DRAINAGE STEWARDSHIP

Upper Souris Watershed Association

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upper souris watershed association

Water Security Agency

WHY DO WE DRAIN?


Photo Credit: Upper Souris Watershed Association (USWA)

We drain to allow more land to be cropped annually.


Photo Credit: P. Thorpe, U.S. Fish & Wildlife Service

We drain to more effectively use water across the landscape.


Photo Credit: Sarah Sommerfeld, PAg Ministry of Agriculture

We drain so we can irrigate dryland.


Photo Credit: M&J Cornwell Farms

We drain to reduce overlaps of inputs such as seed, fertilizer and herbicides.

INTRODUCTION

Across the prairies, drainage has been practiced for decades as a way to increase productivity of lands. Advancements in technology and increasing equipment size make it is easier to drain than ever before, bringing otherwise non-arable acres into annual crop production. Farmers drain in an effort to maximize efficiency and increase profitability, but sometimes this comes at the expense of neighbours and the environment. The aim of this book is to start the conversation with farmers, partners and regulators to promote an ethic of water resources stewardship, encourage proper permitting and authorization, and provide benefits to everyone.

THE ROOTS OF DRAINAGE IN SASKATCHEWAN

The early 1900s was a wet period in Saskatchewan that resulted in the development of many private and municipal drainage ditches. Early settlers often found that high spring water levels threatened farmland, made soils too wet for annual crop production, threatened small communities and put roads in danger. In the Yellow Grass area north of Weyburn, everything from a floating dredge to horses and steam-powered walking dredges were used to drain[1].

Under the Drainage District Act, the provincial government provided technical assistance to municipalities that undertook development of locally funded group projects, many of which remain successfully operated and maintained today.

The Conservation and Development Act of Saskatchewan was legislated in 1949. It allows for an organized process for the design, construction, and long-term maintenance of works under the control of a local producer membership[2]. Government polices and funding schemes historically supported the formation of Conservation and Development Area Authorities (CDAAs) and the drainage, flood control, or irrigation infrastructure associated with them. The funding for projects that fit under the Conservation and Development Act has varied since the 1950s. Today, cost-shared funding is typically only available for maintenance of existing infrastructure. Two or more municipalities can now form Watershed Associations with powers similar to those of CDAAs.

CHALLENGES FACING DRAINAGE TODAY

Farmers drain land that was previously considered unsuitable for annual cropping to gain arable acres and reduce overlap. A study conducted by the Lower Souris Watershed Committee showed that if wetlands were converted to annual cropland and were as productive as the adjacent cropped upland, the returns were positive[3]. Seventy dollars per acre per year of net profit on drained land was attainable.

While drainage can provide many benefits, such as maximizing efficiencies in farming, the costs to the environment and neighbours need to be taken into account. A solid understanding of these challenges is important for the industry to reduce the negative impacts of drainage.


Photo Credit: Saskatchewan Archives Board

Yellow Grass District Drainage circa May 1909

THE CASE OF DRAINAGE STEWARDSHIP

CASE STUDY

A stewardship approach to drainage involves the development of drainage projects to avoid or reduce negative impacts. Working together as a community and communicating the desired end result are critical components of successful stewardship. Stewardship results in win-win solutions for everyone involved.

New tools such as laser levels, 14 cubic yard scrapers and GPS programs allow farmers in annual crop production to create detailed field elevation maps as well as drainage. Fortunately there is the opportunity for good stewardship along with the evolution of high-tech drainage technologies. By using responsible practices in the industry, and regulated, planned, sound drainage works, it is possible to reduce drainage impacts.

MOVING FROM CONFLICT TO TALK TO DRAINAGE STEWARDSHIP

In 1999 flooding was prevalent along the eastern side of the province. Complaints from downstream Manitoba reported that they couldn't handle any more water. People were mad. Ross Madsen and Jim Lorette, two rural municipality (RM) reeves, called a meeting with about 50 RM councillors from Saskatchewan and Manitoba to start discussing the issues. "The first time we met for four hours, there were fireworks," Ross remembers. "We discussed how Mother Nature caused the flood, but there were also issues with drainage when water was allowed to just move uncontrolled. Controlled drainage doesn't have near the negative impacts. There were a number of cases where they (producers) were controlling their water, but some weren't."

Photo Credit: LSWC
Ross Madsen, past chair of Lower Souris Watershed Committee

The group continued to meet regularly. One thing led to another, and eventually Ross persuaded the others to become a legal entity, Four Creeks Watershed Inc. Ross went to the dozen or so surrounding RMs and asked them to officially join the group and commit financially to it for three years. One of the councillors at Wawota said, "Hurry up and give him the money 'cause if not he won't leave us alone." "We were determined to get organized, and get good people in place," says Ross. The Lower Souris Watershed Committee Inc. evolved from the original Four Creeks group. The Saskatchewan Watershed Authority (now called the Water Security Agency) completed the source water protection planning process with the organization in 2006.

Ross marvels that as a general rule there is flooding about every 10 years. "When Mother Nature decides she is going to dump on you, you don't have a choice - the area is going to flood some no matter what you do for drainage."

Ross notices a lot more controlled drainage in the area now as compared to 1999. "Years later we had another flooding year and one of the guys involved in 1999 called me. He thanked me for raising so much hell with him over his drainage. He now was controlling and holding his water and as a result didn't have people downstream mad at him."

CASE STUDY

THE SASKATCHEWAN CONSERVATION AND DEVELOPMENT ASSOCIATION AND WATER ASSOCIATION BOARDS

The Saskatchewan Conservation and Development Association (SCDA) formed in 1966 to provide a unified, coordinated voice for Conservation and Development Area Authorities and Water Association Boards across the province. Today the SCDA represents over 100 member boards from across the province and provides valued advice and service to them. The value of the SCDA and its members is proven. Over 1,800 miles of drainage ditches impacting 4.5 million acres are managed by members.

On the Canadian Prairies the word "wetland" usually conjures images of cattails and standing water, but wetlands can take many forms[4].

Photo Credit: USWA
Ephemeral wetlands hold water for a few days or less. These wetlands are often cropped annually.

Photo Credit: USWA
Temporary wetlands hold water for up to a few weeks and have meadow vegetation such as Kentucky Bluegrass.

WHAT IS DRAINAGE?

Drainage is any action taken or intended for the removal or lessening of the amount of water from land, and includes the deepening, straightening, widening and diversion of the course of a stream, creek or other watercourse, as well as the construction of dykes[5].

Drainage can take many forms:
An ***open ditch*** is a channel that allows water to move from a wetland to another location, such as a natural water run or larger wetland. Open ditches can take many shapes and sizes: for example, landowners may drive a tractor, quad or truck from one area to another to enhance the path of the water and accelerate its movement. Slightly larger, ***V-ditches*** are narrow ditches of varying depths constructed or maintained by ditching equipment. Ditches with a flat bottom are called ***trapezoidal ditches.*** These open ditches tend to erode less because re-vegetation and maintenance is feasible, and generally move larger volumes of water.


Photo Credit: Julie Mackenzie, P.Ag.


Photo Credit: Water Security Agency

Infilling fills a temporary or ephemeral wetland with soil. The wetland is levelled with the field so that water no longer collects, and cropping over the entire area is possible.

Channelization includes any activity such as widening, narrowing, straightening, or lining of a stream channel that alters the amount and speed of the water flowing through the channel or natural waterway. Examples of channelization include: lining channels with concrete; pushing gravel up from the stream bed to line the banks: and cutting off oxbows in a creek.


Photo Credit: Water Security Agency


Photo Credit: Water Security Agency

Dyking involves the creation of small earthen embankments to redirect water draining off a landscape into a drainage ditch or waterway instead of allowing the water to flow across the field or into a temporary wetland. Dyking may also be used to temporarily hold water on a field for irrigation.

Tile Drainage involves the installation of perforated large diameter pipe (four inch minimum) two to four feet below the soil surface across the area of a field where soil subsurface drainage and infiltration are poor[6]. Water moves down through the soil profile into the perforated pipe and then flows through the pipe to a drainage ditch. When the subsoil moisture is drained to the depth of the pipe, the water stops flowing. Tile drainage is typically used in the United States corn belt, southern Ontario and high rainfall areas of Manitoba.
In Saskatchewan, it has been used to drain surface water by laying a single pipe from the centre of the wetland to an outlet.


Photo Credit: Lower Souris Watershed Committee Inc.

Pumping moves water with a PTO driven pump and large diameter pipe from one wetland to another (consolidation) or to an outlet, or spreads it across the adjoining upland with a large sprinkler or cannon type application.


Photo Credit: Water Security Agency


Photo Credit: USWA

Seasonal wetlands can hold water until the middle of the growing season. These wetlands often have sedges growing in them and need to be drained to be annually cropped.


Photo Credit: USWA

Semi-permanent wetlands always have water except in drought years. These wetlands typically have cattails or bulrushes.


Photo Credit: Water Security Agency (WSA)

Permanent wetlands rarely go dry. These wetlands usually have a large area of open water in the center.

IMPACTS OF DRAINAGE

SURFACE WATER QUANTITY IMPACTS

Drainage in average years may increase downstream flood peaks and volumes because water stored in wetlands that normally would not reach a stream or outlet channel will reach an outlet channel. This is true for events that are average to slightly above-average runoff events. As the event becomes larger (above a one in 10 years), drainage plays a much smaller role and has a much smaller impact on flooding. As runoff events increase, the area contributing runoff downstream increases, causing higher peak flows and volumes. Also, in higher runoff events, the fill and spill wetlands are generally full going into the runoff event. Therefore, these wetlands have no ability to store or detain the inflow, making them ineffective to buffer high flows. A study of the Smith Creek Watershed near Langenburg demonstrated that wetland drainage does increase total volumes of water and peak flows in spring runoff[7].

Draining water to an adequate outlet can reduce the impact if the channel is designed to handle the additional quantity and flow of water from the drainage works effectively. Having an adequate outlet is important to reduce impacts to downstream neighbours, communities and municipal infrastructure.

