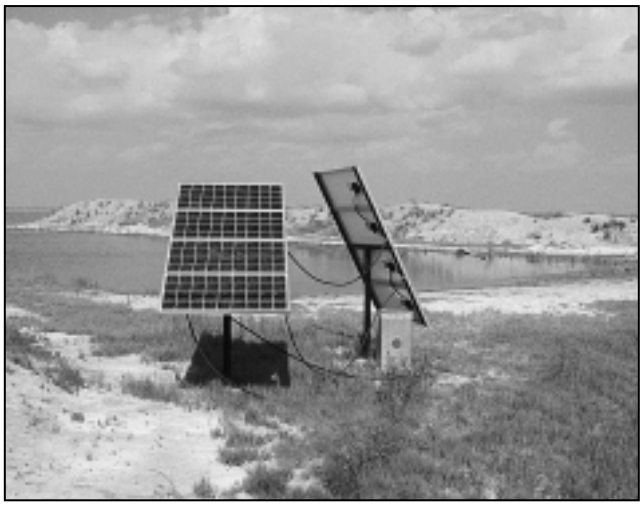
Temporary and seasonal wetlands usually have an abundance of green, palatable forage at this time. Monitor these areas to make sure they are not being overused. If grazing pressure is not well distributed, adjust stocking rates accordingly or take steps to improve distribution. Carryover required in wetlands depends on the grazing season. If wetlands are grazed early in the year and allowed rest before autumn, the moisture present will usually allow some regrowth. If wetlands are grazed during late summer, more carryover is required. Heavy grazing during late summer without sufficient time for regrowth can deplete plant carbohydrate reserves, weakening plants. Grazing wetlands later in fall, after plants are dormant, is another option. In all cases, the goal is to ensure that sufficient plant material remains to protect soils and trap snow before winter sets in.

ii) ALTERNATIVE WATERING SITES

Concentrated livestock traffic associated with watering can destroy wetland vegetation reducing productivity. Manure and waste in water lowers water quality and reduces livestock gains. In addition, livestock can be reluctant to wade through muddy areas to drink and moist conditions promote foot and udder problems.

Some alternatives to direct access to wetlands for watering include:

- Fence large, permanent wetlands and provide water to troughs away from wetlands with wind, solar or electric pumps. Recent research has shown that pumped water from wetlands or dugouts can increase livestock gains by as much as 35 percent. In most cases, fencing all wetlands is not practical or necessary, as not all wetlands will be severely impacted by livestock. Observe livestock behavior and focus on those wetlands which are heavily used. Once alternative watering sites exist, livestock will prefer them and traffic around wetlands will be reduced.
- If cost of pumps or additional wells and dugouts is prohibitive, construct compacted, graveled access ramps to wetlands. Livestock will normally use the compacted areas rather than wade through mud and water.



Saskatchewan Wetland Conservation Corporation

Solar or wind can be used to provide power in remote locations.

Denis Huel

Pumping water to troughs can increase livestock gains by as much as 35 percent.

Ducks Unlimited Canada

Access ramps must have a solid base.

Case study: Livestock Watering Systems

The Issue

The most common type of watering systems for grazing livestock across the province is access to open water, be it dugout, slough, lake or creek. The principle reason for this is it is thought to be inexpensive and maintenance free. However, over the long term, this is probably not the case. Livestock have significant impacts on soil and vegetation around water points when free access is allowed. With unrestricted access, livestock can destroy vegetation resulting in erosion and loss of wildlife potential. Siltation of water sources and deposition of urine and dung result in reduced water quality for both livestock and wildlife - all of which costs the producers in terms of lost livestock production and increased site maintenance. Society also loses in terms of reductions in wildlife habitat and surface watering quality especially when the watering sites are sloughs, lakes or riparian areas.

Al Foster

Laneway to livestock watering point.

The Solution

The solution to this issue is to provide high quality water for livestock by more environmentally friendly methods. Numerous methods are presently available to the province's livestock producers. Solar, wind and animal powered systems enable the fencing of the water source for protection from livestock. Gravel pads allow cattle to drink directly from the water body but provides an area of solid footing with minimal disturbance to the water body.

Cattle Watering Points

When given the option, cattle will tend to water at sites with a solid base that will provide good footing. Access ramps can be built out into the water body using compacted pit run gravel. It is important to excavate the ramp back from the water body far enough to reach firm ground. If there is not a suitable till or clay base (i.e. unstable organic soils) then plastic webbing material can be used to hold the gravel in place and prevent it from sloughing into the water body.

Lister Pumps

Lister pumps are designed to allow cattle to pump water for themselves. The animal uses its nose to push a lever that pumps water into a small water bowl. Lister pumps are self-priming and deliver one quart of water for each stroke of the lever. Therefore, in some situations an adult animal may need to make 50 or more pumps per day to meet its water requirements. For this reason it is important that one pump be available for every 25 adult animals. Animals may need to be trained to use the pumps, possibly by keeping the bowls full during the training period. For larger herds, access should be maintained to an alternate water source until all cattle are familiar with the pumps. Calves will have difficulty using these pumps and will need to drink with the cow. A metal pan can be placed under the pump to collect spillage and provides additional water for calves.

Al Foster

Lister pumps can provide water for 25 cows.

Solar and Wind Powered Systems
Solar or wind powered pumps can be used instead of electric or gasoline powered pumps to move water from a water site to the animal. When considering the use of these pumping systems, it is important to select a system that will meet the demands of your herd. Pumping to a storage reservoir with a gravity feed to a trough equipped with a shut off valve is recommended. Two to three days reserve capacity is recommended in case of equipment failure or during peak demand periods. Where pumps work continuously, a return line should be installed to return overflow water from the reserve or trough back to the water body.

Solar Pumps
Solar pumps are available in a variety of capacities. They use an array of solar panels to convert sunlight into electrical energy. These solar panels can be used to power the pump directly and can also be used to charge a number of batteries. The batteries will store energy to pump water during periods of overcast skies or if there is a problem with the solar panels. These systems are quite reliable but are expensive relative to other water systems.

Wind Powered Pumps
Wind powered pumps have long been used to pump water from wells and dugouts. More recently, windmills that use compressed air to power a floating diaphragm pump have been used to supply water to smaller herds. It is important to have storage tanks and/or extra trough capacity with wind systems due to prolonged calm periods. Windmills should be placed in unsheltered locations away from trees or buildings. On top of dugout spoil piles is often a preferred site.

Water and Wildlife
Watering points designed for livestock use can also include special considerations for wildlife. For example, a dugout which is terraced and fenced will provide habitat benefits to waterfowl. Instead of a steep slope, the gradual incline of 'steps' will promote the growth of a wider vegetation fringe.

Accompanying water sites such as troughs can also be made wildlife friendly. To prevent smaller species such as songbirds from drowning, an 'escape ramp' or perch can be made from a rough material such as wood to provide better footing.

Conclusion
Water quality has been shown to have significant impacts on livestock production. Part, if not all the cost of implementing an alternative watering system can be recovered in improved gain or production per acre of pasture, extending the lifespan of water site, improved wildlife potential of the site, and elimination of livestock deaths due to drowning or miring in shoreline mud.


Al Foster
Solar panels


Al Foster
Watering tanks

iii) REST

Plants require rest from grazing during the growing season in order to rebuild reserves and maintain productivity. Rest can be provided by deferring grazing, rotational grazing, and creating alternative pastures.

Valuable forage plants which are weakened by continuous grazing may be replaced by less desirable species, reducing pasture productivity. Productive shrubs, sedges and grasses in wetland margins are often replaced by foxtail barley or other poor-quality forage plants if these areas are continually overused.

iv) DEFERRED GRAZING

Defer grazing until summer. Soft soils around wetlands are more sensitive to trampling damage in spring when they are very wet. Deferred grazing of pastures also provide better habitat for ground-nesting birds. However, if wetlands are lightly grazed early in the season, there may be sufficient regrowth for a second grazing later in summer.

Deferring grazing allows important forage plants to complete their growth cycle before grazing. If needed, seed some previously cultivated areas to tame forages and graze these pastures first. Tame forages are more productive early in the season and are more tolerant of grazing at this time.

