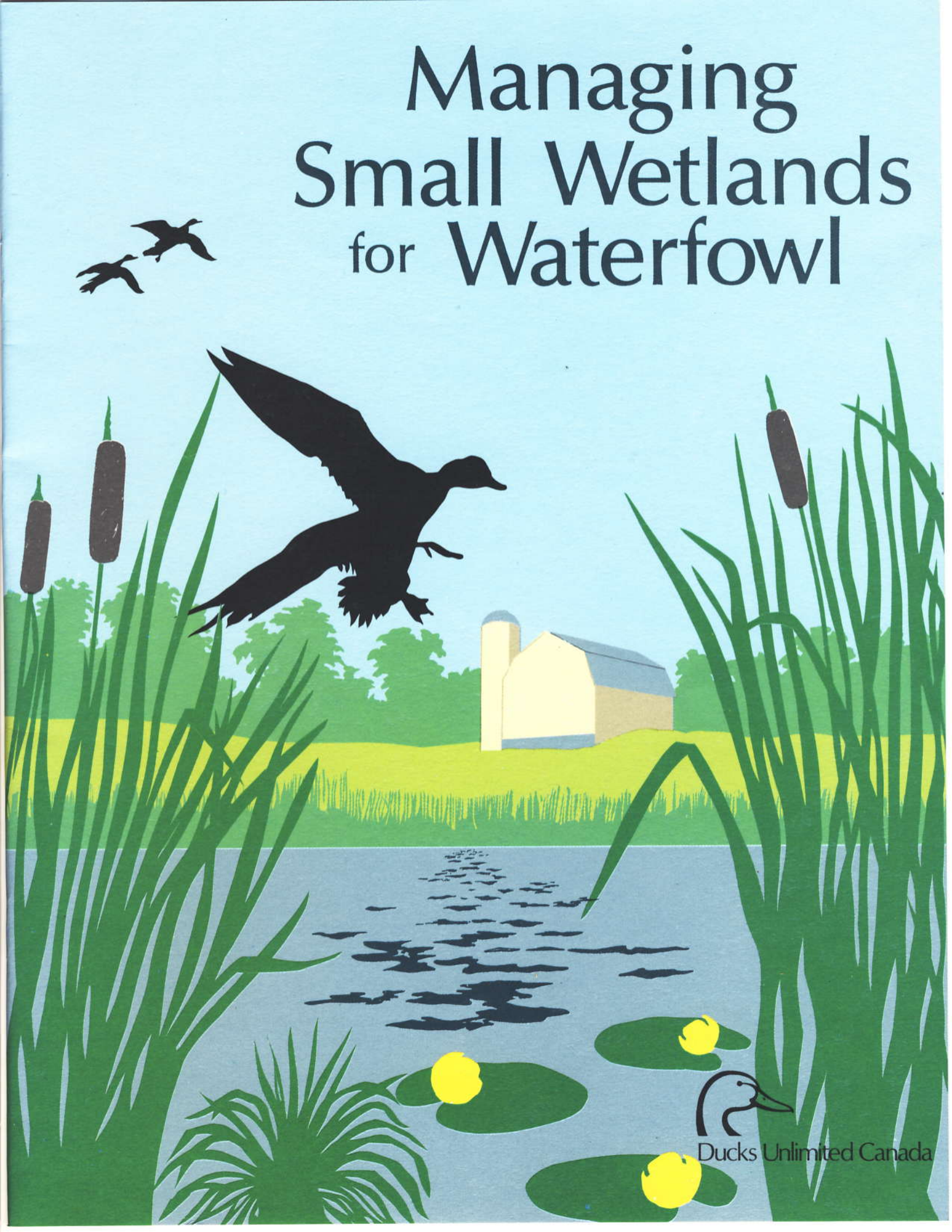
Managing Small Wetlands for Waterfowl



Ducks Unlimited Canada

Managing Small Wetlands for Waterfowl

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Produced by: LRIS, Amherst, N.S.