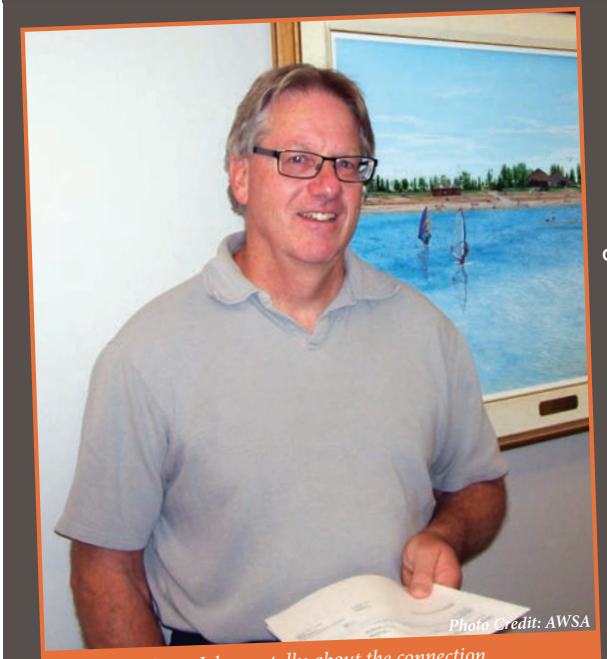
GROUNDWATER IMPACTS

Groundwater is frequently used in Saskatchewan as a reliable source of water. In many cases, wetlands may provide a valuable component of groundwater recharge, particularly in areas where surficial sand and gravel aquifers exist. In these cases drainage may have an impact on these shallow aquifers. However, in areas where a thick aquitard or low permeability layer exists between the surface and the aquifer, recharge is much slower so is less likely to have an impact on groundwater.

SURFACE WATER QUALITY IMPACTS

Drainage can cause erosion, sedimentation and water quality issues downstream, especially if the drainage does not use preventative mitigation techniques. These impacts are only beginning to be studied on the Prairies. In 2009, the impact of wetland drainage on downstream water quality was studied in the Smith Creek Watershed. The study showed that since 1958, there has been a 60 per cent decrease of wetlands in the Smith Creek Watershed. This study compared water quality in drainage areas with high, medium and low levels of wetland drainage. Water quality was consistently poorer in the areas of high and medium wetland drainage[8].

CASE STUDY



Doug Johnson talks about the connection between flooding and drainage.

THE CONNECTION BETWEEN FLOODING AND DRAINAGE

As Director of Regional Services at the Water Security Agency, Doug Johnson has answered lots of questions about flooding over the years. In years of high runoff, he inevitably gets asked about the connection between drainage works and flooding. Rural municipalities worry about flooding impact on roads, and landowners want to know if upstream drainage is affecting their land. Doug's answer to these questions always has two parts: "drainage can increase runoff volumes and peaks for small to moderate runoffs...but in years of extremely high runoff, the drainage works have little impact. This is because the volume of water added by the drainage works is small compared to the total volume of runoff." Doug's favorite examples are drainage works that were designed with reducing flooding in mind. "In the East Central Region and the Moose Jaw River Basin we have examples of drainage works with small culverts in roads or gated culverts so that water gets held back in flood years. Flooding is reduced downstream, but the land still dries up in time to be seeded for that crop year."

IMPACTS OF DRAINAGE

CASE STUDY

OFF THE PLAINS INTO THE MOOSE JAW RIVER

In 2011, Tammy Myers and Bridget Andrews, who are with the Moose Jaw River Watershed Stewards (MJRWS), received funding from Shell Canada to travel down the Moose Jaw River to assess and document drainage discharge points and riparian health along the river.

What they found was staggering. There were 104 individual drainage discharge points between the start of the project, south of Rouleau, and the end, the city of Moose Jaw, a total distance of 50 kilometres. Two-thirds of the drains were a result of human-made activities. Drainage discharges were GPS marked and rated as low, medium or high impact. Each discharge was also assessed for riparian health.

The MJRWS classified 16 discharge sites as high impact with extreme sedimentation occurring in the river from erosion off the heavy clay lands up the channel. "A high priority of the MJRWS is to work with the landowners along the drainage channels contributing to the high risk discharge areas," says agrologist Bridget Andrews. "An increase in sedimentation and erosion equates to increases in nutrient loading. Nutrients such as phosphorous and nitrogen bind to moving soil particles," Bridget adds. Seventeen sites were found to be medium impact and 71 found to be low impact.

CASE STUDY

NATURAL CAPITAL

"Natural Capital" refers to environmental resources that yield goods and services. Examples include fish and wildlife habitat, along with forests, wetlands and grasslands. The study, "The Value of Natural Capital in Settled Areas" assessed the value of natural capital within the Upper Assiniboine River Basin[9]. The main threats to that area's natural capital are wetland drainage and conversion of natural lands to cropland. The study found the net value to society of conserving natural capital in the watershed is $162.20 per acre per year. If the value of wetlands through savings and services provided was recognized by society, it could change the scope and extent of wetland drainage in the watershed.

Photo Credit: Sharie Gross, Nature's Reflections

Society benefits from ecological services such as clean water

FISH HABITAT IMPACTS

Drainage can impact fish and fish habitat. Sediments and silt can settle out as water enters fish habitat from drainage works. During spawning, sediments can impact spawning habitat such as gravel or vegetation. If eggs are released and then covered with sediments, hatching is not likely. Many fish feed on small aquatic organisms. Sediments from flooding can smother and kill these organisms, reducing food sources for fish. Sediment can also negatively affect fish health and carry nutrients, reducing water quality downstream.

Northern Pike Alameda Reservoir

WATERFOWL AND WETLAND SPECIES HABITAT IMPACTS

Wetlands are among the most productive ecosystems on earth and are home to over 600 different species of wildlife in North America, including one third of Canada's species at risk[9]. The Canadian Prairies are the duck factory of North America because of the abundance of diverse wetland types found here. All types of wetlands are important for duck production. Temporary and ephemeral wetlands are important food sources early in the nesting season, while permanent and semi-permanent wetlands are important later in the year once ducklings hatch. The primary limiting factor for waterfowl production is wetland loss due to drought or drainage.

IMPACTS OF DRAINAGE

CARBON SEQUESTRATION IMPACTS

Carbon sequestration is the removal of carbon dioxide from the atmosphere and storage in terrestrial, oceanic, or freshwater aquatic ecosystems[10]. Carbon is stored in plant material and trapped sediments within wetlands. Draining wetlands reduces the ability of the wetlands to sequester carbon[11]. Wetlands also emit greenhouse gases such as methane; however, recent research suggests that these emissions are more than offset by the trapping of carbon[12].

Photo Credit: P. Thorpe, U.S. Fish & Wildlife Service

Prairie Pothole Region has high density wetlands making Saskatchewan a "duck factory."

CASE STUDY

BROUGHTON'S CREEK

In the Broughton's Creek Watershed in southwest Manitoba, the number of wetlands decreased by 70 per cent (5,921 wetlands) between 1968 and 2005[11]. Ducks Unlimited Canada scientists used modeling to estimate the quantity of carbon dioxide released through the drainage and loss of the wetlands, and estimated 125,000 tonnes of carbon dioxide has been released over time. This is equivalent to the annual emissions from approximately 23,200 cars.

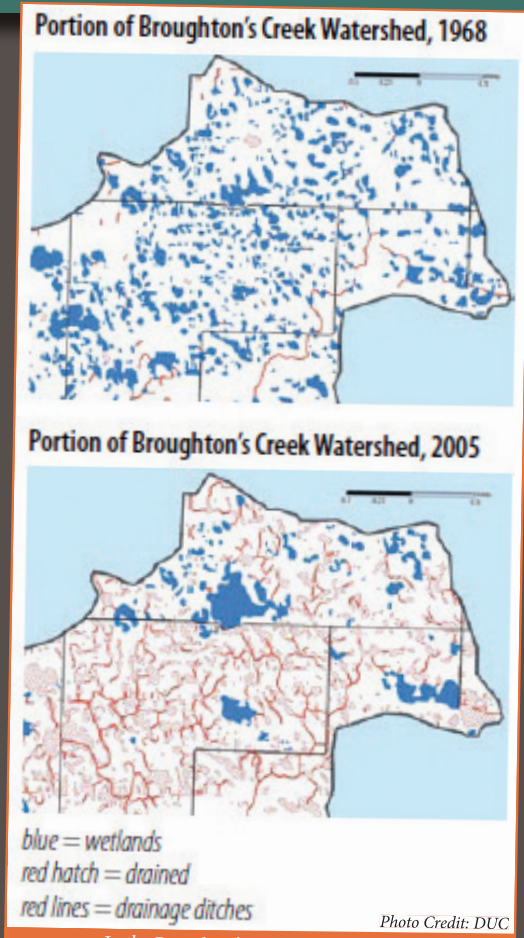


Photo Credit: DUC

In the Broughton's Creek Watershed located in southwest Manitoba, the number of wetlands decreased by 70 per cent (5,921 wetlands) between 1968 and 2005

PLANNING A DRAINAGE PROJECT

Proper planning is necessary for any successful drainage project. This planning process can be used for a small, one-landowner project or a large multi-producer project that results in a Conservation and Development Area. Projects that require regulatory approval and downstream land control should be planned a year ahead. A properly executed project will eliminate or reduce downstream impacts and be an asset to the landowner.

STEP 1:
GATHER AS MUCH INFORMATION AS POSSIBLE:

Many resources are available to help producers plan. Appendix IV provides the contact information of organizations that can provide planning assistance. Satellite imagery is available to producers for planning projects at Google Earth or Saskatchewan AgriMap. Saskatchewan AgriMap can be found at http://atlas.agr.gc.ca/agmaf/index_eng.html.

STEP 2:
DEVELOP A PROJECT PLAN:

The simplest plan may consist of sketching drainage works on satellite imagery. Draw and interpret the proposed drainage project, identifying all existing drainage, natural watercourses, groundwater springs, soil types, roads and existing infrastructure. Estimate the size of the works: length, depth, width, slope and gradient. This initial mapping process helps to identify potential discrepancies in project plans. More complicated projects may require an engineering

design. Use the information and contacts gathered in Step One to develop an appropriate project plan. Consider working through the adjacent flow chart to determine which voluntary beneficial management practices (BMPs) may be appropriate for your project.