Case study: Crystal Springs Pasture

"As far as I can see, livestock and wildlife benefit each other."

Those are the words of Jim Moore, manager of the Crystal Springs Community Pasture which is located south of Birch Hills in north-central Saskatchewan.

Since a multiple use management system was implemented in 1994, Moore said the 5,280 acre pasture has shown a major turn around.

While improved utilization of the pasture provides livestock benefits in the form of forage and water quality - it also provides valuable habitat for wildlife. The poplar bluffs, wetlands and open areas of grassland in this aspen parkland region attract a diverse array of species.

"The cattle come out in better shape and the amount of wildlife and birds that are out there is unreal," said Moore.

So how was this accomplished?

A three phase management plan revolving around a planned grazing system, wetland restoration and the development of livestock watering sites was implemented through the cooperative effort of pasture managers, patrons, Saskatchewan Agriculture and Food, Ducks Unlimited Canada and the Grazing and Pasture Technology Program.

According to Phil Curry of Ducks Unlimited in Melfort, when the large bush pasture was cleared and seeded to a mixture of tame grasses in the 1960s, some of the water drained away.

In addition, with only a limited number of watering sites and an uneven distribution of cattle, the impact of livestock became obvious.

"The few wetlands that were there were severely degraded," said Curry, noting valuable nesting habitat was affected when cattle congregated in these areas.

Ducks Unlimited Canada

Aerial view of Crystal Springs Pasture

Hummocks developed in the wetland margins and undesirable grass species took root in areas that were over grazed. In the meantime, areas that were under utilized were subject to aspen encroachment.

"This reduces the carrying capacity of the pasture," said Curry.

To provide water for livestock and improve wildlife habitat, wetlands encompassing 130 hectares of the pasture were restored. "We created 91 wetlands with little dams and dikes and we recreated wetlands that had been drained," Curry said.

In addition, offsite watering systems were added to a few of the major wetlands and dugouts that were fenced to exclude cattle. Pleased with the changes, Moore said, "The cattle can walk a short distance in any direction and they've got water."

Instrumental to the improvement in livestock distribution, was the development of watering sites which complemented the new grazing system.

By using 13 kilometres of cross fencing, the 11 existing fields within the pasture were divided into 20 paddocks. This not only increased the number of fields - it created fields that were more uniform in size. Fields that previously ranged from 65 to 390 hectares in size are now closer to 120 hectares.

Taking into consideration there are approximately 1,060 adults and 700 to 750 calves in the pasture, the number of herds were also reduced from six to five. A once-over, four paddock rotation is used for each herd from mid-June until October.

"On average, the cattle stay in each paddock for 20 to 30 days," said Moore, adding that each paddock has a full year of rest before it's used again.

While this rotation allows for the life cycle completion of grassland and wetland vegetation, it also benefits waterfowl during the critical nesting period which ends by late July. Since two out of the four paddocks in each rotation are not used until mid summer, grazing is deferred on approximately 1200 hectares.

In the form of improved forage production - this rotation also provides a direct benefit to livestock producers. The grazing period is extended by at least another two weeks. Moore said, "Even in September, you're taking the cattle into a field that has never been grazed. I believe this truly prolongs the longevity of your grass and the longevity of wildlife habitat."

Resting the grass, allowing carryover of residual cover, improving livestock distribution, reducing livestock disturbance in nesting areas and allowing wetland vegetation to recover provides multiple benefits.

"People have been very pleased with it. We continue to do monitoring of wildlife and grass species and have found it's really quite diverse. These areas are really attractive to grassland songbirds, waterfowl and woodland birds such as the vesper sparrow and the blue winged teal," said Curry.

v) WETLANDS AND GRAZING ROTATIONS

Constructing fences and separating large pastures into smaller management units or paddocks can improve pasture productivity, facilitate livestock handling, and allow greater flexibility in use of the grazing resource.

If diverse pastures are divided into paddocks according to landscape and management needs, each area can be used at the optimal time. Seeded, native, and paddocks with wetlands can be grazed in a complementary fashion.

When setting up a grazing system in pothole country, location of wetlands is an important consideration. Successful rotations require frequent monitoring of pastures to determine when livestock must be moved. Because wetlands will likely be the most productive areas of pasture, management decisions based on wetland use may be best for overall productivity.

Saskatchewan Wetland Conservation Corporation

Design the rotational grazing plan based on wetland location and density.

A NOTE OF CAUTION

Several plants growing in or near prairie wetlands are poisonous to livestock. Seaside Arrow-Grass (Triglochin maritima) and Western Water Hemlock (Cicuta douglasii) are the two most likely to be encountered. Seaside Arrow-Grass is a grass-like plant with solid leafless stems often found adjacent to saline wetlands. Western Water Hemlock is found in marshy sloughs and streambanks and is the most poisonous plant of the area. It is similar to water parsnip, which is not poisonous.

F. A. Switzer

Seaside Arrow Grass

F. A. Switzer

Western Water Hemlock

CONVERTING CROPLAND TO FORAGES

Saskatchewan has many areas of cultivated cropland where production of cereals and oilseeds has become increasingly marginal, economically and ecologically. Low yields, low prices, high costs and the loss of the Western Grain Transportation Act subsidy are forcing agricultural producers to rethink production strategies.

In some regions, because of light-texture soils or hilly terrain, years of summerfallow and cereal crop production have greatly reduced soil quality. Extensive wind and water erosion has left soils degraded and depleted of basic plant nutrients. Continued crop production is difficult, risky, and expensive. In these cases, sustainable low-cost production of forages and livestock may prove more viable. When managed appropriately, marginal cropland converted to forage and livestock production can improve economic returns while conserving wetlands and wildlife habitat. This can also protect soils, groundwater supplies, and reduce greenhouse gas emissions.

MANAGEMENT OF ANNUAL CROPS AND WETLANDS

Cultivating land with potholes and sloughs presents special problems for both crop producers and wetlands. Although the values and benefits of wetlands to society are well recognized, individual landowners may have difficulty realizing a direct benefit from wetlands unless they are drained and converted to crop production. Because of the extensive nature of agricultural production in the province, agricultural activities have had a large impact on wetlands.

Because wetland ecosystems can be damaged by production practices that occur on nearby cropland, management practices which minimize negative effects are beneficial.

i) BUFFER STRIP AND INTERPOTHOLE SEEDING

A buffer is an area of permanent vegetation that surrounds and protects wetlands. A 10 meter strip between the wetland vegetation and the cropland should be considered the minimum width of a buffer. However, the actual width required to be effective depends on the size of wetland, topography, soil characteristics, salinity, and crop production practices. Wider buffers are required if soil is prone to erosion, salinity is likely, or summerfallow is frequently used in rotations.

If the buffer is large enough, it is then feasible to manage the buffer area separately for hay or other products. On mixed farms, buffer areas can be a valuable and stable source of hay and forage for livestock that is less susceptible to yield variations caused by drought.

When wetlands are clustered in close proximity, consider seeding the areas connecting the wetlands to forages. This will reduce the amount of equipment turning and overlap, increasing efficiency of field operations in other areas, provide increased and consistent forage production, while maintaining wetlands.

Ducks Unlimited Canada

Seeding forages around a pothole

Case study: A Changing Landscape

Across the prairies of Saskatchewan, the landscape has been painted by the brush of civilization. When settlers first arrived, waves of grass swept across a sea of rolling hills. Then, wheat became king and those waves turned to prairie gold. From these crowns of seed, an agriculture industry - and a way of life - were born. But the landscape is changing again.

In recent years, cropland conversion and permanent cover programs have been helping farmers seed their cropland to perennial forages. While early programs were rooted in the prevention of soil erosion, those developed in later years were created for reasons which include economics, lifestyle choices and wildlife habitat.

For Ken and Shawna Camphaug of Caronport, Sask., a cropland conversion program is helping them build a future in agriculture for their children, Michael and Shannon.

"We had marginal land that we wanted to switch back to pasture and we were also expanding our cattle operation to include our son," said Shawna, adding two of the five sections they farm are located near wetlands.

While the decision to seed forages may be a lifestyle choice for producers such as the Camphaugs - it may be an economic one for others.

