

Wetlands on My Lands?



Some simple, low-cost techniques for creating or restoring wetlands on your property.



566 Welham Road
Barrie, Ontario L4N 8Z7

Toll free: 1-888-402-4444
Fax: (705) 721-4999
Email: du_barrie@ducks.ca
www.ducks.ca

1.888.402.4444 www.ducks.ca



Wetlands on My Lands... What Landowners are Saying:

"I believe restoring wetland habitat was the best choice we could ever have made for this marginal piece of farmland that flooded every spring and never once produced a viable crop. Now we enjoy seeing deer as well as a pair of ducks splashing around and enjoying their new habitat. This wetland has enabled us to truly enjoy what was originally intended for this land years ago."

Anita Kitkowski
Rosewood Farm
Fergus, ON

"Our family really enjoys the two wetlands we created a couple of years ago. Drainage ditches got rid of most of the wetlands in our area so we wanted to put something back for nature. Our wetlands provide enjoyment through wildlife watching and also serve as a skating area for the children in winter!"

Ron Stewart
Old Stewart Farm
Port Elgin, ON

"Our farm is in the Oak Ridges Moraine where there is a significant interest in preserving the natural heritage. People who move here from the city tend to have an appreciation for nature and wildlife and we feel our wetland project has really added value to our property. But most importantly, we're looking forward to enjoying the wetland ourselves."

Paul and Jackie Down
Janetville, ON



What is a wetland?

An area that is covered by water for all or part of a year or where the water table is at or near the surface.

All wetlands have three main characteristics:

- Impermeable soils
- Water source
- Wetland vegetation

Cover photos:
Red-winged Blackbird, Dragonfly, Mallard Duck, Green Frog and White Water Lily

Introduction - How To Use This Guide

So you've decided you want a wetland to enhance the wildlife attractiveness of your property. That's great! Not only will the wetland provide personal enjoyment but you'll be contributing to a healthier, more diverse countryside for future generations. The good news is that you don't have to be an engineer or biologist to create or restore a wetland. However, depending on your comfort zone, you may want to talk to some experts first such as the folks at Ducks Unlimited Canada (DUC). This guide will provide you with some simple, low-cost techniques for creating or restoring wetlands for wildlife habitat. Follow the step by step information inside this booklet but be aware that some steps will overlap so you are encouraged to read through the guide thoroughly before starting your wetland project. Please note italicized words or phrases can be found in the Glossary on page 12.

Step 1	4
Site Selection	
Step 2	5
Project Design	
Step 3	11
Getting Permission and Permits	
Step 4	11
Moving Dirt!	
Step 5	11
Long Term Care and Maintenance	
FAQ's	12
Glossary	12
Contacts	12
Other References	13



Step 1 Let's Get Started

Now that you've decided you want a wetland on your property, what's next? You must evaluate what potential your property has and how much you are willing to spend because this will determine the location and properties of your wetland. The timeline below gives you a general idea of what's involved and when each step should take place. Note that this process may not be completed within a year, especially if any permits are required.

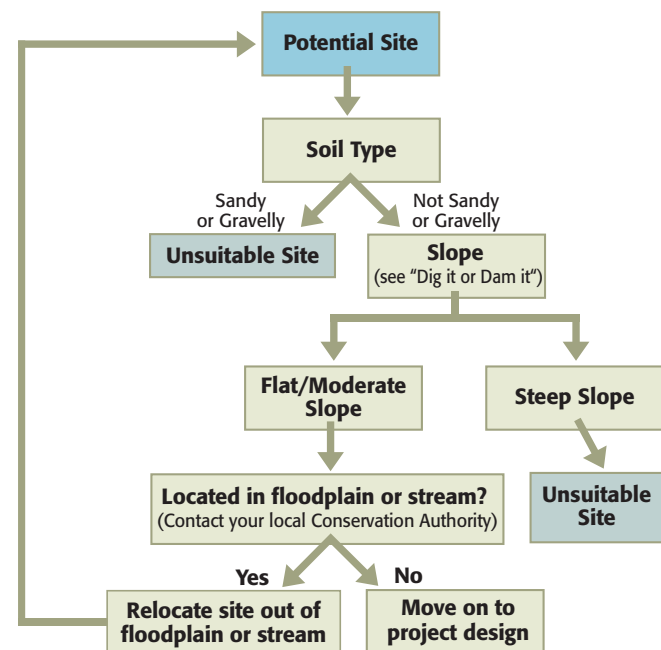
Wetland Enhancement/Restoration Timeline



Site Selection

A suitable site for a wetland doesn't necessarily require a large parcel of land. Almost any site with *impermeable* (not sandy or gravelly) soils and very little slope is a candidate for further investigation. While site selection can be done at any time of the year, it's a good idea to do it during the spring runoff to get an idea of where water flows across and lies on your property. Often, the best sites to look at are previously drained wetlands because you know that the soils are suitable and the seed bank for the wetland plants is already there. If you don't have a wetland to restore on your property then you have to decide where it may be possible to create one. The flow chart below may help you when selecting an appropriate site.