STEP 3: DISCUSS PROJECT WITH DOWNSTREAM NEIGHBOURS:

Discussing a project with affected neighbours before construction can help coordinate drainage efforts and avoid conflict. Land control may be necessary in the form of legal agreements if water passes over a neighbour's land before reaching an adequate outlet.

STEP 4: DETERMINE WHICH REGULATORY APPROVALS ARE NECESSARY FOR YOUR PROJECT:

Use the flowchart in Appendix I to determine if regulatory approvals are required for your project.

EVALUATING THE COST/BENEFIT OF DRAINAGE

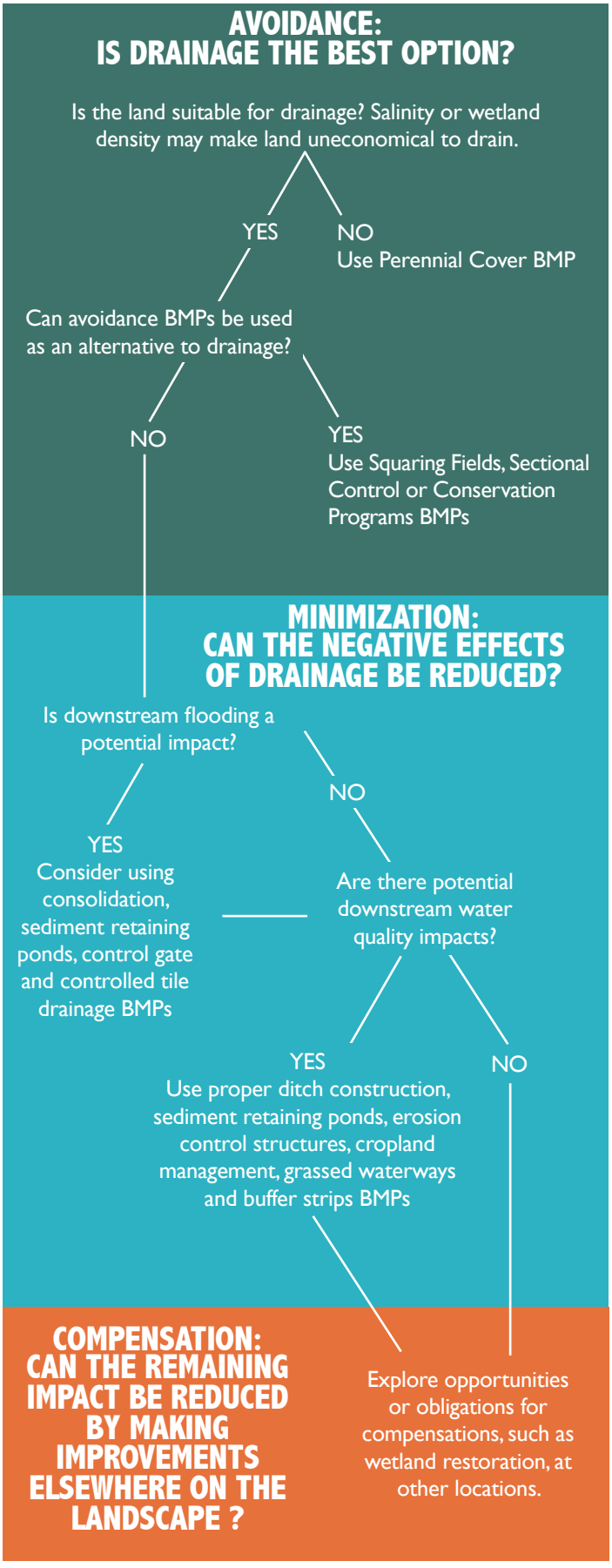
When planning a drainage project, carefully consider the costs and benefits of the project!

Costs to consider:

- Cost of obtaining permits and approvals
- Costs of land control to an adequate outlet
- Engineering costs that may be required for some projects
- Construction costs
- Costs of beneficial management practices such as grassing waterways
- Nuisance costs of farming around drainage works
- Environmental costs of drainage

Benefits to consider:

- Acres of farmland gained
- Reduction in overlap of farm inputs
- Increase in land value



CASE STUDY

THE OKABENA WATERSHED COOPERATIVE

Runoff that is high in sediments flows from the Regina Plains into the Moose Jaw River every spring. The Moose Jaw River Watershed Stewards (MJRWS) found that some of the worst sediment deposition was between Rouleau and Drinkwater, and a positive change was needed to decrease this sedimentation. In March of 2011, therefore, MJRWS agrologist Bridget Andrews invited area producers to a meeting where they discussed water, flooding, ditches, water direction, loss of soil and the impact on the Moose Jaw River.

Local producers jumped on an opportunity to access funding through the Canada Saskatchewan Farm Stewardship Program. They began working together to fix the waterway and form the Okabena Watershed Cooperative. "An opportunity to have a project like this get off the ground doesn't come up everyday," says the cooperative's chairman, Charlie Templeton.

From that point, the hard-to-imagine happened! The producers in the drainage basin agreed to improve the main waterway through engineered designs, resloping, revegetating, and installation of control structures. They decided that they needed to form a Conservation and Development Area Authority (CDAA) with the ability to control land, tax for maintenance, and approve future works.

Bridget coordinated a whirlwind of activities. There were many hoops to jump through and it wasn't easy. "The magnitude of work to get this project designed by an engineer and form the CDAA was huge. In addition, there was the work to sign right-of-way easements, obtain permits, coordinate construction, and pull funding and financing into place. Forming this one CDAA and managing the project was almost Bridget's full time job for 12 months," says the project's Farm Stewardship Program Representative, Julie MacKenzie.

After one community meeting, chairman Templeton pointed out an unexpected benefit of the project. "We didn't have a reason to get together as a community anymore but now we do. People see each other, reconnect and have a common goal." With engineering complete and construction started, all are looking forward to less sediment entering the Moose Jaw River. The producers in the Okabena Watershed Cooperative look forward to sharing what they learned and encouraging responsible drainage stewardship in their community and elsewhere in the watershed.

Photo Credit: Julie Mackenzie P.Ag.

Producers tour and discuss the Okanbena Project in the Moose Jaw River Watershed

Photo Credit: Julie Mackenzie P.Ag.

Okabena drop structure will reduce washouts on Okabena Project

AVOIDANCE: BENEFICIAL MANAGEMENT PRACTICES

USING PERENNIAL FORAGES

The suitability of land for drainage depends on soil type, topography and economics. Some landscapes have such a high wetland density or rolling topography that the land is better suited for pasture rather than annual cropping.

Saline soils are a special situation. Drainage of these soils may or may not resolve salinity issues. Seeding saline land to salt tolerant perennial forages where annual crop production is limited can help manage saline soils. Perennial forages act like pumps, using moisture from below the soil surface. This helps to leave the salts at lower depths unlike tillage, which causes salts to move upward in the profile due to moisture movement caused by evaporation. Once established, forages help stabilize the soil, prevent erosion and improve soil quality. Perennial forages may

Photo Credit: DUC

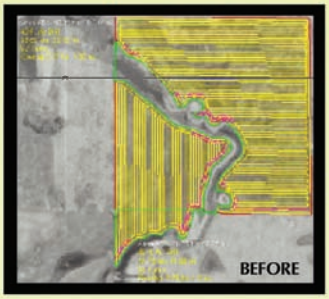
Some landscapes of high wetland density are better suited to use as pasture.

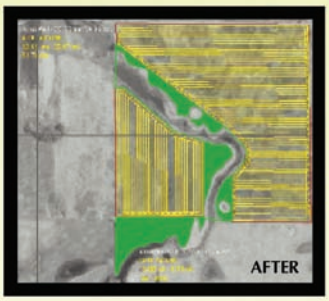
CASE STUDY

BOB MORLEY

Bob Morley owns land near Francis, Saskatchewan and has dealt with salinity on some of his land for over 30 years. In the early 1980s the Morleys implemented a project with Les Henry, a soils professor at the University of Saskatchewan. With the hope of reducing salinity on the Morley land, Les studied the effects of tile drainage on 12 acres of land, where three-inch buried pipe collected water and funnelled it through a six-inch release pipe at the creek. The Morleys, however, did not see a reduction in salinity throughout the tiled area and actually noticed a spread of salinity further downstream at the release. In an attempt to find out if draining lower depth groundwater would improve their salinity issues, the Morleys had test wells dug to analyze the groundwater, which proved to be very high in salts and deemed unusable for any type of consumption. All the land has since been seeded to perennial forage. Some of the acres have produced forage sufficient for haying, while forage production on other acres remains sparse.

AVOIDANCE: BENEFICIAL MANAGEMENT PRACTICES





HOW TO "SQUARE UP" A FIELD

Cultivated Acres	
Before	After
151.42	132.22

Distance Traveled (km)	
Before	After
53.54	46.64

Number of Turns	
Before	After
96	86

In this example, the producer stands to benefit from reducing the amount of mechanical overlap by nearly 4 acres (or approximately 3 percent of the total field acreage), from eliminating areas which would be difficult to work in wet spring years, and from converting over 19 acres from annual crop to one of the perennial crop options.

provide an economic return from land not able to produce economic annual crop yields.

In some cases, the downstream impacts of draining certain wetlands may be great enough that common sense would dictate that that the wetlands should be retained. In other cases, the costs of draining may be greater than any potential benefit, especially when it directly impacts neighbours' safety and livelihoods.

ISOLATING OBSTACLES

Isolating obstacles allows producers to reduce headlands and overlap by seeding cropland adjacent to riparian areas to perennial forages. Rather than draining wetlands near the edges of fields, it may be more economical to square up a field with perennial forages.

SECTIONAL CONTROL TECHNOLOGY®

One of the largest costs of wetlands to annual cropping is the overlap caused by navigating seeding equipment around obstacles. Some technologies can help reduce this cost making it more economical to retain wetlands. Sectional control technology® (SCT®) is designed to reduce seed and fertilizer costs due to overlap. It utilizes GPS to map a field as the producer seeds: sections of the seed drill are shut off, metering stopped and lifted as the GPS recognizes areas that the drill has already passed over. According to Seed Hawk Inc., on average, input costs are reduced by eight per cent on most operations using their SCT®[13]. This percentage can fluctuate based on the number of obstacles within a field. The opportunity to reduce overlap also increases as the size of the drill increases.