Tom Harrison, who coordinates cropland conversion activities for the Saskatchewan Wetland Conservation Corporation in Regina, said the potential of forages as a cash crop may be more appealing - and more feasible than large scale farming which requires costly equipment. "More and more farmers have said to me that they just don't see the economics of grain farming anymore. This is an option to keep farming but in a different manner," he said.

"Under government programs such as the Homestead Act in the 1800's, the Crow Rate and Crop Insurance, there was a lot of land that was broken and farmed that probably never should have been because it was marginal. Now we're trying to back pedal a bit. While we're never going to restore it to native prairie, at least maybe we can get some grass on it." And that's what Bengough area farmer William Haugen is doing. Haugen, who farms nine quarters, said a cropland conversion program is helping him change to a livestock based operation.

"I'm going to go to all cattle now. I did have a mixed farm but the way they're pulling the rail lines out and having to truck grain a long distance I'm going to switch," he said, adding that by growing his own hay, he hopes to expand his herd from 100 to 125 or 150 head.

Elk producer Barry Haubrich of Hodgeville and his partner Keith Kleckner made the same decision in 1996. To maintain a herd of 500 animals, they seeded 880 acres to a mix of meadow brome and alfalfa in 'pothole country' near Coderre, Sask.

"We were expanding our elk operation so the cropland conversion program was perfect for us," said Haubrich. "The land was kind of hilly and marginal and there were lots of sloughs. There were quite a few stones so it just worked out better being put back into grass than it did for farming purposes."

Saskatchewan Wetland Conservation Corporation

Shawna Camphaug is converting most of their marginal cropland to pasture and hay.

ii) MAINTAIN SEASONAL AND TEMPORARY WETLANDS

Small, temporary, and seasonal wetlands are important groundwater recharge areas because they allow slow seepage into the ground and are typically the most productive wetlands. Keeping them in a natural state will protect local water sources.

Since cultivated wetlands are low-lying, they are usually the last areas to be seeded. Late seeding and the danger from frost or flooding by heavy summer rain makes crop production in seasonal wetlands risky. The impervious soil structure below many wetlands results in agricultural soils with low long-term productivity. Instead of draining and cultivating, consider limited improvements which allow them to be efficiently hayed. Sedges and grasses growing in temporary wetlands and wetland margins are productive, palatable to livestock and produce good quality hay at low cost. Periodic flooding and groundwater movement keep these areas productive.

Saskatchewan Wetland Conservation Corporation

Re-grassing natural runways prevents gullying and erosion.

iii) CONSERVATION TILLAGE

Cropping practices that reduce erosion and conserve soil organic matter also reduce the amount of soil, fertilizers and pesticide residues carried to wetlands in run-off. Erosion of soil during spring snowmelt and heavy rain continues to be a serious problem in many areas.

Seeding water runways to grass will prevent gullying and erosion in these areas. Beside protecting wetlands, limiting erosion from croplands will also protect soil quality and productivity.

Ducks Unlimited Canada

Seeding directly into stubble reduces erosion.

iv) Winter Cereals

Direct - seeded winter cereal production is another cropping option in areas that are subject to periodic flooding. Winter cereals reduce tillage and pesticide use. In addition, existing stubble and emerging winter cereal crop protect the soil and provide much needed nesting habitat for waterfowl and ground - nesting songbirds.

v) SEEDING EROSION-PRONE OR SALT-AFFECTED SOILS

Seeding marginal lands to forages to use for hay or grazing provides wildlife habitat and prevents further soil deterioration. Make sure to choose saline-tolerant species where necessary.

Saskatchewan Wetland Conservation Corporation

Seeding winter wheat is compatible with nesting habitat for waterfowl.

Saskatchewan Wetland Conservation Corporation

When wetlands are close together, the interpothole areas can be converted to forages to improve cropping efficiency.

Case study: Seeding Straight

With its rolling topography and many depressions, the prairie pothole region of Saskatchewan is known for its unique landscape. But for farmers - these unique characteristics also create challenges in the field. To achieve the full potential of their cultivated acres, producers maneuver their equipment into small corners and pockets of land. As a result, areas which have already been tilled are worked again.

By "farming the landscape," however, some farmers have found a more productive solution. Patches of perennial vegetation established between wetlands can be used to square up fields.

While this improves efficiency of the farming operation, it also provides benefits in the form of weed control and moisture retention. As well, fields which are prone to soil erosion and salinity also become more productive.

For Felix and Bernice Juzyniec, who farm six quarters in the Whitewood area, the establishment of forages directly benefits their livestock operation.

"I've been haying it but this year I'm going to pasture it," said Felix.

In the fall of 1994, the Juzyniecs seeded a total of 120 acres through a cropland conversion program. By targeting areas of their property which had more potholes, they seeded grass in 40 acre patches on three different quarters.

"There's quite a few sloughs and there's higher land between the sloughs," said Felix.

Satisfied with the success of this project, the Juzyniecs decided to convert more of their cropland to forages.

"I want to semi-retire and keep some cattle around," said Felix.

WETLAND DRAINAGE

Landowners drain wetlands because they expect an economic benefit, either through increased production or decreased costs. Converting wetlands to crop production increases cultivated acreage and can improve efficiency of field operations. However, the negative impacts of wetland drainage are many and include:

- Costs of converting wetlands to crop production often exceed the value of added production
- Loss of water from the prairie water cycle
- Reduction of groundwater supplies
- Reduced water quality
- Increased flooding in downstream areas
- Increased erosion
- Increased salinity
- Loss of wildlife habitat

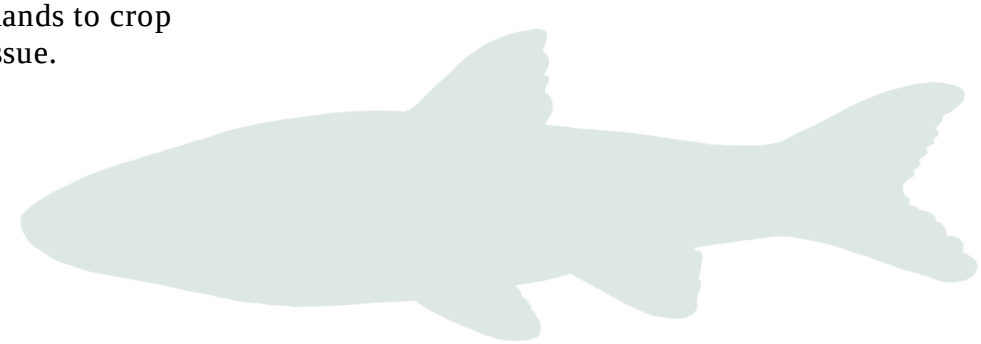
The real costs of drainage include not only the direct monetary costs of clearing, breaking and constructing a drainage network but also indirect costs such as reductions in productivity of other areas due to increased soil salinity, erosion and lowered water tables. Also important is the impact on downstream recipients of drainage water. When examined carefully, the total costs of converting wetlands to crop production often exceed the benefits landowners receive from the additional cropland, especially if steps are taken to alleviate the effects of the extra water on downstream landowners. When considered with other effects of draining, it is evident that converting wetlands to crop production is not a simple issue.

Due to potential impacts and possibility for conflicts, individuals contemplating drainage of wetlands are required to first obtain approval from Sask Water, prior to constructing drainage works. See Appendix 3 for information on approval for drainage works.

The Cost of Draining Wetlands

Drainage of wetlands can be uncontrolled or controlled with the use of structures. In most cases, uncontrolled drainage will result in excess runoff onto neighboring properties. It is therefore, necessary to take steps to construct structures which reduce the impacts of runoff.

An evaluation of water management options for landowners was conducted in Alberta in the early 1990's. In all projects analyzed, the controlled drainage projects resulted in a net increase in acreage available for crop production without detrimentally affecting neighboring land. However, it was determined that even with subsidies, controlled drainage projects were not economically feasible. In fact, the actual benefit to cost ratios of the projects ranged from 0.2 to 0.5, even with government financial assistance. This means that for every dollar the producer spent on drainage, his return was only 20 to 50 cents total over a twenty year period.