Wetland Site Selection Flowchart



Considerations when selecting a site:

- Observe where water naturally lies in the spring or after heavy rainfalls
- Try to create or restore the wetland near other wetlands or wildlife habitat features on the property
- Conduct soil tests to ensure site will hold water

Always Avoid:

- Coarse-textured soils (sand or gravel) as these don't hold water very well
- Sites within existing defined *watercourses* (permanent or intermittent)
- Areas adjacent to roads or other human disturbance
- Areas where flooding could affect a neighbors property

DID YOU KNOW?

Wetlands are one of the most productive ecosystems on the planet. Wetlands provide habitat for waterfowl and over 600 species of plants, animals and insects.

Step 2 Project Design - Factors to Consider

Now that you have a good site picked out you can start planning what you want your wetland to look like. You need a design! Your design should include a rough sketch of the wetland from overhead, the position of the *outlet* (where the water flows out) and depth of the basin. The design you pick for your wetland will depend on a number of factors including:

- Site history– Are you restoring a drained wetland or creating a new one?
- Slope across the site
- Size of the proposed wetland
- Water depth (permanent vs. non-permanent wetland)
- Amount of water flowing into your wetland or "catchment area"
- Your budget

Usually, drained wetlands are restored by plugging the ditch that drained them. However, if you are creating a wetland, the first major decision you

have to make is whether you will dig (excavate) or create a berm (impound). This is determined by **slope**. The diagram below will help you decide - "Dig it or Dam it". It should be noted that excavating is usually more expensive (cost/hectare) than building a berm and also leaves you with a lot of dirt to deal with!

Test Your Soil

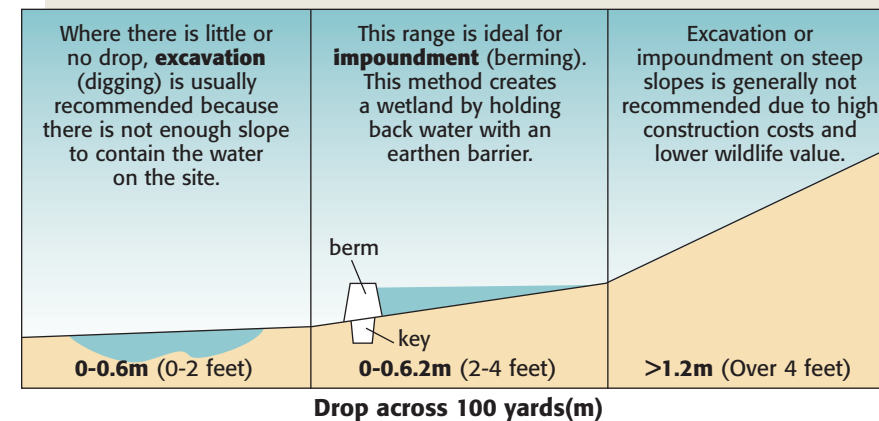
Impermeable soils are an important characteristic of wetlands. If you are creating a wetland, it is important to test the soil texture first to ensure the site will hold water. When impounding a wetland you need only go down about 60 cm (2ft) to get past the *topsoil*. If you are excavating, then you need to test the soils down as far as you plan to excavate. Dig up a small amount of dirt at several spots in the area and attempt to roll the dirt between your thumb and forefinger. You may need to add water to do this. If you can form a ball or ribbon with the soil then the particles are likely small enough to hold water. Sites that don't have fine-textured soil are not well-suited for wetland creation because they allow water to percolate downward. It is possible to bring in suitable soils to line a basin so it will hold water but this will raise your costs substantially and may not be successful.

"Catchment" Area

Something to consider when designing your wetland is the "catchment" area (area that provides surface runoff into your wetland). The amount of water entering your wetland will determine how long it will take to fill, how long it stays flooded and what sort of spillway you need to release excess water. Catchment area can be difficult to estimate for most people. Good methods of estimating how much water flows into your proposed wetland site is to inspect it during the spring runoff or look at the size of the road culverts directly upstream and downstream of the site.

Dig it or Dam it? That is the question.

"Lay of the land" will tell you whether you need to excavate or impound. A quick topographic survey will determine the method best suited to your site.



Topographic survey:

The project design requires that you complete a simple topographic survey across the site using a survey level or even a simple laser level. These can be rented at many equipment rental companies. Simply set up your level on the outside edge of the proposed wetland area and take a few measurements in and around the basin. If you are unsure how to complete a topographic survey or whether you require one, you can contact DUC for advice.

Size Doesn't Matter!

Slope and your budget will essentially determine the size of your wetland. Remember that wetlands come in all sizes and all are valuable so don't worry about making it too small. For example, wetlands the size of small swimming pools can provide good wildlife habitat. Proper water depth and location are as important as size in determining the value of your wetland for wildlife.

How Deep Should I Make My Wetland?