CASE STUDY

ISOLATING OBSTACLES WITH FORAGE IMPROVES EFFICIENCY

The Prairie Agricultural Machinery Institute (PAMI) studied the benefit of increasing efficiency by minimizing overlap in fields with natural obstacles such as wetlands and riparian areas. While the study concluded that auto steer technology was the most cost-effective way to reduce overlap, it also found that it paid to seed perennial forage to isolate wetlands and riparian areas[14]. In this study, the reduction in overlap more than paid for the lost crop acres. On a quarter section with 151 farmable acres there were 23 acres of overlap. If 11.5 acres were seeded to perennial forage to isolate obstacles, the overlap was reduced by 17.24 acres.

CASE STUDY

IN MANITOBA, SOME WETLANDS CAN'T BE DRAINED

Manitoba implemented policies in 2009 to halt drainage of some wetlands. This was accomplished by eliminating the policy exemption of "minor works" from licensing. Now all drainage projects must be licensed.

The Manitoba Conservation and Water Stewardship Department created policies and procedures to implement the Water Rights Act specific to licensing of surface water drainage. Drainage of semi-permanent and permanent wetlands would not be licensed. The only exceptions to this Act would be cases in which the works are substantiated as critical by science, engineering and social needs. These cases would then be subject to mitigation. The issuance of a permit also hinges on construction related practices to prevent or reduce erosion, and further protect water quality during drainage project construction. Exposed soil must be re-vegetated immediately following construction, and accepted drainage construction and erosion control methods implemented.

SCT® working around a low wet area.

AVOIDANCE: BENEFICIAL MANAGEMENT PRACTICES

INCENTIVES FOR KEEPING WETLANDS

Some conservation programs provide monetary compensation to producers for retaining wetlands. One such type of compensation is through a conservation easement. Conservation easements are voluntary legal agreements between a landowner and a conservation organization that are registered against the title of the land for a specified time or in perpetuity[15]. These documents are negotiated to meet a specific conservation goal. A conservation organization may compensate the landowner for signing a conservation easement, or a landowner who donates an easement can be the recipient of income tax advantages. The conservation organization may also monitor the land over time to ensure stewardship values are maintained.

Riparian area and native grass.

MINIMIZATION: BENEFICIAL MANAGEMENT PRACTICES

PROPER DITCH CONSTRUCTION

Proper planning and responsible construction of drainage work help reduce environmental impact. It's important to ensure channel banks are stabilized and protected before connecting the ditch to its outlet channel. Stabilizing banks with vegetation or manufactured erosion control material will reduce the erosion that occurs when water comes into the new drainage ditch. Keeping grades and bank slopes shallow will help to reduce erosion and slumping risk. Different soil types require different slope considerations to prevent erosion: For example, sandy soils require shallower slopes than clay[16]. Ideal grades for ditch construction are 0.1 per cent to 0.3 per cent[16]. Grades may vary outside of this range if site conditions necessitate. Channel side slopes are typically 3:1 or 33 per cent, but may be flatter to provide greater stability. Another important aspect of a sustainable drainage plan is the choice of location for the deposition and long term storage of sediment and spoil material. The topsoil from the creation of large ditches should be removed separately from sub-soil and returned to the field surface[16]. Some drainage projects will require design input from professional engineers and will need to consider topography, soils, potential downstream effects and the magnitude of the project.

Proper maintenance of drainage channels reduces drainage-caused erosion within the channel. Maintenance can include mowing within the ditch and removing sediment or debris from the channel. Mowing helps control shrubs, grass, and weed growth. Uncontrolled plant growth leads to the build-up of dead material within the ditch, increasing the risk of blockage and back flooding.

Improper sediment maintenance causes back flooding due to blockage of the channel. Re-contouring the banks can help prevent cutting and other erosive influences, therefore decreasing sediment and erosion. It's important to further stabilize exposed banks with erosion control measures and structures or vegetation, as exposed banks can accelerate erosion[17]. Maintenance work on drainage structures within the channel is usually done during late winter and is typically performed yearly or as needed in cases of high runoff or increased erosion.

Sediment deposits needing removal.

MINIMIZATION: BENEFICIAL MANAGEMENT PRACTICES

GRASSING WATERWAYS

Grassed waterways and ditches are water channels that have been seeded to a grass or grass-legume mix allowing for water to pass over the vegetation as it flows [18]. Ideal grassed waterways are saucer shaped, allowing for dispersal of the erosive force of water and for the passage of implements across the waterway[18]. These waterways can be productive forage sources due to the area's high moisture. In other cases, ditches are seeded specifically for bank stability and erosion control. There are several grass species best suited to seeding within waterways. Topography, soil type, and purpose should be considered when choosing a species mix. This information is available through a local Forage Agrologist (see Appendix IV).

Photo Credit: Stacey Lieslar, PAg

Drainage ditch grassed on one side, farmed to edge on other.

Photo Credit: Stacey Lieslar, PAg

Un-grassed ditch sediment deposition.

Photo Credit: USWA

Grassed and properly sloped with 4 to 5 meters buffer from cropland.

SEEDING AND MAINTAINING BUFFERS

Riparian buffer strips can be an area of grass, forbs, trees, or shrubs located between riparian areas and cropped areas. Riparian areas act to filter runoff before it reaches the surface water source. To be effective, buffers must intercept overland water flow[19]. Buffer strips are seeded and maintained for their environmental and production benefits. Depending on the situation, buffer strips of 5 to 20 metres must be maintained.

Photo Credit: WSA

Vegetative buffer strips adjacent to cropland.

WETLAND CONSOLIDATION

Wetland consolidation is drainage of one or more wetlands into a larger containment area or wetland. Often several small wetlands or seasonal pools are consolidated into one large wetland. Consolidation projects are often done to increase crop production in regions containing many small potholes that impede the movement of large farm equipment or cause mechanical overlap due to frequent turning. When high water volumes are contained within larger wetlands, rather than directed via surface drainage into watercourses, consolidation can have environmental benefits by reducing downstream flood effects. If dugouts are used for consolidation, they should be drawn down each year or else the storage will be limited to the previous year's evaporation loss.

CASE STUDY

CONSOLIDATE INSTEAD OF DRAINING

Jeff Goodfellow of Broadview, Saskatchewan has many low, wet areas on his farm in the spring. After several years of watching the natural course of runoff in the spring, Jeff decided to undertake a consolidation project that would hasten the drainage of these low, wet areas. Consolidation of his small wetlands into larger dugouts contained within his land allows Jeff to complete his surface drainage project without negatively affecting his neighbours downstream. Using shallow, graded, surface drainage, Jeff plans to drain 20 to 30 acres of seasonal wetlands into two large dugouts. He thinks he will gain acres of crop production by consolidating these low, wet areas into a containment area.

CASE STUDY

GRASS DITCHES SAVE MONEY

Some CDAAs choose to mow their grassed ditches yearly, or as able, to prevent water impediment. Brian Dreger, chairman of the Souris CDAA #1, says, "There is a significant difference in erosion, maintenance reduction and cost reduction associated with our grassed ditches compared to those not grassed." Ditches with a small cross sectional area designed to leave the grass uncut need a cross sectional area two to three times or more larger because the grass impedes flow, slowing the water down.

CASE STUDY

CASE STUDY: FLAX BALE STRUCTURES

Milt Rigetti, chairman of the Madrid CDAA #142, describes the CDAA's drainage area, specifically the elevation drop towards the Moose Jaw River: "It can drop six feet in one mile here; that's where drop structures need to go to protect our ditch from erosion." Madrid CDAA has used flax bale drop structures to help reduce damage caused by erosion in these sensitive areas. Flax bales are placed along the banks in the area of concern. Rocks are placed on top of the bales and along the bottom of the channel. The bales and rocks are held in place with page wire and rebar. As the flax bales degrade, grass grows over the area, leaving grass and rocks to stabilize the banks and ditch bottom. Several of these structures have been used throughout the Madrid CDAA in areas where the drop in elevation is significant.

Elevation changes in a flax bale and rock drop structure in Madrid CDAA

Rebar, wire, and rock in grassed ditch in Madrid CDAA

Photo Credit: Stacey Lieslar, PAg

CASE STUDY

EROSION CONTROL ON THE SOURIS

The Souris CDAA #1 has implemented erosion control structures along their main drainage channel throughout the history of its operation. Most of the erosion control projects have been constructed with natural materials. Many flax bale structures have been constructed in the past to reduce erosion at large inlets along the main channel. Flax bale structures are long lasting and the materials are relatively available. Bales are dug in widthwise across the bottom of the inlet and held in place with rebar, page wire, and rocks. Several lines of bales can be used to protect the soil in the inlet from the erosive force of the water as it enters the main channel. Water movement slows as it passes over the structure, letting the sediment drop out in these areas securing the soil from further erosion. As the flax bale breaks down, vegetation is able to reestablish over the material, further stabilizing the area. The Souris CDAA has also used subsurface drainage pipes to direct water into the main channel from lateral ditches. These small culverts reduce water travelling over the surface and reduce the potential for surface erosion. The Souris CDAA plans to implement further erosion control measures using geo-textile materials. Straw waddles and erosion control blankets will be used, as well as a triangular sediment cage to slow water and reduce erosion.

DROP STRUCTURES

Drop structures lower the elevation of a drainage ditch over a short distance and are used to allow a drainage ditch to be constructed with a flatter, more stable slope than the slope of the terrain would dictate. In areas of higher elevation drop (increased slope) the erosive force of water increases. Drop structures must be designed to withstand the local increase in water velocity they generate and to transition the flow back to the calmer lower energy state of the downstream ditch using flax, straw, or geo-textile matting and other structural armouring. Other drop structures may actually avoid surface water flow by piping water to a lower elevation with an underground pipeline or culvert. Drop structures may require design by a professional engineer

Rock Drop Structures: Geo-textile materials can be used in place of natural fibers such as flax bales. Non-woven geo-textile matting can generally be used for elevation drops from up to 1.5 metres. Matting is laid at the start of elevation drop to the flat bottom of the drop. Stakes can be used to secure the matting and rocks are placed on top of the matting. The matting should be keyed into the soil around the periphery. Internal joints in the matting are made by overlapping the material. The size of the rock must be sufficient to prevent dislodging by the design flow of the structure. The structure may further be secured with wire mesh.