When calculating whether or not drainage will financially cost you, there are several factors to consider:

1) Capital costs

2) Operating costs

3) Borrowing costs

4) Property tax implications

5) Productivity increases

6) Crop quality

7) Downstream or socio impacts

8) Wildlife impacts

9) Reflooding risks with summer rains

Calculate your cost of draining. Are you going to make any more money by draining your wetlands?

Added Revenue:

Gross revenue: estimate the value per acre of the crops produced from the new lands available as a result of drainage activities over a twenty year period. (Remember to use your planned crop rotation including summerfallow, and stubble crops over the next twenty years).

Cost reduction: estimate the value from increasing the efficiency of field operations which result from less overlapping and less turning over a twenty year period.

Added Costs:

Cropping costs: estimate the cost per acre of putting in the crop on the new lands following your planned crop rotation over a twenty year period (Remember to add all costs including all inputs and operating costs, crop insurance, cost of borrowing, increase in taxes from a re-assessment, etc.)

Capital costs: estimate the cost of drainage, breaking, spraying, rock picking, tillage and construction of control structures such as berms, weirs, dikes or chokes amortized over a twenty year period. Loss of production: estimate the loss of hay production from not being able to bale the sloughs over a twenty year period.

Divide your estimated total additional revenue by your estimated total additional cost. If this value is less than one, you are losing money as a result of drainage and clearing activities.

Gross Revenue _____

Cost Reduction _____

Total Additional Revenue **A**

Cropping Cost _____

Capital Cost _____

Total Additional Costs **B**

If $\frac{A}{B} < 1$ - You are losing money by draining

MANAGING FOR WILDLIFE

Providing wildlife habitat may be an important management objective for some landowners. Often, looking after the health of the land and water will in itself, improve wildlife habitat.

Because of the universal requirement of water for life, wetlands are focal points on the landscape for a variety of bird and animal activities and are a good starting point when conserving and creating wildlife habitat. Enhancement projects centered on wetlands provide habitat for many species of wildlife.

Many areas lack sufficient grassland nesting cover for ground-nesting birds such as sharp-tailed grouse, songbirds and some ducks. This shortage of cover forces birds to nest in poorer habitat or concentrates nests making it easier for predators to locate and destroy them. Ducks such as the mallard and the northern pintail have been most affected by upland habitat loss. In regions with poor nesting habitat, success of duck nests can drop to below 15 percent. While the amount of upland habitat necessary varies with the quality, a ratio of three upland hectares to one wetland hectare is considered good. More habitat may be required if it is poor quality, or grazed and hayed annually. Frequently creating quality nesting habitat is the easiest and most productive habitat improvements landowners can make.

To enhance wildlife habitat quality, consider the following management practices:

- Ensure adequate buffers of permanent vegetation are present around wetlands. If a buffer is not present, seed an appropriate mixture of forages and/or trees and shrubs.
- Avoid cultivating or draining temporary and seasonal wetlands. If needed, these can provide a late summer haycut.
- Avoid cultivating or clearing any remaining natural areas.
- If not present, provide upland nesting habitat by seeding some cultivated land to forage or hay.
- Consider planting winter wheat or fall rye as these do not require spring tillage operations that disturb and destroy many duck nests.

Saskatchewan Wetland Conservation Corporation

Man - made nests such as bales or tunnels can reduce predation.

- If upland nesting habitat for waterfowl cannot be provided by natural areas or seeded perennial forages, nesting platforms or structures can provide sites for some duck species.
- Implement a planned grazing system such as a rest/rotation which allow some areas to remain undisturbed each year.
- Restrict livestock access to large permanent wetlands. If wetlands are used as water sources, pump water to sites away from the wetlands or construct compacted access areas to direct cattle movements to limited portions of the wetland.
- Make sure enough carryover is present after the grazing period to protect soils and provide cover.
- If not already present, plant trees and shrubs to provide food and cover for upland birds and animals.
- Construct islands of rock and soil in larger shallow wetlands. These are used as nesting sites by Canada geese and other birds.

Saskatchewan Wetland Conservation Corporation

Ducklings hatched in a nesting area.

Ducks Unlimited Canada

Nesting area for waterfowl and other birds.

Denis Huel

Purple Loosestrife

PURPLE LOOSESTRIFE

(Lythrum salicaria) is an introduced plant with showy flowers that is occasionally planted as an ornamental by prairie gardeners. Although beautiful in the flower garden, purple loosestrife can escape and become established in prairie wetlands where it spreads aggressively, displacing native wetland plants. Because purple loosestrife is of little value to wildlife, the habitat potential of infested wetlands is destroyed. At present the plant is not yet common in Saskatchewan wetlands. However, it does occur in an increasing number of widely scattered sites throughout the southern part of the province.

There are no herbicides available to control purple loosestrife. However, biological controls in the form of insects which attack the plants are available. Gardeners should be aware of the serious problem this plant can cause and destroy any purple loosestrife plants present in ornamental plantings.

If you find purple loosestrife in your wetlands, report this to your local Conservation Officer. If only a few plants are present, you may be able to eradicate the weed before it spreads. Dig out plants paying special attention to remove all roots, stems and leaves. Root pieces left in the ground will re-sprout and pieces of stem and leaves can root, forming new plants. Flowers produce viable seed by mid-summer, so it is important to remove plants before this time. If you suspect seeds are present, cut and bag the seed heads before moving the remainder of the plant. The collected plants should be moved to where they can be safely disposed of, either by burning or bagged securely in a dark plastic container and sent to a landfill.

Case study: Flushing Bar Saves Wildlife
As landowners, Grant and Julie Rourke of Morse, Saskatchewan feel a strong sense of responsibility for the affects of land use practices on wildlife which share their property. And that's why they use a flushing bar during the haying season.

"I haven't killed a duck since I put it on, and the year before I put it on - I slaughtered them," said Grant, who along with his wife Julie, uses the bar while cutting 100 to 120 hectares of alfalfa annually.

So what is a flushing bar?

Developed to reduce the number of birds killed during the nesting period, flushing bars are mounted on the front of the tractor. A series of chains which hang from the bar drag through the hay and scare ducks out of the mower's path. While nests may be lost, studies show up to 90 per cent of birds can be saved.

And that's good news for landowners such as the Rourkes.

"We have a lot of ducks," said Grant. "We're in the Missouri Coteau range so we have a lot of pockets of water - a lot of sloughs and it's very rolly. It's a real popular area for nesting and that bar just works super. It's a must."

But while the bar was designed to save waterfowl - the Rourke's are pleased to see that it protects other wildlife too.

"I think it works quite well overall. I've had fawns jump up right underneath it," said Grant, adding Julie feels the same way.

"Her favorite job is cutting hay and she just thinks the flushing bar is the greatest thing. We wouldn't go to the alfalfa fields without it."

And like many farmers who find that "necessity is the mother of invention", Grant also found a way to improve the flushing bar's effectiveness.

"I made a few little changes on mine. Instead of a single chain running all the way from the bar to the ground level - about three-quarters of the way down, I welded on another chain so they make kind of a racket. I've found that having a double chain at the bottom end really seems to help quite a bit."

In the meantime, while the Rourkes are already sold on the benefits the bar provides, they say its success hinges on the number of producers who are willing to use it.

"I think the biggest problem most landowners have is they look at it and think it's going to be a hindrance to them - it's not. It doesn't seem to be in the way at all. Once you've had it on for a day, it just seems like part of the machine," said Grant.

"And if they've got any feeling at all for wildlife, whether it's ducks or chickens or deer - it's a good idea."

Saskatchewan Wetland Conservation Corporation

Grant and Julie Rourke

HAYFIELDS AND WILDLIFE

Upland nesting birds such as songbirds, sharp-tailed grouse, pheasants and some ducks are attracted to the dense cover found in hayfields. Unfortunately many of these nests are destroyed, abandoned, or exposed to predators after haying operations. Birds and other wildlife are frequently injured or killed by swathers and mowers. Delaying hay cutting until mid-July allows nesting birds time to hatch their young and move them to safety.