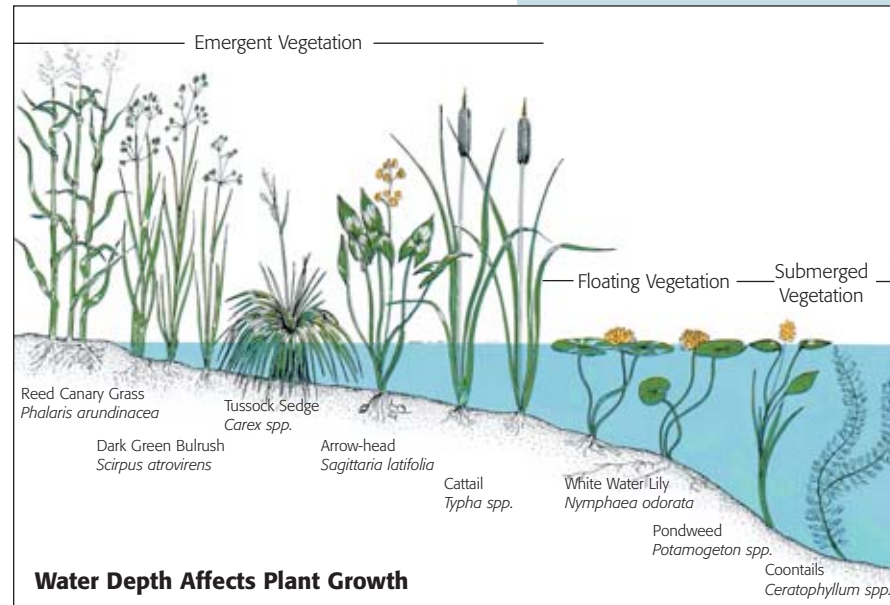
Some wetlands remain flooded throughout the year, while others are seasonal in nature. All provide important functions and values. Wetland depth is a key factor that will determine how long water stays in your wetland. In general, 3 months or so of flooded conditions are required for insect and amphibian larvae to grow. If your wetland is located in a sunny location with limited water supply you may want to make it at least three feet deep in some areas. If your wetland is shaded with a good water supply then you can get away with shallower depths. Other wetlands in the area can provide a good reference for water loss throughout the summer.

In most of southern Ontario there is sufficient naturally occurring wetland plant seed in the air and soil that planting is usually not required as part of the project design. Seeds usually germinate once water is added to the site. The plants that germinate on their own should be better adapted to your wetland than ones you would plant. Often it will take just a couple of seasons for wetland plants to begin colonizing your wetland.

Water Depth and Wetland Plants

(see diagram at right)

Water depth will determine what vegetation and how much grows in your wetland. This is important to remember because wetland plants form the base of the wetland food chain, provide habitat for wildlife and help keep your wetland healthy. In general, *emergent vegetation* will grow in water depths of 1 m (3 ft) or less. It is advisable that if you are creating a wetland, to design it so that approximately 25% of the area is 1 metre or more in depth to ensure an ideal mixture of vegetation and open water. It is also valuable when excavating your wetland to create an uneven bottom to encourage a variety of wetland plants to grow. Generally, the more plant species you have the more productive the wetland is for wildlife.



How Much Will This Cost?

Estimating the cost of your wetland project depends on many factors including soil moisture conditions, size, number of contractors in your area, construction technique and required materials. In order to keep costs down, try to create or restore your wetland during the driest period of the year when machinery can work more quickly and efficiently. Try to get at least three quotations from experienced contractors and remember that excavation will likely cost more than creating the same sized wetland through impoundment.



Robert Messier - Wetland Habitat Foundation

ISLANDS – While islands may seem to be a good addition to the design of your wetland, they can become overgrown with weeds or attract Canada Geese which are becoming a nuisance in some areas. If you want to increase over water nesting opportunities for waterfowl try a nesting tunnel (see photo). Plans are available from DUC.

DID YOU KNOW?

Wetlands can help reduce flooding. Wetlands provide storage across the landscape to help hold back flood waters and reduce flood peaks.

Getting it Wet – Techniques for Creating and Restoring Wetlands

Now that you've done your wetland design fieldwork, you must decide how to create or restore your wetland and how to keep the water in it. The first step in the "Design" phase was examining the slope across the site to help you decide whether to excavate or impound. We will deal with areas that are suitable for impounding first then look at techniques used where flat land prevails.

Moderate slope

- Constructing small berms to create or restore wetlands
- Blocking Drainage Ditches to restore drained wetlands

Little or no slope

- Excavation to create wetlands
- Cutting buried field tiles



Green Frog

Opportunities for Impoundment

Small Berms (Impounding)

Small *berms* create wetlands by holding back or "impounding" water behind them. Generally this is the most cost-effective and successful means to create or restore a wetland. You can use a berm to create a wetland if you have between 0.6 and 1.2 metres of slope across your site.

Important factors to consider when blocking a ditch include:

- Calling your local municipality to ensure the ditch is not a municipal drainage ditch. Municipal drainage ditches have been constructed to facilitate drainage of farmlands and cannot be blocked. Private drainage ditches (ditches constructed by private landowners without financial assistance from the municipality) can be blocked as long as you do not flood any land beyond your property boundary.
- Larger wetlands (over 1 hectare or 2.5 acres) with large "catchment" areas will likely require a more complex outlet structure. In this case it is advisable to contact DUC for advice.

The simplest type of berm is one that doesn't allow you to change the water level in the wetland (*fixed level berm*). In this case, the water level builds up behind the berm until it flows out of the spillway. Mother Nature (inflows and evaporation) controls your water level. This type of simple berm is recommended when inflows are not large. In most cases, where small wetlands (< 1 ha or 2.5 acres) are being created, you will only require a fixed level berm.