Sod Drop Structures: Plant cover protects soil from the erosive power of flowing water and raindrop impact[21]. In low energy situations sod can be used to secure soil in channels that need protection quickly, as it can be laid in the fall for use in the spring. Sod drop structures can be used in channels that are wide with a gentle elevation drop. The channel must be wide enough to spread out the flow energy of the water. Sod is laid on the flat upper elevation, down through the drop to the flat lower elevation. These structures must be very long, to dissipate the energy of the water. Drops must not exceed one metre for the sod to prevent erosion. Sod can be pinned down with stakes


Photo Credit: Agriculture & Agri-Food Canada

Nutrient retaining pond with healthy riparian area

CASE STUDY

MADRID CONSERVATION AND DRAINAGE DISTRICT

One way to manage water is similar to the use of a small dam: install control gates in culverts or small dams. Using control gates, Milt Rigetti of the Madrid CDAA #142 thinks that staging water releases is an efficient way of mitigating downstream flood effects during times of high runoff. In the Madrid CDAA, water is contained by control gates on culverts used to back-flood cropland. This cropland is only flooded for a short period of time, depending on the water volume to be moved through the main channel. This type of management requires co-operation from all landowners involved, but the benefit is evident in the reduction of flooding effects.


Photo Credit: Stacey Lieslar, PAg

Control gate on Madrid CDAA Ditch

for extra reinforcement, and water can be further slowed by the use of geo-textile ridge baffles that are also pinned to the sod and the ground.

Culvert Drop Structures: There are several types of culvert drop structures which may be constructed using a variety of culvert sizes. One type drops water into a vertical riser connected to a nearly horizontal outlet pipe at a lower elevation. Water drops to the lower elevation through this vertical culvert and flows out through the horizontal culvert at the lower elevation. It is important to protect the soil at the entrance and outlet of any culverts. Erosion can be prevented with rock or concrete pads. Another type of culvert drop structure utilizes an angled section, either at the inlet or midsection of the structure, to facilitate the elevation drop. This type also has a near horizontal outlet section at the lower elevation. The outlet is protected from erosion with geo-texile materials and rocks. Depending on the height of drop, a specific number of specially designed baffles are welded within the angled culverts to slow the velocity of water within the culverts. In general these types of structures are used to handle drops of 1.5 to 3 metres.

SEDIMENT RETAINING PONDS AND SMALL DAMS

Sediment retaining ponds are shallow, water holding cells with sloped sides. They are used to manage sediment-laden runoff in stream water systems. Retaining ponds are designed to hold water long enough to settle out suspended sediment[22]. Water is released from the pond but not drained completely. It's important that the level of water be maintained to keep sediment from leaving the pond.

Sediment retention ponds can effectively reduce pollutants in waterways. Sediments carry pollutants and, when the sediments settle within the retention pond, the pollutants settle out with them. Plants, algae and bacteria can take up pollutants retained in the pond, or decomposition may occur. Vegetation within the riparian area surrounding the retaining pond acts as a filter of pollutants. The vegetation traps sediments as runoff enters the pond, and excess nutrients may be taken up by plant roots. Absorption and decomposition of pollutants improves the quality of water leaving the retention pond. Sediment may be removed from the pond mechanically when sediment levels get too high.

MINIMIZATION: BENEFICIAL MANAGEMENT PRACTICES

CASE STUDY

SOUTH TOBACCO CREEK - SMALL RESERVOIRS

The South Tobacco Creek Watershed in south-central Manitoba experienced flooding and soil erosion in its annual cropland. The landowners wanted to mitigate the effects of both issues so they constructed several dams and reservoirs in the headwaters. Over an eight-year period, two of the reservoirs were monitored during spring snowmelt. The focus was the reservoirs' effect on peak flows, sediment and nutrient loads downstream. The study proved that these storage dams were effective in reducing peak flows from annual cropland and reducing annual concentrations of sediment and nitrogen in water bodies downstream[23]. Phosphorus was slightly reduced downstream from one of the dams. This reduction in nutrients downstream and the improvements in flood mitigation suggests that sediment-retaining ponds could be practical and effective in other agricultural landscapes

CASE STUDY

SHELDON WIEBE

Sheldon Wiebe of MacGregor, Manitoba, completed a tile drainage project in 2004. He used PVC weeping tile buried subsurface three- to four-feet deep every 50 feet throughout his wettest quarter. Using an existing retention pond within his property he pipes the water collected by the tiles via four-inch lateral pipes into a 14-inch outlet that empties into the retention pond. The lateral pipes are covered at their inlet with a nylon sock to prevent sand from clogging the pipeline, as the soil at Sheldon's farm is a very fine sandy loam. Sheldon uses approximately 2,500 feet of lateral piping to transport drained water to the retention pond. Water from the retention pond has been monitored and tests well enough for livestock consumption. Sheldon uses this water for irrigation on the farm. Along with the benefits from utilizing stored water for irrigation, Sheldon says that he has seen the salinity slowly recede from the wet quarter over the years since the project has been in place. His only regret is that the tile was installed in early spring, so he hit the frost line that prevented laying the tile as deeply as planned. Sheldon explains that it hasn't been an issue so far.

CONTROLLED TILE DRAINAGE

Controlled tile drainage refers to a tile drainage system equipped with control gates within the outlet channels. These control gates are able to hold back water within the tile portion of the project. Tile drainage lowers the water table within the drainage area by releasing excess moisture to an outlet. When water is held back within the outlet channel, the water table can be increased to benefit crop growth on the drained area.

Tiling equipment and perforated pipe

Installing Drainage Tile

Controlling water release in tile drainage systems for sub-irrigation provides storage of rainwater and may reduce tile discharge losses of nitrogen[24]. The growing plants can utilize the nitrogen in the water when sub-irrigated with the water from previous drainage.

MINIMIZATION: BENEFICIAL MANAGEMENT PRACTICES

CROPLAND MANAGEMENT

Good management practices that protect water help mitigate the impact of drainage by improving the water quality of runoff.

Winter cereals, including fall rye, winter wheat and winter triticale, provide many environmental benefits because they are actively growing in the spring. They eliminate the need for soil disturbance in the spring when waterfowl are nesting. The plant growth holds the soil, reducing the potential for soil erosion when runoff is highest. They make use of the early spring moisture for growth, and normally mature before there is any damage from the summer heat. The early spring growth increases competition with annual weeds and reduces the need for in-crop herbicides[25]. Other benefits of the early maturity of winter cereals normally include reduced insecticide and herbicide use[25].

Lush winter wheat in spring.

Zero till systems offer long-term soil conservation benefits, including increased soil organic matter, preservation of earthworms important for improving aeration, improved water infiltration, and prevention of soil erosion. Fuel costs and subsequent pollution can be reduced with zero till management due to reduced machinery use prior to seeding.

Variable rate technology is used to distinguish fertilizer needs within a field depending on topography imaging and soil analysis, including fertility and soil conductivity. Compared to flat rate applications, the use of variable rate technology to fertilize crops may reduce the risk of nutrient loading by applying adequate fertilizer for crop production without applying excess[26].

CASE STUDY

BUD MCKNIGHT

Bud McKnight of Homewood, Manitoba, wanted a method of manipulating the moisture levels on his land. A corn and soybean producer, Bud decided to tile drain a half section of his land in the fall of 2011. He wanted to incorporate some control structures in the outlet channels in hopes of being able to drain off excess moisture in the spring and pump water back into the tile drained areas later in the year when conditions are dry. Bud designed the system into seven zones based on soil type. These drainage zones give Bud the flexibility of back flooding into specific zones, or all of the zones as needed. Excess water drains out of the drainage area through four-inch lateral pipe into various sized sub-mains, then subsequently into 18-inch main channels. Control gates, installed in 2012, are situated on mains and sub-mains and are variably adjustable. The adjustability of the gates will be used to store water and pump water back to the tiled area for crop growth benefit later in the season. Bud has been studying similar projects to find solutions to some challenges associated with the project. Nylon socks are often used on laterals to filter particles from the water in the drainage system to prevent blockage within the laterals and mains, but Bud has not yet determined how to filter the water flowing back into the tile drainage system at drier times of the year. He has observed the flow of water into the tile drainage system through 2012 and hopes to have the project ready for use in the spring of 2013.

COMPENSATION: BENEFICIAL MANAGEMENT PRACTICES

WETLAND RESTORATION

Wetland restoration involves plugging a drainage ditch outlet to restore a previously drained wetland back to its natural capacity. Plugs are built with clay to ensure a sturdy earthen structure. They are contoured to allow water to spill over on wet years to avoid flooding acres outside the natural basin boundary. An ideal wetland to restore is typically one to five acres in size. Wetland vegetation quickly re-establishes as the natural moisture levels are restored. Conservation agencies will work with landowners to cover the costs of restoring wetlands.

Photo Credit: WSA

Wetland basin restored with earthen ditch plug

DRAINAGE MITIGATION ACRES

Drainage mitigation acres compensate within the watershed for wetland and habitat acres lost due to drainage on agricultural land. Mitigation is implemented by establishing new areas for constructing wetlands, restoring wetlands or conserving existing wetlands to a volume or acreage equal or incremental to that lost to the drainage project[27].