Injury to wildlife can be reduced through the use of a flushing bar. Mounted on the tractor ahead of the mower, the flushing bar's chains drag the ground and flush birds and other wildlife away, before they can be injured. While the nest might be destroyed, the hens are saved and will often re-nest elsewhere.

Saskatchewan Wetland Conservation Corporation

Attaching a flushing bar to the mower-conditioner will scare the hens off the nest and allow them to re-nest.

NESTING TUNNELS

When upland nesting habitat for waterfowl cannot be provided by natural areas or seeded forages, artificial nesting structures can be placed within wetlands to provide nesting sites. While old basket-type structures were more readily accepted by Canada Geese, a new tunnel style is well used by mallards. When properly placed, these structures average a 70 percent use rate. In addition, nesting success is extremely high, exceeding 90 percent.

In selected areas, Ducks Unlimited Canada, cooperating with local branches of the Saskatchewan Wildlife Federation, will install and annually maintain these structures in return for an agreement by landowners that the wetlands will not be disturbed. Individual landowners can also obtain the structures directly. In return, they are responsible for supplying the structures with fresh straw each year before the waterfowl breeding season.

Saskatchewan Wetland Conservation Corporation

Nesting tunnels located in wetlands act to reduce predation.

RESTORING OR CREATING WETLANDS

Restoring a wetland that has been altered, damaged, or lost to cultivation and drainage can be rewarding for landowners. The process is sometimes as simple as filling in a drainage ditch, quickly restoring water to the wetland basin during the next run-off period. Seeds of many wetland plants remain viable in the soil for decades. Restoring water to a wetland basin will bring back most wetland plants.

It's possible to create a wetland where there was none before by excavating a shallow basin or constructing dikes to retain or collect run-off. Because soil texture affects the ability of the wetland to hold the collected water and the potential for salinity problems, careful site selection is important for the success of this type of project.

Creating a wetland which will be used by wildlife is more complicated than restoring a natural wetland basin and some guidance from wildlife biologists will likely be helpful.

Ducks Unlimited Canada

Ducks Unlimited Canada

Man made dams on runways can create watering areas for livestock and provide waterfowl habitat.

Case study: A Prairie Oasis

If you ask Fred and Margie Mackow why they developed a back flood project on their mixed farm near Chaplin, Saskatchewan - they'll tell you the answer is simple.

"We really love wildlife!"

By holding back spring runoff and creating a 20 hectare wetland which is flooded year round, the Mackows have provided an oasis for wildlife on the prairies.

"It originally started because we wanted to attract the wildlife," said Margie, adding the back flood has developed into a rewarding 'retirement project.'

"Because we wanted to slowly get out of farming, my husband thought we'll put in some grass," said Margie. "We also planted over 40,000 trees to help us bring in the wildlife as much as we can."

As a result, Fred is happy to see the grassland surrounding the new wetland is providing a source of income as a hay crop. For Margie, 'inhabitants' such as red-winged black birds, western meadowlarks, pelicans and blue herons are a natural complement to her fledgling bed and breakfast business; "Margie's Country Getaway."

So how did they do it?

In 1984, with assistance from Prairie Farm Rehabilitation Administration (PFRA), the Mackows developed a back flood from a springfed creek which flowed through their yard.

"Part of the fill of this back flood is by a spring that runs through the winter and forms ice fields. When they melt, they run into this back flood project of ours," said Fred.

While the Mackows can release the water by opening a flood gate - they have chosen to maintain the wetland for wildlife habitat.

To widen the diversity of wildlife attracted to the area, the Mackows provided additional habitat by planting trees.

"We contacted the PFRA Shelterbelt Centre in Indian Head to help us pick trees and shrubs that would benefit wildlife the most," said Margie, adding they established stands of buffalo berry, chokecherry, caragana, lilac and evergreens.

When Ducks Unlimited Canada became involved in the back flood project in the early 1990s, the Mackows also learned about management practices that would make their farming operation more 'wildlife friendly.' One that suited their needs in particular was Ducks Unlimited's delayed hay cut program.

"We cut our hay after July 15th so the ducks have time to finish nesting and move off," said Margie, noting the 240 hectares (600 acres) they seeded back to grass provides cover for more than just waterfowl.

"In fact, there were some elk on our hayfield here too along with coyotes, foxes and rabbits," she said.

As a benefit to their bed and breakfast business, the Mackows have also found the wildlife creates a focal point for visitors who are eager to see a variety of plants and animals.

For example, due to their close proximity to Chaplin Lake, a large saline wetland that has been recognized as a Western Hemisphere Shorebird Reserve Network Site, the Mackow's wetland also attracts shorebirds such as the American Avocet.

"It really helps me," said Margie. "We have birdwatchers that come here and just sit on the veranda at the house or walk down by the water and watch the birds."

Fred added, "We can watch the geese nest right from our window while we're eating breakfast."

"He put bales out there to attract the geese so they can nest there," said Margie, noting that she likes to join him in scattering grain around the wetland for the birds.

While this is a small part of maintaining the project, building these attractions for wildlife along with planting trees, seeding forages, delaying haying operations and becoming involved in ecotourism all contributes to what the Mackows value most about wetlands - an abundance of wildlife.

And that's what makes this back flood project a special treasure they're happy to share.

"There's nothing like being out in the country," said Margie. "Our guests are really enthused about it. It seems like a lot of these people are from the city and they don't get to hear these birds or see some of these things."

Saskatchewan Wetland Conservation Corporation

Fred and Margie Mackow - Chaplin Sk.

STEP 4.

MONITORING AND EVALUATING

The final step in a wetland management strategy will be a continuing one. After a management plan is implemented, continued monitoring is required to assess the effectiveness of changes in management practices. Re-visit your original assessment of your wetlands and determine if there is a change in wetland health or is there evidence that a change is taking place. This will give you some indication as to whether the plan has been effective and successful. Have short-term goals been met? Is progress occurring on the long-term goals? Are any adjustments necessary? Continued, periodic evaluation will ensure that your actions have the desired effects and that wetlands stay healthy.

PART 3. CONSERVING WETLANDS FOR FUTURE GENERATIONS

When considering long term protection of wetlands, landowners have several options. Implementing a management plan which keeps wetlands functioning and healthy is a first step to conserving wetlands for future generations.

Several other options are available to landowners. If a parcel of land has special wetland and wildlife significance, conservation groups may be interested in purchasing the land. Landowners can donate land directly to conservation groups and receive a charitable donation tax receipt. In other cases, special use agreements may be developed that compensate landowners for management decisions that directly benefit wildlife.

CONSERVATION EASEMENTS

Another option is a conservation easement. A conservation easement is a legal agreement between a property owner and a conservation agency which restricts the amount and type of development and land use allowed on a property. The exact nature of these restrictions depends on the landowner and conservation agency.

Easements can be granted for a specified period of time or in perpetuity. The easement is filed with the title and is binding on current and future owners for the term of the easement. An easement provides a method of protecting a parcel of land from what a landowner might consider undesirable land use or development, even after he/she no longer own the land. An easement could be filed to restrict wetland drainage or protect a natural area from cultivation or other development.

A conservation easement has some tax benefits and may be considered a charitable donation. For more information on conservation easements, contact any of the appropriate organizations listed in Appendix 5.

Saskatchewan Wetland Conservation Corporation

REFERENCES

The following is a list of references and publications containing useful information on wetlands and issues related to wetlands. Most are available from the agencies that produced them or can be obtained through local libraries.

CROP PRODUCTION AND SOIL CONSERVATION

Direct Seeding Manual. 1993. Prairie Agricultural Machinery Institute and Saskatchewan Soil Conservation Association.

Farm Management Facts.The Economics of Converting Wetlands to Croplands. Water Series No. 1. Saskatchewan Wetland Conservation Corporation.

Farm Management Facts. Making $ense of Salinity. Saskatchewan Wetland Conservation Corporation.

Soil Conservation Resource Directory. 1993. Canada-Saskatchewan Agreement on Soil Conservation.

Tillage Practices that Reduce Soil Erosion. 1992. Saskatchewan Agriculture and Food.

FORAGES AND LIVESTOCK GRAZING

Grazing Systems for Rangelands of Southern Saskatchewan. 1994. Z. M. Abouguendia and T.O. Dill. Saskatchewan Stock Growers Association/ Grazing and Pasture Technology Program.