Ducks Unlimited Canada

ACKNOWLEDGEMENTS

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INTRODUCTION

Wetlands provide important habitat for a wide variety of plant and animal species and are excellent places to observe wildlife. Many small wetlands involve private land. Some of these areas are very productive and diverse in wildlife species, while others can be made more so by applying a few proven management techniques.

Ducks Unlimited Canada has been actively creating and managing larger wetlands throughout the Maritimes since the mid 1960's. With the publication of this booklet, Ducks Unlimited hopes to assist individuals in managing the thousands of small privately owned marshes.

TYPES OF WETLANDS

A Wetland can be defined as "an area of land which is covered by water for part or all of the year". They may be associated with rivers, lakes, streams or coastal habitats. The types of wetlands usually described are marshes (fresh or salt water), bogs, fens, swamps and ponds.

One of the most productive wetland types is the fresh water marsh with water less than one metre deep. These marshes usually contain aquatic vegetation which provide escape cover, food and nest sites for wildlife.

This publication provides a few instructions on how to improve small freshwater marshes and ponds. Salt marshes are naturally productive, while bogs, fens and swamps are usually nutrient poor or are not easily improved.

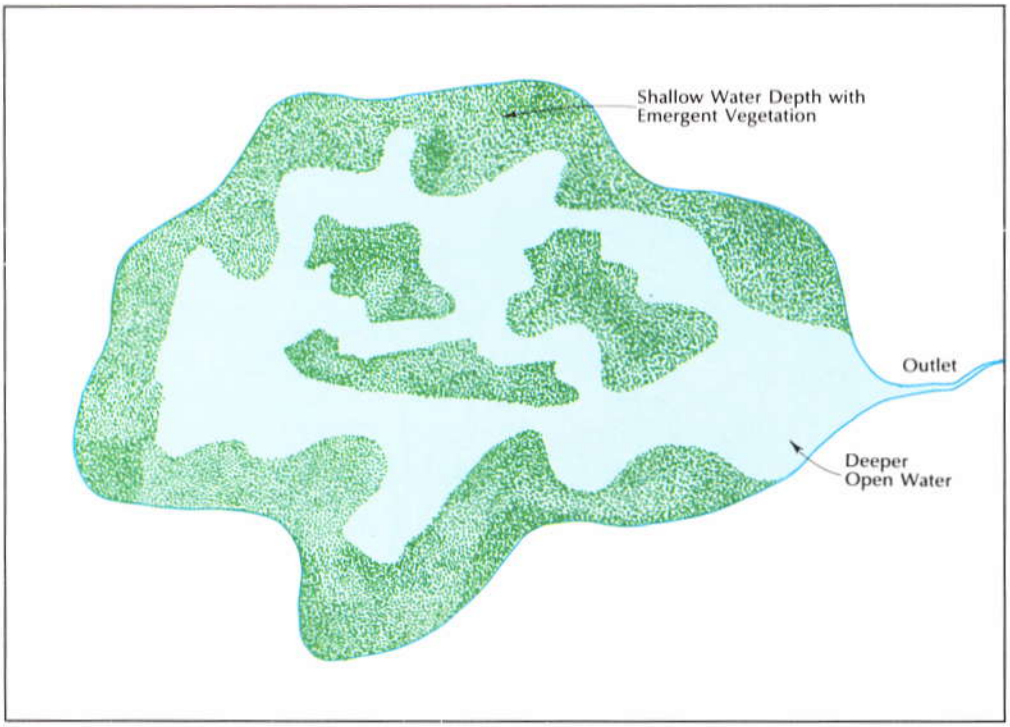

Figure 1
HEMIMARSH
50 percent Open Water

IMPORTANT CONSIDERATIONS

A great deal of research has been carried out in recent years on marsh management as it applies to waterfowl habitat. This research has identified three important characteristics which make marshes attractive to waterfowl.