UPPER ASSINIBOINE CONSERVATION DISTRICT

Recognizing the long-term value of wetlands and water storage, the landowners in the Upper Assiniboine Conservation District (UACD) in Manitoba developed a no net loss framework for their drainage mitigation work. "No net loss" means that the volume of water storage lost due to drainage is reclaimed completely in another area. Ideally, the area chosen is close to the drainage project site. The UACD uses GIS to estimate the volume of water lost to drainage and tries to create new water storage in all its cases. Riparian vegetation and wetland function is restored in time. Where wetland restoration must be used to create water capacity, the project is turned over to Ducks Unlimited Canada or the Manitoba Habitat Heritage Corporation. Mitigation is suggested by the UACD when landowners apply for drainage project permits on their land. The process is voluntary and the landowner and the UACD work together to find an area to store water to mitigate the loss. Many challenges are faced by UACD when initiating these mitigation projects: In many cases, landowners don't want to store water elsewhere; the cost of doing the work may be a deterrent; and the mitigation efforts may slow up the process of getting approval for the drainage works. Still, Ryan Canart of the UACD believes that landowners will reap the benefits from the mitigation process: "It's our responsibility to achieve a no net loss of ecological function and hydrological function," he says. "The cost in the long run in terms of habitat loss, flood effect mediation and water quality degradation is much greater than the present cost of mitigating the water storage loss."

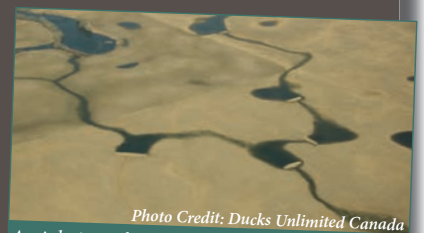


Photo Credit: Ducks Unlimited Canada

Aerial view of constructed ditch plugs that have restored numerous wetland basins on a quarter section that was previously drained.

DRAINAGE REGULATIONS

Many different levels of government and agencies have a hand in the movement of water and drainage. Appreciating the roles and concerns of each will help proponents understand the processes associated with regulated, planned drainage.

WATER SECURITY AGENCY OF SASKATCHEWAN

(formerly the Saskatchewan Watershed Authority)

Focus: Regulating water development, water allocation and use, water quality and movement.

Through legislation and regulations, the Water Security Agency of Saskatchewan (WSA) is responsible for licensing the use and movement of water and construction works (including drainage works) involving water. Before draining water in any way: contact a WSA Regional Office for assistance (see Appendix IV). WSA Regional Services staff will discuss any plans with the proponent, ensure projects are initiated properly, and ensure that work carried out will not have a negative impact on water movement or quality. Drainage of permanent wetlands is not allowed unless the proposed use will be of greater benefit to society and appropriate mitigation and/or replacement can be accomplished.

The WSA has processes to resolve a landowner's concerns with unregulated drainage impacting their operation or municipality. Written requests for assistance resolving the issue can be submitted to a WSA Regional Office. Regional Services staff will investigate the concern, provide non-binding advice and work to resolve the concern. If an agreement between parties is not met, a formal complaint can be launched with a binding end result. The applicable forms and information are available at: https://www.wsask.ca/en/Water-Programs/Drainage-Problems-and-Complaints/.

Focus: Bank alteration and potential impacts to the site and downstream.

Through the Environmental Management and Protection Act, WSA is legislated to manage the alteration of beds, banks, or boundaries of watercourses. Watercourses include: streams, creeks, rivers, gullies, valley floors, drainage ditches, or any other natural or man-made channel[28]. Water may flow continuously or intermittently. An Aquatic Habitat Protection Permit must be obtained to alter a water course in any way (www.wsask.ca, see Appendix III). There are a few exceptions where a permit is not required. These currently include: If the watercourse is wholly contained on the producers land and does not exit the land; if the intermittent watercourse, such as a drainage ditch, has been cultivated continuously since December 5, 2002; or under conditional circumstances of culvert replacement, beaver dam removal or vegetation removal/maintenance.

RURAL MUNICIPALITIES

Focus: To safeguard infrastructure.

Through the Municipalities Act a municipality may, by way of a bylaw, regulate the use of or activity on any river, stream, watercourse, lake and other natural body of water within the municipality, including the air space above and the ground below[29]. Municipalities can impose further regulations above and beyond Federal and Provincial laws, as long as Federal and Provincial laws are followed. The bylaws of each municipality are different. Please consult with your local municipality to learn about bylaws pertaining to water and water movement.

CONSERVATION AND DEVELOPMENT AREA AUTHORITIES (CDAA)

Focus: Flood control for the orderly movement of water off the land for the purposes of improving agriculture.

Under the Conservation and Development Act, a CDAA is a producer led and managed organization that has the ability to expropriate land, and construct, own and maintain flood control and other works on behalf of its ratepayers[2]. Projects must receive approval through the WSA. It has the authority to apply taxes to the municipal tax roll on land within the CDAA for maintenance and infrastructure costs. Producers within a CDAA or in close proximity to a CDAA can apply to have a parcel of land added to the CDAA for drainage, or taken out of the CDAA if no drainage is occurring on the land. CDAAs work closely with WSA regional staff.

Forming a CDAA takes time but provides legal stability, powers to tax benefiting lands and the coordination to assure maintenance on main waterways. The Saskatchewan Conservation and Development Association (SCDA) can provide interested producers with more information about CDAAs. Consult with your local WSA Regional Office regarding the process of becoming a Conservation and Development Area Authority.

WATERSHED ASSOCIATION BOARDS

Focus: Flood control for the orderly movement of water off the land for the benefit of their partner agencies.

Watershed Association Boards (WAB) operate under the Watershed Associations Act similar to CDAAs[30].

CASE STUDY

THE VALUE OF PERMITTING DRAINAGE WORKS

Warren Thomson has worked on drainage issues for the Saskatchewan government for 35 years. Now the Regional Manager for the Water Security Agency in Yorkton, he has many stories about the dollar value of obtaining a legal permit for drainage. "I've seen landowners who drained across a neighbour's land with verbal permission but later had to close the ditches when the land changed hands" recalls Warren.

Photo Credit: Water Security Agency

Warren Thomson at work

"One farmer was ready to retire, but received a reduced price for his land because the ditches had been ordered closed. His retirement plans had to be cut back because he had not guaranteed the long term operation of his drainage project."

UNREGULATED DRAINAGE

1) ***Any drainage works initiated since January 1st, 1981, and without permit.***
2) ***Drainage works not constructed under the authority of, or pursuant to, the instructions, or an order, of the minister.***
3) ***Drainage works constructed or operated by an owner of land, where the water drained and the drainage works are not located entirely on the owner's land and the water drained does drain from the owner's land.***

Whereas a CDAA has membership from individual landowners, WAB membership is made up of different agencies. Member agencies such as rural municipalities, irrigation districts, non-profit corporations, CDAAs and urban municipalities pay levies into the WAB to construct, operate and maintain works. Works often benefit a large number of people within the various agencies: For example, a controlled outlet on a lake is a common WAB project. The Saskatchewan Conservation and Development Association oversees WABs and can provide additional information to interested agencies.

DEPARTMENT OF FISHERIES AND OCEANS

Focus: Protecting fish and fish habitat, including spawning grounds, feeding grounds, adult habitat and upstream activities that can impact fish habitat.

Through the federal Fisheries Act, the Department of Fisheries and Oceans (DFO) ensures no harmful alteration, disruption, or destruction of fish habitat unless approved by DFO[31]. Pertaining to drainage, the Fisheries Act has two main roles. First, new construction with the potential to impact fish habitat must go through an approval process: Design, construction techniques, processes and mitigation measures must all be laid out for and discussed with the appropriate organization (Proponent's Guide to Information Requirements for Review Under the Fish Habitat Protection Provisions of the Fisheries Act http://www.dfo-po.gc.ca/habitat/role/141/1415/14155/requirements-exigences/index-eng.asp).

The second guiding role of the Fisheries Act is ditch maintenance on already constructed ditches or watercourses. Such activities may include: silt removal, ice and snow clearing, routine rock placement, mechanical vegetation control, and debris removal. Saskatchewan has been allowed to have Standard Mitigation Measures for Routine Ditch Maintenance, which can be obtained from a DFO Regional Office. If applicable and if the conditions and mitigation measures outlined are followed, further review or approval is not required for routine ditch maintenance.

WATERSHED STEWARDSHIP GROUPS

Focus: Non-enforcement based ability to assist in improvements to the local watershed.

Many different watershed stewardship groups exist across the province. Some were established from Source Water or Watershed Protection Plans with assistance from the WSA, while others originated with community members coming together over an issue or an opportunity. Local watershed stewardship groups have the ability to point producers in the right direction for funding opportunities, legislation and processes. They can also facilitate discussion and learning events, and find technical resources to answer questions about drainage.

STEPS TO BECOME A CONSERVATION AND DEVELOPMENT AREA AUTHORITY - AN OVERVIEW:

- Local producers meet to discuss the possibility and logistics of becoming a CDAA;
- Local drainage basin is defined. It includes land that is contributing or has the potential to contribute to the project area;
- An interim CDAA board is elected;
- Work with WSA to develop a legally binding landowner petition;
- Area producers appoint a returning officer;
- A minimum of two-thirds of the area landowners must sign the petition to become a CDAA;
- Petition is presented to the Minister in charge and processed accordingly;
- Parallel to the process of becoming a CDAA, the producer group may bring drainage works into regulatory compliance or construct new engineered works. These works must be approved by WSA;
- The CDAA may tax members to build infrastructure.

UPPER SOURIS WATERSHED ASSOCIATION

Like other local watershed stewardship groups, the Upper Souris Watershed Association (USWA) is an independent, non-profit organization that has been developed from the ground up. Together, members from within the watershed use the locally developed Source Water Protection Plan to direct key actions to improve the watershed. The USWA has a number of on-going projects aimed at improving overall watershed health, such as the Nickle Lake Water Quality Project and the Souris River Restoration Project. Like other watershed stewardship groups, the USWA can help producers find technical resources and access to funding, move projects forward and bring people together.

Wetlands provide many goods and services such as: regulating water supply, protecting water quality, food production, recreation, cultural benefits and wildlife habitat.

APPENDIX I

FLOW CHART OF REGULATORY/PERMITTING PROCESSES FOR DRAINAGE PROJECTS

This flow diagram represents the current practice around drainage of agriculture land. However, it is not well recognized that beds and shores of water bodies, including wetlands, are owned by the Crown

For this drainage project, will water leave the quarter or legal parcel?

NO
Water will only flow into a wetland or other area within the same quarter section and does not leave the property. In this case, you are only impacting your own land and own operation, even if the land is sold or traded. Water Security Agency of Saskatchewan, fisheries, municipal, Conservation & Development Area Authority, or Aquatic Habitat Protection permits are not required.