Initial Stocking Rate Recommendations for Seeded Pastures in Saskatchewan. 1998. M.Tremblay and B.Kirychuk. Saskatchewan Agriculture and Food.

Managing Your Native Prairie Parcels. 1998 Saskatchewan Wetland Conservation Corporation.

Managing Saskatchewan Rangelands. 1990. W. Pyle and W. Johnson Eds. Saskatchewan Agriculture Development Fund, New Pastures and Grazing Technology Project.

Planning Aids for Balancing Forage Supply and Demand. Saskatchewan Stock Growers Association, Grazing and Pasture Technology Program.
Ranching for Conservation and Profit: Producer Experiences. 1999. Grazing and Pasture Technology Program.

Range Plan Development. A Practical Guide to Planning for Management and Improvement of Saskatchewan Rangeland. 1990. Z. M. Abougendia. Saskatchewan Agriculture Development Fund, New Pastures and Grazing Technology Project.

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Rejuvenation of Tame Forages: Southern Saskatchewan 1999. Grazing and Pasture Technology Program. Saskatchewan Agriculture and Food.

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Saskatchewan Forage Crop Production Guide. 1998. M.Tremblay, Saskatchewan Agriculture and Food.

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Streambank Stewardship. 1998. Saskatchewan Wetland Conservation Corporation.

The Stockman's Guide to Range Livestock Watering from Surface Water Sources. Prairie Agricultural Machinery Institute. 1996. Canada - Manitoba Agreement on Agricultural Sustainability (CMAAS), Saskatchewan Agriculture and Food.

PLANT IDENTIFICATION

Budd's Flora of the Prairie Provinces. 1979. J. Looman and K. F. Best. Agriculture Canada, Research Branch. Publication No.1662.

Flora of Alberta. A Manual of Flowering Plants, Conifers, Fern and Fern Allies Found Growing Without Cultivation in the Province of Alberta, Canada. 2nd. Ed. 1983. E. H. Moss, revised by J.G. Packer.

Identification of Common Range Plants of Northern Saskatchewan. Saskatchewan Agriculture and Food.

Identification of Common Range Plants of Southern Saskatchewan. Saskatchewan agriculture and Food.

Identification of Riparian and Wetland Plants in Saskatchewan. Grazing and Pasture Technology Program / Saskatchewan Wetland Conservation Corporation. (In press)

Plants of the Western Boreal Forest and Aspen Parkland. 1995. D. Johnson, L.Kershaw, A. MacKinnon and J. Pojar.

Prairie Grasses Identified and Described by Vegetative Characteristics. 1982. J. Looman. Agriculture Canada Publication No. 1413.

Wildflowers Across the Prairies. 1984. F. R. Vance, J.R. Jowsey and J.S. Mclean.

WATER SUPPLY AND MANAGEMENT

A Prairie-wide Perspective of Non-Point Agricultural Effects on Water Quality. 1997. D. Brook Harker. PFRA, Prairie Resources Division.

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WETLAND ECOLOGY

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Restoring Prairie Wetlands. An Ecological Approach. 1994. S. M. Galatowitsch, and A.G. van der Valk. Iowa State University Press. Ames, Iowa.

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WILDLIFE HABITAT

Designing Tree Plantings For Wildlife. PFRA Shelterbelt Centre.

Methods of Reclamation of Wildlife Habitat in the Prairie Provinces. 1987. Environment Canada.

Planting Trees for Wildlife. PFRA Shelterbelt Centre.

Trees and Shrubs for Wildlife Habitat Plantings. PFRA Shelterbelt Centre.

Wildlife Habitat. A Handbook for Canada's Prairies and Parklands. 1981. Environment Canada. Canadian Wildlife Service.

APPENDIX 1

Common and Latin names for Riparian and Wetland plants.

Alkali Cordgrass ..... Spartina gracilis
Awned Sedge .....Carex atherodes
Awned Wheatgrass...Agropyron subsecundum
Basket Willow.....Salix petiolaris
Balsum Poplar .....Populus balsamifera
Baltic Rush .....Juncus balticus
Beaked Sedge .....Carex rostrata
Beaked Willow .....Salix bebbiana
Bluejoint .....Calamagrostis canadensis
Buffaloberry .....Shepherdia argentea
Bulrush .....Scirpus spp
Canada Buffaloberry ....Shepherdia canadensis
Canada Wild Rye .....Elymus canadensis
Cattail .....Typha latifolia
Choke Cherry .....Prunus virginiana
Common Bulrush .....Scirpus validus
Common Plantain .....Plantago major
Common Tall Manna Grass ....Glyceria grandis
Coontail .....Ceratophyllum demersum
Cow-Parsnip .....Heracleum lanatum
Creeping Spike-Rush ..... Eleocharis palustris
Desert Saltgrass .....Distichlis stricta
Duckweed .....Lemna spp.
Fowl Manna Grass .....Glyceria striata
Goldenrod .....Solidago spp.
Great Bulrush ..... Scirpus acutus
Green Ash .....Fraxinus pennsylvanica
Hawthorn .....Crataegus rotundifolia
Hoary Willow .....Salix candida
Manitoba Maple ..... Acer negundo
Marsh Hedge-Nettle .....Stachys palustris
Marsh Smartweed .....Polygonum coccineum
Marsh Marigold .....Caltha palustris
Narrow-Leaved Cottonwood .. Populus angustifolia
Narrow Reed Grass .....Calamagrostis stricta
Nebraska Sedge .....Carex nebraskensis
Needle Spike-Rush ..... Eleocharis acicularis
Northern Reedgrass .....Calamogrostis inexpansa
Nuttall's Saltgrass .....Puccinellia nuttalliana
Pondweed .....Potomageton spp.
Prairie Cord Grass .....Spartina pectinata
Prickly Rose ..... Rosa acicularis
Pussy Willow ..... Salix discolor
Red Osier Dogwood .....Cornus sericea
Red Samphire ..... Samphire spp.
Reed Canarygrass ..... Phalaris arundinacea
Reed Grass ..... Phragmites communis
Sandbar Willow ..... Salix exigua
Saskatoon ..... Amelanchier alnifolia
Sea-Milkwort ..... Glaux maritima
Seaside Arrowgrass .....Triglochin maritima
Seaside Buttercup .....Ranunculus cymbalaria
Sedges .....Carex spp.
Silverberry ..... Elaeagnus commutata
Silverweed .....Potentilla anserina
Slender Wheatgrass ..... Agropyron trachycaulum
Sloughgrass ..... Beckmania syzigachne
Smartweed ..... Polygonum amphibium
Spikerush .....Eleocharis spp.
Spotted Water-Hemlock .....Cicuta maculata
Three-Square Bulrush .....Scirpus pungens
Trembling Aspen .....Populus tremuloides
Tufted Hair Grass .....Deschampsia caespitosa
Yellow Willow ..... Salix lutea
Water Sedge ..... Carex aquatilis
Water Smartweed .....Polygonum amphibium
Water Parsnip .....Sium suave
Water Plantain .....Alisma plantago-aquatica
Western Dock ..... Rumex occidentalis
Western Sea-Blite .....Suaeda depressa
Western Snowberry ...Symphoricarpos occidentalis
Whitetop ..... Scolochloa festucacea
Wild Black Current .....Ribes americanum
Wild Mint .....Mentha arvensis
Wood's Rose .....Rosa woodsii

APPENDIX 2

Agencies and organizations able to provide information and assistance on wetlands and wetland management.