To create a simple fixed level berm, you must place your berm in the path of surface flows at the lowest point around your wetland. Ideally, your berm spans the shortest distance possible to keep costs down. These berms can be created with a variety of machinery including tractors with buckets, small bulldozers or high-hoes. The best time to construct a berm is during the driest part of the year (usually late summer or early fall). Waiting until the ground is dry to begin construction can save time and money.

If you are considering creating or restoring a larger wetland that has large inflows then you will likely require a "*variable level control structure*" that will allow you to change water levels and accommodate more outflow.

It is highly recommended you contact DUC before pursuing this more complex option.

Blocking a Ditch - Wetland Restoration

Restoring a drained wetland is often the easiest and most cost-effective method for creating wildlife habitat. If there is a ditch leading out of the wetland, it can be a simple process to block the ditch with a berm to restore the water levels in the basin.

If you are planning to block a privately-constructed ditch that has drained a wetland you will want to follow the same procedure for constructing a small berm as outlined in the steps on page 8. Whenever possible, try to restore the wetland to its original water level. You can estimate the original water levels in the basin by obtaining historical air photos from your local Ontario Ministry of Natural Resources office, or by looking for water line marks left on trees in the basin.

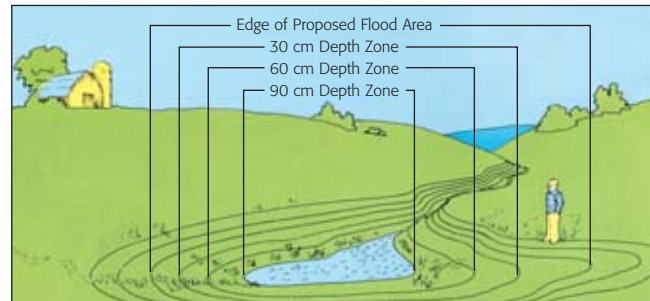
DID YOU KNOW?

Wetlands are great places to relax and have some fun. Their natural beauty and abundant wildlife make wetlands ideal places for wildlife watching, hunting, angling, canoeing or camping.

Topographic Survey



Contours of Wetlands: Each depth of water supports different plant species. A surveyor's level is used to determine exactly the water depths, and where the shoreline will be.



Using a Contour Survey to Determine the Wetland Size and Depth: Raising the water level on a smaller wetland will increase the area of the surface water and create zones of varying depths which will diversify plant species.

Constructing a Berm: (as illustrated in photos)

- **Survey the site** to define the wetland area (See above diagrams)
- **Stake out wetland boundary** as determined by site survey
- **Remove the topsoil** from the area where the berm is to be built and stockpile (this can be used to cover the berm later)
- **“Key” the berm.** This is a layer of compacted impermeable soil beneath the berm which acts as a barrier to water movement under the berm. A small bulldozer or tractor with a bucket can do this job. The key should be approximately 60 cm (2 ft) wide by 60 cm (2 ft) deep. Make sure the soils in the key have a high clay content to prevent water seepage. ***This is a very important step!** Your berm will probably wash away within a short period of time if you don't construct a proper key.
- **Construct the berm.** Minimum berm height should be at least 60 cm (2 ft) above the maximum proposed water level in the wetland. You should construct the berm with a minimum 3 m (10 ft) wide top. This will allow you to drive a vehicle or tractor across the berm if required. Make the berm with a series of soil layers 20 cm (8 in) thick or less. Compact each layer with a pass of a bulldozer or tractor. Make the side slopes gradual to prevent erosion (30 cm vertical for every 100 cm horizontal or 1 ft vertical for every 3 ft horizontal)
- **If your berm is over 1 m (3 ft) high,** then you'll need a *spillway* or overflow to accommodate high water flows. The spillway sets the maximum water level in your wetland and should be about 60 cm (2 ft) below the top of the berm. Locate the spillway on either end of the dam on undisturbed ground and cover it with *rip-rap* to reduce potential erosion problems.
- **Finishing touches.** Spread excess topsoil over the berm to create a good seedbed. Seed the berm with a forage mix that will establish easily to reduce erosion. Any left over topsoil can be graded back from the site at a gentle slope being careful not to create a “donut” around the wetland which will block surface water inflow.



Clear away the topsoil from the berm location to ensure there is a good seal between the berm and native soil.



The “key trench” runs underneath the length of the berm and is backfilled with clay soil to ensure water does not seep through the berm.



Construct the berm using impermeable soils from the proposed wetland area.



This photo shows the contrast in color between the impermeable clay (light color) soil making up the core of the berm and the stripped off darker topsoil.



As the berm is being constructed, compact the soil in layers no thicker than 8 inches. Once the berm is completed, replace the topsoil and seed with a quick growing forage mixture.

DID YOU KNOW?

Wetlands are important groundwater recharge areas. As wetlands store water, it seeps back down into the ground to replenish ground water supplies.