YES
Go to next question.

Is this is a new drainage project yet to be constructed?

NO
Has there been a formal complaint made against the drainage works?

YES
Please work with your WSA Regional Office to resolve the issue.

NO
Work with your WSA Regional office to permit the drainage works.

YES
Go to next question.

Is your land located within a Conservation & Development Area Authority (CDAA) or adjacent to one?

YES
Contact the local CDAA to request that your project be considered. The CDAA will decide if the project can join, and what the potential impact to the adjoining land in the CDAA may be. Acres within a CDAA are charged additional municipal taxes for CDAA maintenance and infrastructure costs. As every CDAA is different, your CDAA will inform you of further regulations or permitting discussed below that you may require.

NO
Go to next question.

If your project will impact R.M. infrastructure or land or if your R.M. has bylaws pertaining to drainage, consult your rural municipality.

Are there a number of producers all within the same area that are draining or wish to drain?

YES
Forming a Conservation & Development Area Authority (CDAA) or a Watershed Association Board may be an option.

NO
Go to next question.

APPENDIX I

FLOW CHART OF REGULATORY/PERMITTING PROCESSES FOR DRAINAGE PROJECTS

Will your project drain directly into fish habitat (e.g. a lake, creek, stream, flood plain, major channel) or is your project in fish habitat (e.g. a wetland or flood plain where fish spawn)?

YES
Project mitigation measures to ensure no impact to fish habitat must be followed. Some standard mitigation measures exist. Consult with the Department of Fisheries and Oceans for current forms and processes.

Go to next question.

NO
Go to next question.

Will your project affect a watercourse or waterbody that is not entirely contained on your land?

YES
Measures to mitigate potential harm caused by your project must be taken. An Aquatic Habitat Protection Permit (AHPP) prior to construction must be obtained. Consult with the Water Security Agency for current forms and processes.

NO
Go to next question.

Seek approval from the Water Security Agency: To pursue legal, licensed drainage works within Saskatchewan, an Approval To Construct And Operate Works must be obtained. The Water Security Agency (formerly the Saskatchewan Watershed Authority) has done an excellent job creating a number of fact sheets and regulatory documents on constructing and operating works. All are available online or through the Water Security Agency of Saskatchewan (WSA) Regional Offices (see Appendix II). To submit an application:

1. First obtain the following factsheets:
   A) Drainage Approval Process Fact Sheet (FS-314),
   B) Instructions to Complete Application to Construct and Operate Drainage Works (RG-108D),
   C) Obtain and submit an Application to Construct and Operate Drainage Works (RG-103D)
2. WSA regional staff will conduct a preliminary evaluation of the application and project.
3. The producer proposing the drainage works is responsible to provide information and a plan of the drainage works.
4. The producer proposing the drainage works is responsible for obtaining the binding agreement of the owner(s) of the land being drained onto and/or through. When an Approval to Construct is granted, an easement is registered against all affected land titles.
5. WSA can ask that numerous other requirements be met dependant on the project and its impacts.

Water Security Agency

Instructions to Complete Application for Approval to Construct and Operate Drainage Works under *The Saskatchewan Watershed Authority Act, 2005*

Every person desiring approval to commence the construction, alteration, extension or operation of works and/or right to use water shall file with the Water Security Agency (WSA) a completed application form, a fee as established by the WSA and, where not waived, acceptable engineering plans and other additional information as the WSA deems necessary to complete the application. A separate and complete application is required for each project and the following is itemized information on how to complete the application.

Item 1: ***Name of Applicant(s)***

The applicants should be the owners of the property on which the works are proposed to be constructed on, or exist on. If the applicants do not own the property, a legal interest is required. The applicants are to clearly print or type their surnames and at least one given name and initial(s). When lands are owned by a corporation, company, association, or other legal entity, the full name of the entity is to be shown as the applicant. Additionally, and in order to address correspondence and inquiries, the first and last names of a responsible point of contact should be provided in brackets.

All names appearing on the titles of all the affected lands must be included as *Applicant(s)*.

Item 3: ***Description of Works***

The applicant is to provide a brief description of what the works will consist of and how they are intended to be operated.

Item 4: ***Description and Owner of Lands***

The full legal description (1/4 Section, Township, Range and Meridian) and the names of the owners or occupants are to be provided for lands on which works will be constructed and/or will be affected by the works. The applicant's legal interest in each parcel of land affected should be shown as one of the following:

(a) registered owner;
(b) holds the land under agreement for sale;
(c) leases the land; or,
(d) rents the land.

Item 5: ***Drainage***

For drainage projects it is not necessary to submit plans of the project with the application; however, a sketch plan would be helpful. It should be drawn on a separate sheet of paper and faxed, emailed or submitted with the application to the appropriate regional office. A preliminary evaluation of the proposed project will be made on the basis of the information contained in the application form to determine whether or not the project could be approved for construction. If it appears from the preliminary evaluation that the project could be approved for construction, the applicant will be advised of the plans required.

Item 6: ***Application Fees***

Schedule of fees for the various applications:

1. Approval to Construct and Operate Works
   (a) an approval to an individual.....$ 25.00
   (b) an approval jointly to two or more individuals.....$ 50.00
   (c) an approval to any person other than an individual.....$ 100.00

   Application fees are payable to the Water Security Agency in accordance with the fee schedule outlined above at the time an application is filed and are **non refundable**.

2. Registration Charges: ISC (Land Titles) Registrations
   (a) Notice of Issuance of an Approval of Works.....$ 50.00 per title
   (b) Certificate.....$ 50.00 per title

The fees for registering notices/certificates on land titles are established by the Information Services Corporation and payable in advance with the application fees to the Water Security Agency. The WSA registers notices and/or certificates on lands where the works are constructed and on lands affected by the works. The WSA may, upon special request, invoice the applicant in accordance with the fee schedule outlined above once the land control and registration requirements for the project have been determined and where it has been agreed that payment need not be made in advance.

Applicant's Signature: All applicants are required to sign and date the application (*See Item 1*). When lands are owned by a corporation, company, association, or other legal entity, the application must be signed by one officer or director and a seal affixed, or by two officers or directors in which case no seal is required.

Completed applications should be submitted to the nearest Water Security Agency Regional Office. The location and addresses are outlined on a map under the "*About Us*" section on the Water Security Agency website www.wsask.ca.

Water Security Agency

Application for Approval to Construct and Operate Drainage Works under *The Saskatchewan Watershed Authority Act, 2005*

WSA File: _____

PLEASE READ THE INSTRUCTIONS (RG-108D) BEFORE COMPLETING THIS APPLICATION.

1. Name of Applicant(s): _____
(surname) (first name and initials)

Mailing Address: _____

_____ Postal Code: _____

E-mail Address: _____

Telephone No.: ( )_____ Cellular No.: ( )_____

2. I/We do hereby make application under *The Saskatchewan Watershed Authority Act, 2005* for drainage.

3. Brief description of what the works will consist of: _____

_____

_____

_____

_____

4. Works will be constructed on ☐ or exist on ☐ and affect the following lands or areas:

Land Description	Registered Owner	Applicant's Interest in Said Land

Note: The Water Security Agency (WSA) will be registering notices on lands where the works are located and certificates on land affected by the works. The WSA must recover charges applied by the Information Services Corporation (ISC) for registering the notices/certificates on the land and titles.

5. Drainage
   (a) Approximate length of works _____
   (b) Approximate size of area drained _____ (hectares/acres)
   (c) Description of outlet where works will discharge _____

6. Fees payable in support of this Application *(Refer to the schedule in Item 9 of the instructions)*
   (a) Application Fee – Approval to Construct and Operate Works $_____
   (b) ISC (Land Titles) – Registration Charges $_____
   Total Fees Payable $_____

NOTE: All fees are to be made payable to the Water Security Agency

I/We certify that the information contained in this application is complete and accurate.

I/We acknowledge and accept that this application will be subject to a registration fee payable to the Water Security Agency for the cost to register notices and/or certificates with Information Services Corporation.

I/We acknowledge any information submitted in support of this application will be subject to disclosure under the Freedom of Information and Protection of Privacy Legislation (FIOP). If supporting information contains a confidentiality provision, the Applicant must provide a letter from the author of the information acknowledging the information is being provided to the Water Security Agency and authorizing it to be made public.

Dated at _____, Saskatchewan, this _____ day of _____ 20____.