Agriculture and Agri-Food Canada - PFRA
603 CIBC Tower
1800 Hamilton Street, Regina, SK S4P 4L2
Phone (306) 780-5070
Website - http//aceis.agr.ca/PFRA/

Agriculture and Agri-Food Canada
PFRA Shelterbelt Centre
Box 940 Indian Head, SK S0G 2K0
Phone (306) 695-2284
Website - http//aceis.agr.ca/PFRA/

Agriculture Canada - PFRA
P.O. Box 1150 Watrous, SK S0K 4T0
Phone (306) 946 - 8720

Agriculture Canada - PFRA
1410 A Caribou Street West
Moose Jaw, SK S6H 7S9
Phone (306) 691 - 3370

Agriculture Canada - PFRA
304 Royal Bank Tower
1101 - 101st Street
North Battleford, SK S9A 0Z5
Phone (306) 446 - 4050

Agriculture Canada - PFRA
205 Federal Building
Weyburn, Sask. S4H 0W0
Phone (306) 848 - 4488

Agriculture Canada - PFRA
Box 1748 Melfort, SK S0E 1A0
Phone (306) 752 - 4442

Agriculture Canada - PFRA
1011 - 11 Innovation Blvd.
Saskatoon, SK S7N 3H5
Phone (306) 975 - 4693

Agriculture Canada - PFRA
Box 130 Melville, SK S0A 2P0
Phone (306) 728 - 5790

Agriculture Canada - PFRA
P. O. Box 1420 Rosetown, SK S0L 2V0
Phone (306) 882 - 4272

Agriculture Canada - PFRA
L.B.Thompson Place
Gate No. 2, SPARC, Airport Road
Box 1088 Swift Current, SK S9H 3X3
Phone (306) 778 - 5000

Agriculture Canada - PFRA
P.O. Box 155 Gravelbourg, SK S0H 1X0
Phone (306) 648 - 2214

Agriculture Canada - PFRA
Box 430 Maple Creek, SK S0N 1N0
Phone (306) 662 - 5520

Ducks Unlimited Canada (Regional Offices)

Ducks Unlimited Canada
Oak Hammock Marsh Conservation Centre
Box 1160 Stonewall, Manitoba R0C 2Z0
Phone (204) 467 - 9028
Web Site - http://www.ducks.ca

Ducks Unlimited Saskatchewan
1606 - 4th Ave. Regina, SK S4P 3W7
Phone (306) 569 - 0424
Web Site -http://vm.ducks.ca/prov/skmenu.htm

Ducks Unlimited (Field Offices)

Box 1180 2552 Commerce Drive
North Battleford, SK S9A 3K3
Phone (306) 445 - 2575

Box 2139
Highway # 3 West, Melfort, SK S0E 1A0
Phone (306) 752 - 2791

#13 - 301 45th Street West
Saskatoon, SK S7L 5Z9
Phone (306) 665 - 7356

Box 670
77 1st Street NE
Wadena, SK S0A 4J0
(306) 338 - 3677

Highway 16 A West
Yorkton, SK S3N 2X3
Phone (306) 782 - 2108

Box 250
Highway #123
Cumberland House, SK S0E 0S0
Phone (306) 888 - 2149

Saskatchewan Environment and Resource Management
3211 Albert Street, Regina, SK S4S 5W6
Phone (306) 787-2314
Web site - http://www.serm.gov.sk.ca

Saskatchewan Purple Loosestrife Eradication Project Phone (306) 975-4101.

Saskatchewan Soil Conservation Association
Box 1360 Indian Head, SK S0G 2K0
Phone (306) 695-4233
Website - http//paridss.usask.ca/consgroups/ssca

Saskatchewan Stock Growers Association
Box 4752 Regina, SK S4P 3Y4
Phone (306) 757-9499

Grazing and Pasture Technology Program
Box 4752 Regina, SK S4P 3Y4
Phone (306) 757-9499
Website - http://www.aginfonet.sk.ca /agricarta/html/t_forages.html

Grazing and Pasture Offices

South West Regional Office
#1 -1081 Central Avenue North
Swift Current, SK. S9H 4Z1
Phone (306) 778-8294

North West Regional Office
5-100 1st Avenue West
Unity, SK S0K 4L0
Phone (306) 228-6402

South East Regional Office
Box 2003
Weyburn, Saskatchewan S4H 2Z9
Phone (306) 848-2382

North East Regional Office
105 Crawford Avenue West
Box 6500 Melfort, SK S0E 1A0
Phone (306) 752-6159

Saskatchewan Wetland Conservation Corporation
Room 101 - 2022 Cornwall Street
Regina, SK S4P 2K5
Phone (306) 787-0726
Website - http://www.wetland.sk.ca

Saskatchewan Wildlife Federation
444 River Street West
Moose Jaw, SK S6H 3J6
Phone (306) 692-8812
Website - http://wwwdi.com/swf

Sask Water Corporation
4th Floor, Victoria Place
111 Fairford Street E
Moose Jaw, SK S6H 7X9
Phone (306) 649 -3900
Website - http://www.saskwater.com

Sask Water Offices

Sask Water
Box 2133, 201-1st Avenue E
Nipawin, SK S0E 1E0
Phone (306) 862-1750

Sask Water
402 Royal Bank Building
1101- 101st Street
North Battleford, SK S9A 0Z5
Phone (306) 446-7450

Sask Water
Box 5000, 350 Cheadle Street West
Swift Current, SK S9H 4G3
Phone (306) 778-8257

Sask Water
Weyburn Square, 110 Souris Avenue
Weyburn, SK S4H 2Z9
Phone (306) 848-2345

Sask Water
2nd Floor, 120 Smith Street East
Yorkton, SK S3N 3V3
Phone (306) 786-1490

APPENDIX 3
Approval to Construct/Operate Drainage Works

Sask Water is the provincial crown corporation responsible for managing and administering the province's water resources.

Before you can construct or operate most types of drainage works, you must obtain approval from Sask Water. Some types of drainage works do not require approval under The Drainage Control Regulations which are a part of *The Water Corporation Act*. In some cases, approval will also be required from Saskatchewan Environment and Resource Management (SERM). However, you will be informed by Sask Water when approval from SERM is necessary.
By discussing your proposal with staff at the nearest Sask Water Regional Office, you will be advised whether or not you have to obtain approval to proceed.

Where an approval is required, the following basic steps are followed:

1. Obtain an application form from the regional office of Sask Water for your area. (This will provide you with an excellent opportunity to discuss your project with the regional office staff and deal with any questions or concerns they or you might have about the project, the application form and the procedure to be followed.)

2. Submit your application to the appropriate regional office along with the appropriate fee. The fee is $25 for an individual project, $50 for a joint project and $100 for all other projects.

3. Sask Water will review the application for potential conflicts with other water projects and to estimate possible downstream effects. If it is determined that downstream effects may be significant, a project evaluation and investigation of outlet sufficiency may be required.

4. If it appears that the proposal will be approved as submitted, you will, in most cases, be requested to have surveys undertaken and provide a design of the project. Your design plans will have to be submitted to the regional office so that the staff can complete a detailed evaluation. For some projects, the regional office may indicate that sketch plans are acceptable.

Upon request, engineering surveys, designs and plans may be undertaken by the Prairie Farm Rehabilitation Administration (PFRA), depending on the availability of staff. If requested, Sask Water will undertake the required engineering work, either directly or through the use of consultants. You will be charged 50 % of the cost involved up to $4,000 and all of the cost exceeding that amount.

5. You may be required to advertise your intention to construct by posting a notice to appear for 21 days in your local post office and rural municipal office. In some cases, the regional office will also require that you advertise your intention for three consecutive weeks in the newspaper serving the area in which the project is located.

6. The regional office will discuss with you any objections received as a result of the posting and/or advertising, and the options to deal with them.

7. It is your responsibility to obtain land control from owners of other lands affected by your works. Sask Water will seek rural municipality and Department of Highways and Transportation approvals where a municipal road and/or a provincial highway will be affected.

8. Once all the legislative requirements have been met, Sask Water will issue an Approval to Construct Works, and you can begin construction according to the approved plans. PFRA may provide construction surveys for plans and designs they provide. Sask Water will provide that service if it provides the engineering work, subject to charge-out costs as outlined in #4 above.

9. When you complete the works, Sask Water will have them inspected to confirm they were built according to plans. If all is in order, Sask Water will issue an Approval to Operate works subject to any terms and conditions required.

RIGHT TO APPEAL

Under Section 77 of the Water Corporation Act, the applicant or any person affected by any action, order, or decision by the Corporation has the right to appeal a decision to issue or deny an approval and any terms or conditions attached to an approval. The appeal is heard by the Water Appeal Board, appointed under the Water Appeal Board Act.