Excavation

If your survey has determined you have less than 0.6 m (2 ft) of drop across your site, then you must excavate a basin to create your wetland. This can be the most expensive method of creating a wetland because you have to excavate the entire wetland basin. (That can be a lot of dirt to move!) You must also consider what you are going to do with the dirt (or “spoil”) you remove. Excavation does allow you to have complete control of wetland shape and depth without having to consider the natural topography of the land.

Excavating a wetland will require either a bulldozer or a high-hoe depending on the size of the pond and site conditions. Local contractors can be helpful in deciding what is required for your particular project. Remember that you will have to deal with huge volumes of dirt that will either need to be hauled away or graded back being careful not to create a ring dam around the wetland.

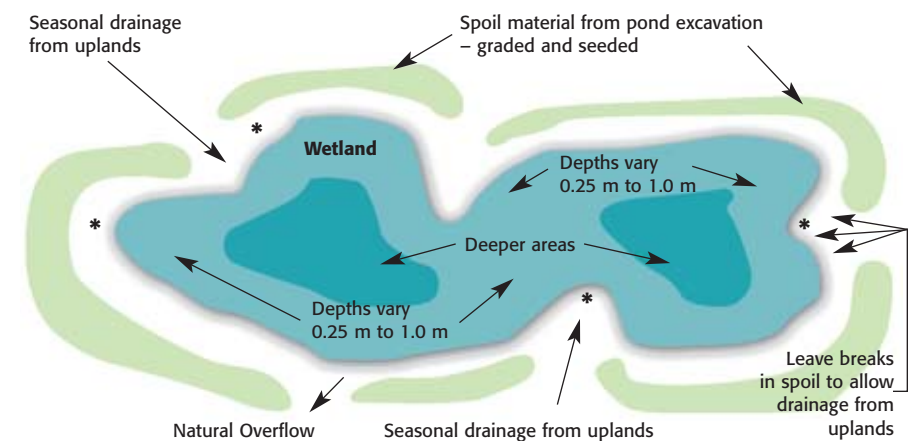
DID YOU KNOW?

Wetlands keep our water clean. Sometimes referred to as the “kidneys of the landscape”, wetlands have many plants, bacteria and animals that actually help purify water.

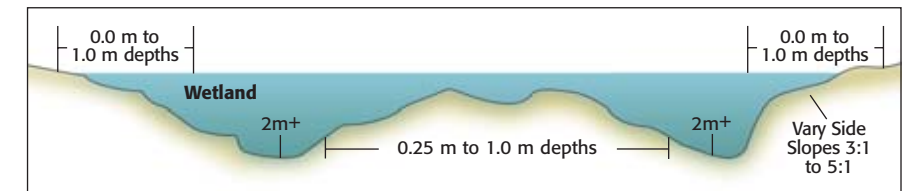
“Cutting” Buried Drainage Tiles

If you own a field that has been *tile drained*, it is possible that there were wetlands in the field before the tiles were installed. In agricultural fields that have been retired from production, it can be a simple matter to restore wetlands that used to occupy the field by breaking or “cutting” the buried field tiles and blocking them so that water no longer can drain into them. This work almost always requires a back-hoe or high-hoe. A site inspection in the early spring can help you find the low areas in the field that will be most likely to hold water. The most difficult part will be to determine where the buried tiles are located but a tile contractor or an experienced high-hoe operator can help you out. In order for this technique to work properly, at least 2 m (6ft) of tile should be removed and the resulting trench filled with compacted soil.

Sample Excavated Wetland Plan * Note Irregular Shoreline Configuration*



Excavated Wetland Profile



EXCAVATION STEPS:

1. Stake out wetland edges - remember to make the wetland irregular in shape with many bends in the shoreline to mimic a natural wetland (see above plan).
2. OPTIONAL – Strip off any organic soils from the site and set aside. This soil can be placed back in the bottom of the wetland after excavation to provide a good seed bank and growing substrate for native wetland plants.
3. Excavate the wetland with an undulating bottom to encourage various types of vegetation. Wetland vegetation provides wildlife habitat and will keep your pond healthy but you may want to excavate some deeper pockets that will remain free of vegetation. This will provide diversity to your wetland and allow you to add some native fish or use one end of the wetland for recreation.

Where should I locate my excavated wetland?

Suitable Locations:

- Where it will fill up: poorly drained depressions with mucky, impervious soils
- Away from dwellings and disturbances
- Ideally associated with other habitat features (woodlots, idled fields, existing wetlands etc.)

Unsuitable Locations:

- Within existing, defined watercourses (permanent or intermittent)
- Within healthy, functioning wetlands
- Within flood plains or erosion-prone areas
- Where pond will receive excessive nutrient runoff

To Plant or Not to Plant

Seeds from aquatic plants will move into your new excavated wetland with wind, water and wildlife. If you want to give your wetland a “jump start” you can either purchase native wetland plants from nurseries (can be expensive) or add some muck or seeds from local wetlands, obtained with the landowner’s permission. Do not transfer soil from wetlands containing purple loosestrife or phragmites! These species are non-native, spread rapidly and can choke out or prevent growth of desirable native species.



Potential Vegetation Problems:

Key Point: A properly designed and located wetland is usually self-managing, however, problems can arise. Always remember to treat the cause and not the symptom!