_____ _____
Please Print Name Applicant's Signature

_____ _____
Please Print Name Applicant's Signature

_____ _____
Please Print Name Applicant's Signature

Water Security Agency Use Only

Approved as the application filed with the Water Security Agency dated

_____, 20_____

Publication of Notice is Required / Waived

_____
for Water Security Agency

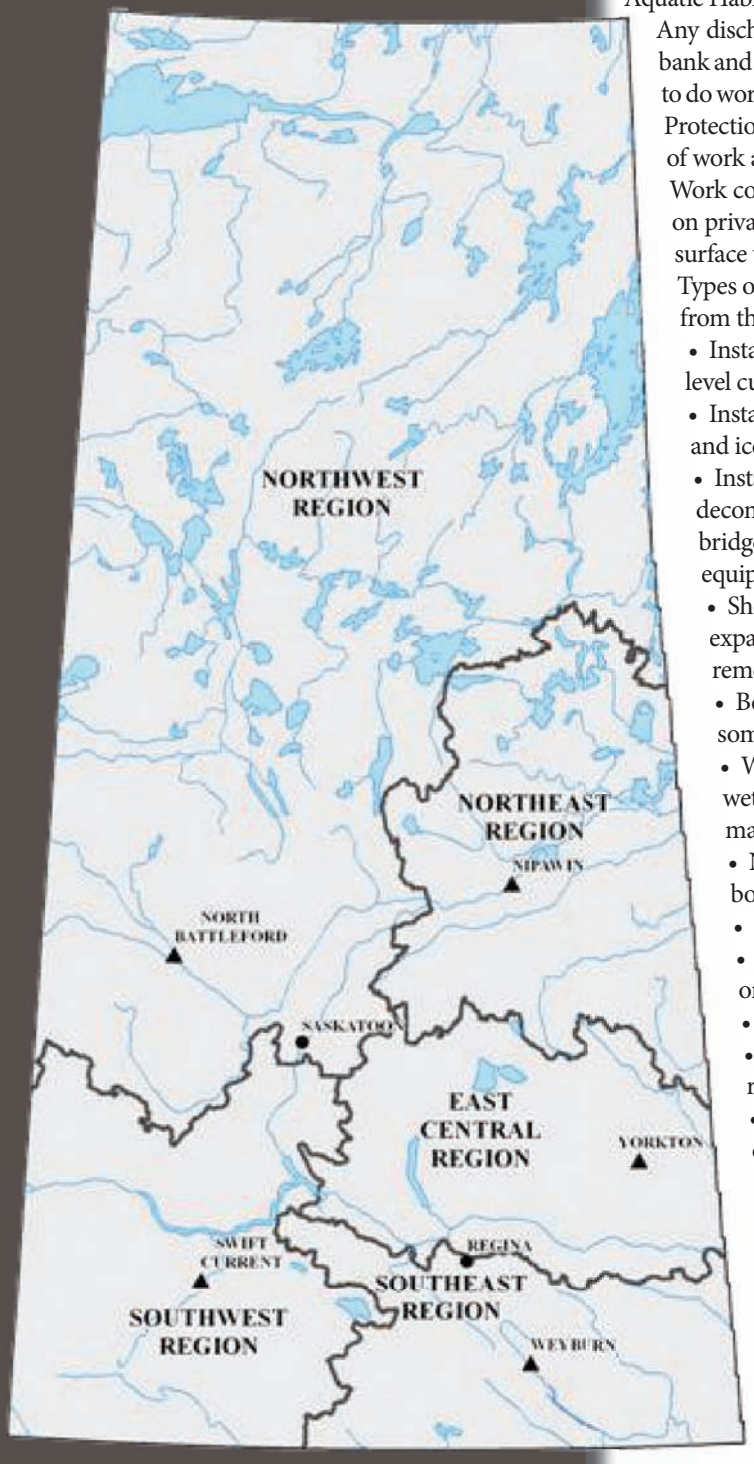
APPENDIX III

AQUATIC HABITAT PROTECTION PERMITTING

Application Procedure

To apply for an Aquatic Habitat Protection Permit, complete the application form and submit a completed form to the appropriate reviewer according to the WSA Regional Map.

Permit applicants may submit their applications by e-mail, by mail, or in person at WSA Offices and Ministry of Environment field offices. Visit the Water Security Agency website (www.wsask.ca) for more information and contacts.



The Water Security Agency (WSA) is the provincial organization responsible for reviewing aquatic habitat alterations for the protection of aquatic ecosystems and human health in a way that balances social and economic development interests.

The Environmental Management and Protection Act (EMPA) and The Water Regulations define WSA's provincial authority for aquatic ecosystem protection and the broader aquatic habitat protection objectives that stem from it, such as protection of the bed, bank and boundary of Crown surface waters and the values entailed such as aquatic habitat, aquatic organisms, the water cycle, and shoreline stability.

Aquatic Habitat Protection Permits

Any discharge with adverse effects on water or any work in the bed, bank and boundary area of water is subject to EMPA. Anyone wanting to do work in or near Crown surface water requires an Aquatic Habitat Protection Permit from the WSA. Existing exemptions for some types of work and sites as defined by The Water Regulations will continue. Work conducted on water bodies or watercourses wholly contained on private land owned by one individual that do not flow into other surface waters are exempt from most requirements.

Types of work that require an Aquatic Habitat Protection Permit from the WSA include, but are not limited to, the following:

- Installation of new round, arch or box culvert crossings, low-level culvert crossings or crossings involving channel realignment.
- Installation of temporary stream crossings: rock fords, ice roads and ice bridges.
- Installation of new clear-span bridges, and maintenance or decommissioning of existing clear-span bridges. Also multi-span bridge installations that involve channel realignment or heavy equipment working in the watercourse.
- Shoreline stabilization projects: retaining wall construction, expansion or removal, flood-proofing, and vegetation/tree removal on shorelines after flooding.
- Beaver dam removal by mechanical means (except under some conditions).
- Water conveyance projects: channel clearing, channelization, wetland infilling or drainage, existing drainage ditch maintenance, construction of new ditches.
- Non-routine maintenance dredging of channels or water bodies.
- Irrigation and water supply projects.
- Water control structures: construction of small-scale dams or weirs, repair or routine maintenance of existing structures.
- Aquatic vegetation removal by mechanical means.
- Marina and breakwater construction and maintenance or repair, including routine dredging.
- Construction, maintenance or removal of public/community boat launches.
- Construction and maintenance of public/community beaches.
- Dock and waterline construction adjacent to surface water.
- Golf course developments adjacent to surface water.

APPENDIX III

AQUATIC HABITAT PROTECTION PERMITTING

Water Security Agency

Aquatic Habitat Protection Permit Application

Note: Work is not authorized until a permit has been issued

Name of Applicant: _____ Telephone No.: _____

Mailing Address: _____ Postal Code: _____

Name of Registered Land Owner: _____ Telephone No.: _____

Location of proposed work (Lot/Block, Twp/Rg, UTM or Lat/Long): _____

Name of Affected Water Body or Watercourse: _____

All applications MUST contain the following information (use back of application if additional space is required):

1) Description of proposed work or development: _____

_____

_____

2) Description of area where work is to take place including slope, distance from water, soil type, substrate and vegetative cover: _____

_____

_____

3) Construction schedule, type of construction materials and equipment to be used: _____

_____

_____

_____

4) Proposed measures to mitigate or prevent any potential impact of the activity on aquatic and riparian habitats, including erosion and sediment control plans: _____

_____

_____

5) Plans for restoring the environment after the proposed activity has been completed, including replacing or restoring vegetation: _____

_____

_____

Inclusive of accurate maps, photos and plans will normally aid in project review and reduce review time

Signature of Applicant _____ Date_____

An approval granted here does not release the applicant from the responsibility of obtaining any other approvals that may be required under federal, provincial or municipal legislation.

APPENDIX IV

AGENCY CONTACT INFORMATION

AGRICULTURE AND AGRI-FOOD CANADA, SCIENCE AND TECHNOLOGY BRANCH - **www.agr.gc.ca**
REGINA OFFICE
408 - 1800 Hamilton Street
Regina, Saskatchewan S4P 4L2
Phone: 306-780-5070
WEYBURN OFFICE
110 Souris Ave. E.
Weyburn, SK S4H 2Z8
Phone: 306-848-4488

DUCKS UNLIMITED CANADA – **www.ducks.ca**
REGINA OFFICE
P.O. Box 4465
1030 Winnipeg St.
Regina, SK S4R 8P8
Phone: 306-569-0424

FISHERIES AND OCEANS CANADA - **www.dfo-mpo.gc.ca**
REGINA OFFICE
1804 Victoria Avenue East
Regina, SK S4N 7K3
phone: 306-780-8725

MINISTRY OF AGRICULTURE - **www.agriculture.gov.sk.ca**
AGRICULTURE KNOWLEDGE CENTRE
1-866-457-2377
KINDERSLEY REGIONAL OFFICE
Phone: 306-463-5513
PRINCE ALBERT REGIONAL OFFICE
Phone: 306-953-2363
NORTH BATTLEFORD REGIONAL OFFICE
Phone: 306-446-7962
OUTLOOK REGIONAL OFFICE
Phone: 306-867-5575
PRINCE ALBERT REGIONAL OFFICE
Phone: 306-953-2363
REGINA REGIONAL SERVICES BRANCH
Phone: 306-787-9773
SASKATOON REGIONAL OFFICE
Phone: 306-933-8116
SWIFT CURRENT REGIONAL OFFICE
Phone: 306-778-8285
TISDALE REGIONAL OFFICE
Phone: 306-878-8843
WATROUS REGIONAL OFFICE
Phone: 306-946-3230
WEYBURN REGIONAL OFFICE
Phone: 306-848-2857
YORKTON REGIONAL OFFICE
Phone 306-786-5859

MINISTRY OF ENVIRONMENT - **www.environment.gov.sk.ca**
General Inquiries: 1-800-567-4224

SASKATCHEWAN ASSOCIATION OF WATERSHEDS
www.saskwatersheds.ca; info@saskwatersheds.ca

SASKATCHEWAN ASSOCIATION OF RURAL MUNICIPALITIES
www.sarm.ca
2075 Hamilton St. Regina, SK S4P 2E1
Phone: 306-757-3577

SASKATCHEWAN CONSERVATION AND DEVELOPMENT ASSOCIATION INC.
mcmer@sasktel.net
Box 505, 110 2nd Ave S
Rose Valley, SK S0E 1M0
Phone: 306-322-2222

WATER SECURITY AGENCY - **www.wsask.ca**
See map page 25 for the Regional Services Office that serves your area
HEAD OFFICE
400 - 111 Fairford St. E.
Moose Jaw, SK S6H 7X9
Phone: 306-694-3900
REGINA OFFICE
420 - 2365 Albert Street
Regina, SK S4P 4K1
Phone: 306-787-0726
SASKATOON OFFICE
101 – 108 Research Drive
Saskatoon, SK S7K 3R3
Phone: 306-933-7442
YORKTON REGIONAL OFFICE
2nd Floor, 120 Smith Street East
Yorkton, SK S3N 3V3
Phone: 306-786-1490
WEYBURN REGIONAL OFFICE
3rd Floor, City Centre Mall
319 - 110 Souris Avenue
Weyburn, SK S4H 2Z8
Phone: 306-848-2345
SWIFT CURRENT REGIONAL OFFICE
Box 5000, 3rd Floor, E.I. Wood Building
350 Cheadle Street West
Swift Current, SK S9H 4G3
Phone: 306-778-8257
NIPAWIN REGIONAL OFFICE
Box 2133, 201 – 1st Ave. E.
Nipawin, SK S0E 1E0
Phone: 306-862-1750
NORTH BATTLEFORD REGIONAL OFFICE
402 Royal Bank Tower1101 - 101st St.
North Battleford, SK S9A 0Z5
Phone: 306-446-7450

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