To file an appeal, you write to:

The Water Appeal Board
Room 216, 3085 Albert Street
Regina, Saskatchewan
S4S 0B1

It is important to note that a notice of appeal must be filed within 30 days and must be accompanied by the appeal fee of $200 as required by the regulations.

See Appendix 2. for addresses of Sask Water's regional offices.

Shoreland Alteration permit

Saskatchewan Environment and Resource Management is responsible for the management and protection of Saskatchewan's natural resources, including fish, wildlife, lands, forests, air, soil, water.

The Environmental Management and Protection Act requires that a Shoreland Alteration Permit must be obtained before any work is conducted in or along any water body in Saskatchewan. This includes all works that have potential to alter the bed or bank of the water body, add material to the water body, remove material from the water body or remove aquatic vegetation from the water body. Some examples of projects that require approval by a Shoreline Alteration Permit include channel clearing, channelization, dam construction and road crossings (including low level and ford crossings).

One important exception to the requirement to obtain a permit for work that will occur on a water body is that a permit is not required for work conducted by a landowner on sloughs and dugouts situated completely on his own land. However, a permit is required for work on private land if the water body is connected to other water bodies or water courses not located on land owned by the individual carrying out the project.

Permits may be obtained by applying to the nearest SERM area office.

An application form is available for small projects while larger, more complex projects will require submission of detailed plans. Applications should be made at least thirty days in advance of project startup. Proponents are encouraged to discuss their project with the SERM area manager or regional fisheries biologist early in the planning stages so they are aware of any regulatory concerns and can plan their project accordingly.

SERM staff will review the project and determine if the project can be approved, approved with conditions, or if it must be rejected. If there are concerns, the project is discussed with the proponent and additional information may be requested or modifications to the plan may be suggested. When the project is approved, a Shoreland Alteration Permit is issued with appropriate conditions to minimize impacts to aquatic habitat.

During the SERM review, if the reviewer determines that the project has potential to destroy fish habitat, the proposal will be referred to the federal Department of Fisheries and Oceans (DFO). A separate review by that agency will then be conducted.

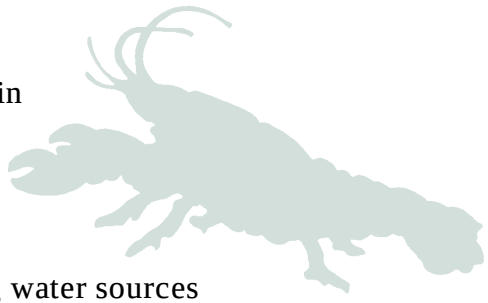
Following completion of the project, an inspection is conducted by SERM staff to ensure that all permit conditions were followed.

Water Management Framework

Saskatchewan people recognize the importance of water to their lives and well-being and recognize the need to protect and use those water resources wisely. The importance of water to provincial residents and the need to address critical water issues has led the Government of Saskatchewan to develop an integrated Water Management Framework.

Management of water in Saskatchewan today is more complex than in the past. Demands on water are greater than they were even a few years ago. Water resource management strategies must balance competing demands, address growing requirements and optimize social, cultural, environmental and economic benefits for all the people of Saskatchewan.

The Water Management Framework was developed around the following three themes. Objectives that provincial agencies must fulfill in order to realize the water management goals are listed under each theme.



1. Protection of water and wetlands

- Maintain, restore and protect the health of aquatic and riparian ecosystems and drinking water sources
- Minimize contamination of waterbodies
- Protect aquifers from depletion and contamination
- Foster wetland retention and orderly drainage in accordance with regulations and public policy

2. Management and Development of the Resource

- Enhance safety of municipal and domestic drinking water supplies
- Promote water developments with broad public benefits
- Promote economic diversification and stability through sustainable use of water and related land resources
- Prevent bulk export of water
- Establish innovative approaches for financing costs of developing, operating, maintaining and upgrading infrastructure
- Plan developments in consideration of the potential effects of flood, drought and climate change
- Clearly define and fully integrate agency mandates and activities related to water
- Manage water on a watershed basis
- Recognize Aboriginal peoples' interests
- Monitor and research water resources

3. Coordination of government activities and public involvement in decision-making

- Enhance public awareness and involvement in water management planning and decision making
- Recognize the intrinsic and economic value of water and cost of its management

For further information, contact ***SaskWater*** at ***(306) 867-5500*** or ***Saskatchewan Environment and Resource Management*** at ***(306) 787-2700***

Saskatchewan's Wetland Policy

Increased awareness by Saskatchewan residents about the decline of the province's wetland resources led the Government of Saskatchewan, in 1995, to develop a policy to aid in the conservation of provincial wetland resources. The Saskatchewan Wetland Policy is seen as complementary to the development of overall land and water management strategies for the province.

Saskatchewan residents guided the planning and development, and are continuing to guide implementation of the policy through various groups in this province.

Objectives

Implementation of the policy is based on five key objectives:

- to increase awareness of the benefits of wetlands;
- to increase wetland monitoring;
- to coordinate government policies and programs to improve wetland management;
- to develop land-use planning guidelines for wetland management;
- to encourage landowners to maintain wetlands.

Wetland Policy Principles

The following principles will guide delivery of wetland policy.

- Wetlands are a valuable resource with multiple benefits.
- The rights of landowners and their role in the stewardship of land are recognized and their ongoing involvement is assured.
- The interest of aboriginal people in resource management will be respected and their involvement is assured.
- Wetland conservation will be pursued in an integrated approach to land use planning and management.
- Sustainable uses of wetlands are to be achieved through partnerships and co-operation with all levels of government and the public. The public will continue to be informed and involved in wetland management decisions through activities such as education and awareness programs and public consultations.
- All government organizations involved with or affecting wetlands are to recognize and consider wetland functions in their policy and program development and decision-making.
- Wetlands are an intrinsic component of broad ecological processes and systems. Wetland management will be carried out using an ecosystems approach.

Contact

For further information, contact the
Saskatchewan Wetland Conservation Corporation
at ***(306)787-0726***.

Saskatchewan
Wetland
Conservation
Corporation

APPENDIX 4

Ducks Unlimited Canada Programs

Ducks Unlimited Canada in cooperation with partners delivers a wide range of programs that promote soil, water and wetland conservation. These programs are designed to secure wildlife habitat and to demonstrate and provide incentives to alter agricultural practices. They may provide financial assistance to landowners.

- Habitat Purchase
- Wetland Restoration
- Cropland Conversion to Forages
- Land Use Exchange Program
- Planned Grazing Systems
- Winter Cereals Extension
- Flushing Bars
- Salinity Plantings

For more information on which programs are available in your area, please contact the nearest field office of Ducks Unlimited Canada.

APPENDIX 5

The following organizations are qualified to hold conservation easements. For more information, contact the agency that best suits your objectives for conservation and land management.

Ducks Unlimited Canada
Phone (306) 569-0424
Website - http://www.ducks.ca

Meewasin valley Authority
Phone (306) 665-6887
Website - http://www.lights.com/meewasin

Nature Saskatchewan
Phone (306) 780-9273
Website - http://www.unibase.com/~nature

Rocky Mountain Elk Foundation
Phone (306) 691-2854
Website - http://www.rmef.org

Saskatchewan Environment and Resource Management Phone (306) 787-2314
Website - http://www.serm.gov.sk.ca

Saskatchewan Parks and Recreational Association Phone (306) 780-9262
Website - http://www.spra.sk.ca

Saskatchewan Wetland Conservation Corporation Phone (306) 787-0726
Website - http://www.wetland.sk.ca

Saskatchewan Wildlife Federation
Phone (306) 692-8812
Website - http://wwwdi.com/swf/index.html

Wakamow Valley Authority
Phone (306) 692-2717
Website - http//www.asupca.sk.ca/wakamow.htm

Wascana Centre Authority
Phone (306) 522-3661
Website - http//www.wascana.sk.ca

Nature Conservancy of Canada
Phone (403) 294-7064
Website - http//www.natureconservancy.ca

Trans-Canada Trail Foundation
Phone (306) 780-9262
Website - http://www.tctrail.ca