Wetland vegetation is important to a wetland’s ecosystem but if you notice an algae problem or an increase in the amount of vegetation (over 75% of the wetland area), consider these steps:

- 1. Prevention:** Verify there is an intact *buffer*, reduce nutrient inflows, check septic system for leaks.
- 2. Physical intervention:** Water-level manipulation, dredging, physical removal of plants.
- 3. Biological intervention:** Aeration, barley straw for prevention of algae growth.
- 4. Chemicals:** NOT RECOMMENDED! Pesticides are potentially dangerous near water and use is restricted to certified individuals.

Other Wetland and Upland Enhancement Techniques

Once you’ve completed your wetland, or if you have other existing wetlands on your property, you may consider enhancing them for wildlife. Here are a few techniques you might be able to use:

- Establish a *buffer* around your wetland of undisturbed grasses, trees or shrubs. Buffer width should be a minimum of 20 m (60 ft) but any buffer is better than no buffer!
- Install nest boxes in your wetland to increase cavity nesting opportunities for wood ducks, hooded mergansers, tree swallows and other wildlife.
- Plant native fruit-bearing shrubs around your wetland to increase wildlife cover food availability. Appropriate species lists can be obtained from your local nursery.
- Establish some native trees within your wetland buffer to provide a more effective and permanent buffer.
- Drag a few thick branches or logs into the wetland to provide basking areas for frogs, turtles and ducklings.



DID YOU KNOW?

Wetlands are still being lost. In some areas wetland loss is over 70%. You can help by supporting Ducks Unlimited Canada.



In some areas, Canada goose populations are increasing rapidly and may become a nuisance. If you want to deter Canada Geese from using your wetland ensure you have an undisturbed buffer around your wetland and do not construct any islands!

Step 3 Getting Permission and Permits

No matter the method of construction or the size of your wetland project, you will have to consider what permits may be required from various agencies. Permits may be a requirement for your wetland project because there are many regulations regarding the capturing or blocking of surface water. Permits also ensure your project is not being built in an area that is susceptible to flooding and you are not negatively impacting other types of fish and wildlife habitat. The easiest way to determine whether you need a permit is to contact your

local *Conservation Authority*. They will likely ask you to send them a very simple plan of your wetland concept and where it will be located. This information will be sufficient to determine whether you need to apply for permits with the Conservation Authority or Provincial or Federal Government. Keep in mind the permit process can take a while (several months) given the number of permits these agencies have to process. Therefore, it is a good idea to begin the permit process as soon as you have a design for your wetland.

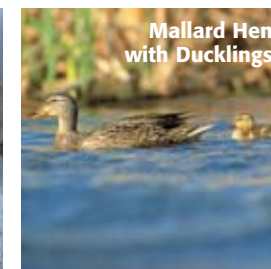
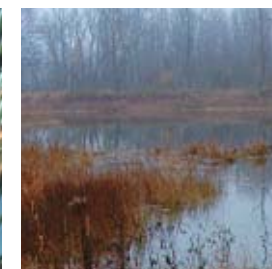
Step 4 Moving Dirt!

Working with Contractors

Once you’ve designed your wetland and obtained any applicable permits, you can finally begin moving dirt! Unless you know a good friend with some construction equipment, you will have to pay someone to create or restore your wetland. As previously recommended, you should try to invite at least three local reputable contractors to your property to ensure you get an accurate cost estimate and you find someone you are comfortable dealing with.

Take the time beforehand to stake out the area of the proposed wetland to give the contractor a good idea of the area involved. Carefully explain what you want to achieve as many contractors have not had much experience constructing wetlands. Once the site consultation is over ask the contractor

to provide you with an estimate of costs and time it will take to do the job. Ensure that your contractor talks to you about controlling any sediment that may be deposited downstream from your site because of exposed bare dirt. He may suggest installing some *silt fencing* as a temporary measure until vegetation is established on the berm.



Robert Messier - Wetland Habitat Fund

DID YOU KNOW?

Wetlands help stop erosion. Wetlands provide water storage which slows down heavy surface flows, leading to less soil erosion.

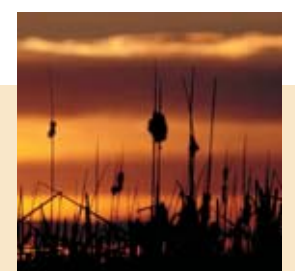
Step 5 Long Term Care and Maintenance

Now that you have successfully created or restored your wetland, you can begin to enjoy it and watch it mature. Part of the enjoyment will come from being around your wetland and noticing the wildlife and vegetation change over seasons and years. You will want to inspect your wetland a few times a year to ensure the berm is in good

condition and there are no problems with erosion or vegetation overgrowth. If you see a potential problem, it is better to address this before a larger problem arises. Finally, keep regular records of water levels, amount of vegetation, wildlife, and general condition of the earthworks.



Robert Messier - Wetland Habitat Fund



Frequently Asked Questions

You may have a few questions as you read through this guide. Here are the answers to some of them.

Where can I get help?

Ducks Unlimited Canada and Wetland Habitat Fund staff have had a lot of experience doing just what you are planning. See the “Contacts” section for contact information.

Will Canada geese be a problem?

Most populations of Canada geese are rising across Canada. These large birds can be problematic in some areas because they can reduce the attractiveness of an area by defecating in and around areas that they inhabit. Canada geese love unvegetated ponds and manicured lawns. You can reduce the chances of Canada geese inhabiting your wetland by ensuring that there is a shallow area at the shore where dense marsh vegetation will grow, and by making sure that grass is not cut adjacent to the wetland. Also, make sure you do not construct any islands in your wetland that may be attractive to breeding Canada goose pairs.

What do I do if beavers move into my wetland?

Beavers are a natural part of a wetland ecosystem and many people enjoy these interesting creatures. However, if they are becoming a nuisance by eating valuable trees or raising the water level in your wetland, there are some options you may consider. To protect valuable trees you can wrap them with chicken wire or fence large areas out. There are also repellents that can be applied to trees, but these have to be applied regularly. If all else fails, you may have to call in an experienced trapper. Your local Ontario Ministry of Natural Resources office can provide you with a list of local reputable trappers. Live trapping and relocating is generally not recommended as it moves your problem to someone else’s property and can facilitate disease transmission.

Muskrats are burrowing into my berm!

Sometimes muskrats or beaver, will begin to burrow into an earthen berm. If the burrows are numerous they will eventually cause the berm to fail. Usually the construction of a clay core in the berm is the best prevention but sometimes an experienced trapper may need to be called in.

I am concerned about mosquitoes and West Nile Virus.

Ontario has lots of habitats that mosquitoes inhabit. The types of wetlands you build generally do not provide habitat for the West Nile Virus carrying mosquito, unless you have a small, shallow wetland with water present only for a very short time. Mosquitoes will breed in your wetland, but there is little chance that you will notice any increase in the mosquito population in your area because a healthy wetland also attracts many natural mosquito predators such as dragonflies, bats and songbirds.

How can I reduce algae?

There will always be some algae in a healthy wetland. An over abundance of algae is a signal that there are excessive nutrients, probably nitrogen, in the water. The easiest ways to assure you don’t get an algae problem is to minimize the run off of nitrogen from lawns and farm fields and by establishing a good buffer.

Will the vegetation in my marsh become too dense?

If your wetland is too shallow, emergent vegetation may thrive and form a solid stand. Design your wetland so that there are deep areas where the marsh plants cannot survive. Depths greater than 2-3 feet (60-90 cm) are usually deep enough to prevent emergent vegetation growth.

Glossary

Berm: A small man-made mound of earth used to hold back (impound) water behind it.

Buffer: A zone of undisturbed vegetation around a wetland that improves wetland function and provides wildlife habitat.

Catchment Area: The area of land draining into a wetland or watercourse. Sometimes referred to as “watershed”.

Conservation Authority: Conservation Authorities are local, community-based environmental agencies. They represent a grouping of municipalities on a watershed basis and work in partnership with others to manage their respective watersheds.

Emergent Vegetation: Wetland vegetation that grows above the water surface.

Fixed Level Berm: A berm constructed to hold water at a specific set level.

Impermeable Soils: Soils that do not allow water to quickly percolate downward. Typically these soils are made of silts or clays with little or no sand or gravel.

Impoundment: A body of water held back by a berm.

Outlet: Location where water flows out of a wetland or other water body.

Rip Rap: A layer of coarsely broken rock (10—30 cm in diameter) placed on soil to reduce erosion by running water.

Silt Fencing: Temporary barrier installed to contain sediment-laden surface runoff.

Spillway: A channel or passageway around a berm through which excess water is released.

Tile Drainage: Land drainage by a series of buried tiles or perforated pipes laid at specified depth, grade and spacing.

Topsoil: Uppermost layer of soil (10-20 cm thick) that contains the highest amount of organic material.

Variable Level Control Structure: A spillway with the capability to change upstream water levels by inserting or removing a series of stop logs or boards.

Watercourse: A naturally occurring water channel that includes rivers, creeks and streams.

Intermittent watercourse: Watercourse that contains flowing water for part of the year and dries up seasonally.

Permanent Watercourse: Watercourse that rarely, if ever, dries up.

Contacts

Ducks Unlimited Canada (DUC)

Offers technical and funding assistance to certain landowners who want to create or restore wetlands on their property.

566 Welham Rd., Barrie, ON L4N 8Z7
1-888-402-4444 (Barrie) 1-866-389-0418 (Kingston)
E-mail: du_barrie@ducks.ca
Website: www.ducks.ca

Wetland Habitat Fund

Provides technical assistance and partial funding for certain wetland enhancement projects.

Suite 310 - 1750 Courtwood Cres.
Ottawa, ON K2C 2B5
1-613-722-2090 ext. 248.
Email: admin@wetlandfund.com
Website: www.whc.org/wetlandfund

Conservation Ontario

This organization can give you the contact information for your local Conservation Authority who can help out with any necessary permitting issues and potential project funding.
P.O. Box 11, 120 Bayview Parkway
Newmarket, ON L3Y 4W3
Phone: (905) 895-0716
Website: www.conservation-ontario.on.ca

Ministry of the Environment

The Ministry of the Environment is responsible for protecting clean and safe air, land and water to ensure healthy communities, ecological protection and sustainable development for present and future generations of Ontarians. Contact these people if you’ve been advised to obtain a “Permit to Take Water”.
135 St. Clair Avenue W.
Toronto, ON M4V 1P5
Toll free: 1-800-565-4923
Website: www.ene.gov.on.ca

Ontario Ministry of Natural Resources

This Ministry is in charge of protecting Ontario’s natural resources. Contact them if you have a specific question about wildlife or wildlife habitat on your property.
Southern Regional Office:
300 Water Street, 4th Floor, South Tower
P.O. Box 7000
Peterborough, ON K9J 8M5
(705) 755-2000
Website: www.mnr.gov.on.ca

Ducks Unlimited Canada has provided the foregoing information based on the organization’s experience in wetland construction and related available knowledge. The information in this brochure does not constitute professional advice. Landowners should obtain their own professional advice to ensure the project is designed and constructed properly. Landowners should also obtain all necessary permits and authorizations from the applicable authorities. The results of individual landowner wetland projects may greatly vary and DUC does not assume any liability for project results that do not meet the landowner’s expectations.

Other References

Wetland Information/Management:

Nest Box Guide for Landowners – available from DUC

“Fish and Wildlife Management”, “Water Management” and “Farm Forestry and Habitat Management” – available from Ontario Ministry of Agriculture and Food (OMAF)

“Wetlands and Wildlife Ponds” – OMAF Infosheet #22

“Wildlife Ponds” Fact Sheet – available from DUC, Barrie office

Wetland Buffers:

“Buffer Strips” – available from Ontario Ministry of Agriculture and Food (OMAF)

“Buffers Protect the Environment” – Ontario Ministry of Natural Resources Extension Note

“Considerations When Working Around Wetlands” – available from Environment Canada

“Wetland Buffers” Fact Sheet – available from DUC, Barrie office

Canada Geese/Nuisance Wildlife:

“Resident Canada Geese in Agricultural Southern Ontario” – available from Environment Canada

“Canada Geese in Southern Ontario – Seasonal Deterrent Techniques for Lakeside Home and Cottage Owners” – available from Environment Canada

“Probing Problem Wildlife” – available from Ontario Soil and Crop Improvement Association

“Coping with Canada Geese” Fact Sheet – available from DUC, Barrie office

Help Save Ontario’s Wetlands!

For a donation of \$35 or more, you become a member of DUC and receive four quarterly issues of **Conservator Magazine**.

Yes, I would like to become a member of Ducks Unlimited Canada!

I would like: (Please check all that apply)

a tax receipt to volunteer additional information

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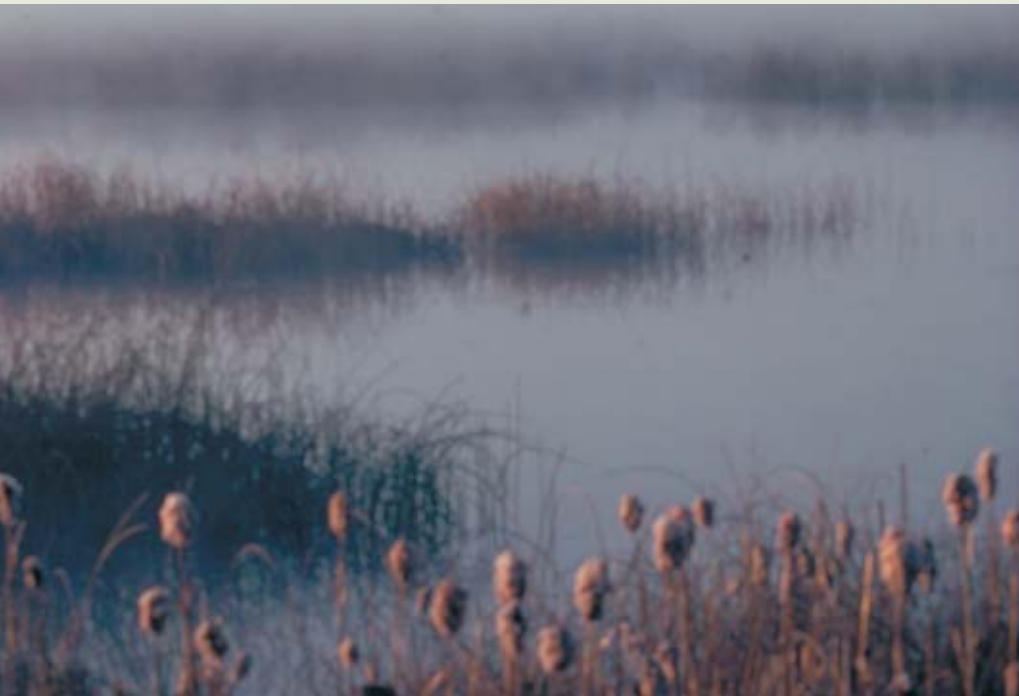
Telephone _____

Email _____

MAIL TO: 
Ducks Unlimited Canada
CANADA’S CONSERVATION COMPANY
566 Welham Road
Barrie, Ontario
L4N 8Z7
Toll free: 1-888-402-4444
Fax: (705) 721-4999
Email: du_barrie@ducks.ca
www.ducks.ca



Marsh Wren



Pied-billed Grebe

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