1 A *hemimarsh* exists where there is approximately half open water and half vegetation which is dispersed throughout the water. This creates *edge* within the marsh. Edge is that point where two different habitat types meet thus creating ideal feeding and escape opportunities. Refer to Figure 1.

2 A ready supply of nutrients (mainly phosphorous and nitrogen) through natural fertility, recycling (refer to Figure 3A) or artificial sources will result in the availability of plant and animal food for waterfowl.

3 A suitable water depth, usually less than 1 metre, is important to establish vegetation in the marsh. Refer to Figure 2.

When managing for waterfowl it must be remembered that a particular marsh may provide one or more needs. For example, in the early spring, hens and drakes usually seek out small isolated ponds which act as pairing territories. The hen may select a nest site near another wetland which she will use as brood rearing habitat, while the flying young and post breeding adults may group together on yet another wetland - perhaps a saltmarsh. In some cases, on larger marshes, all of these requirements are met in one place.

When considering what improvements may be carried out on a particular wetland, the life cycle of waterfowl must be considered. Ask what will the wetland most likely be used for...pairing, brood rearing, staging and migration stops are all important.

To enhance a wetland, management should be directed toward creating a *hemimarsh* situation and to have some method to control water levels.

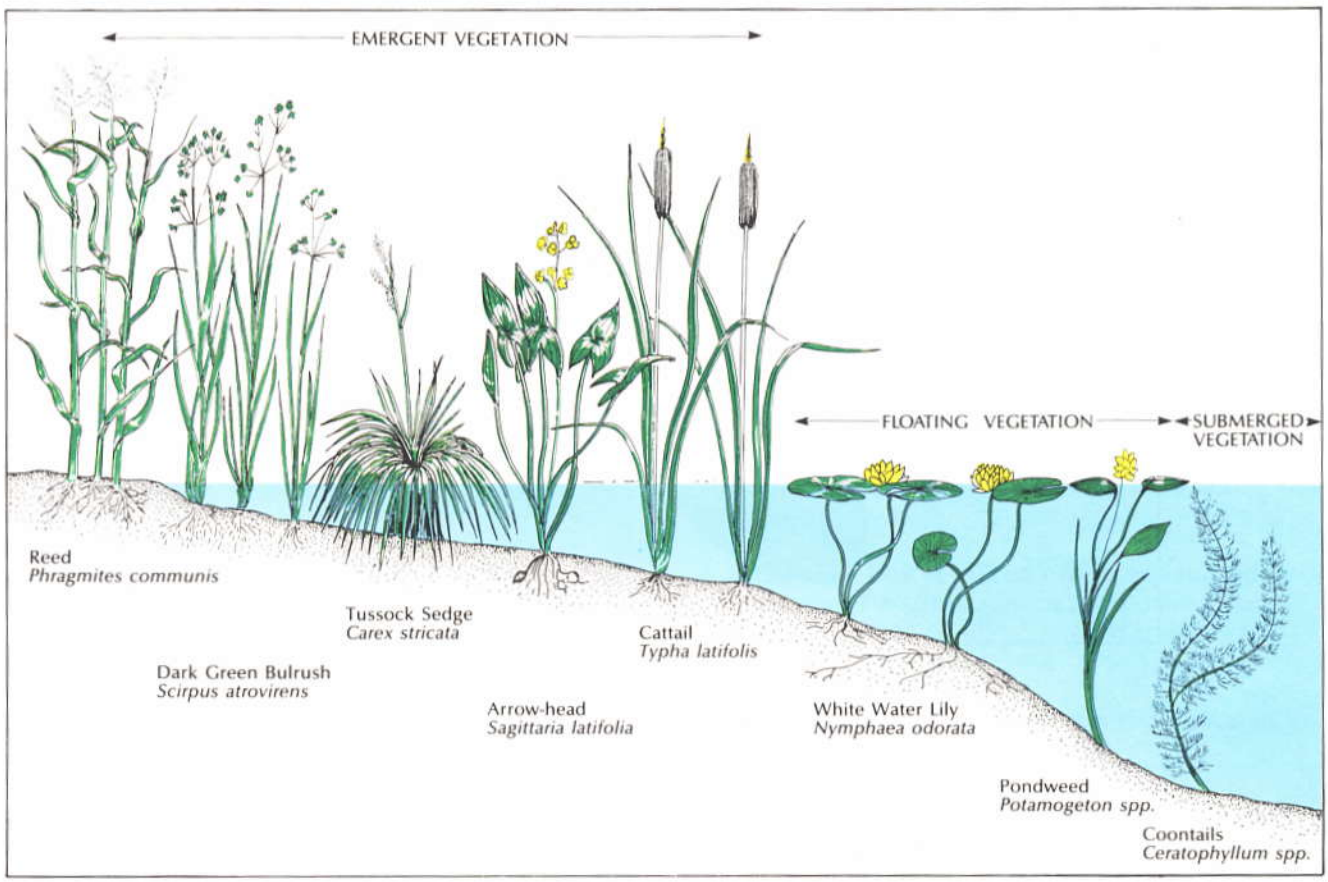

Figure 2
WATER DEPTH AFFECTS PLANT GROWTH

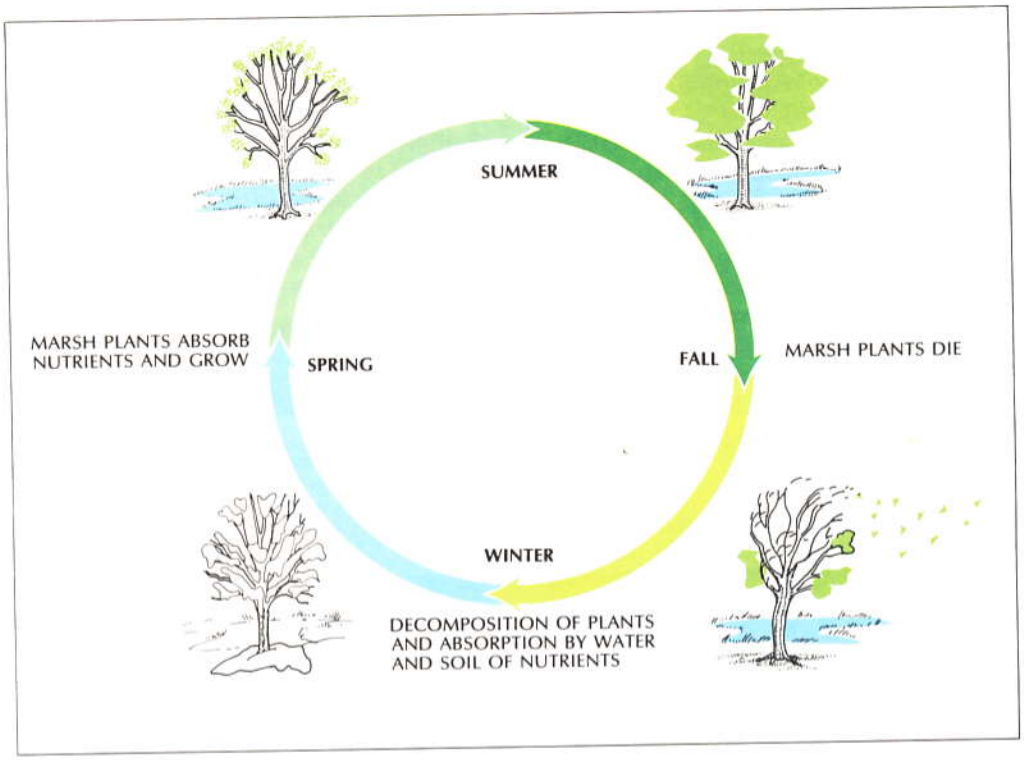

Figure 3A
SEASONAL NUTRIENT CYCLE

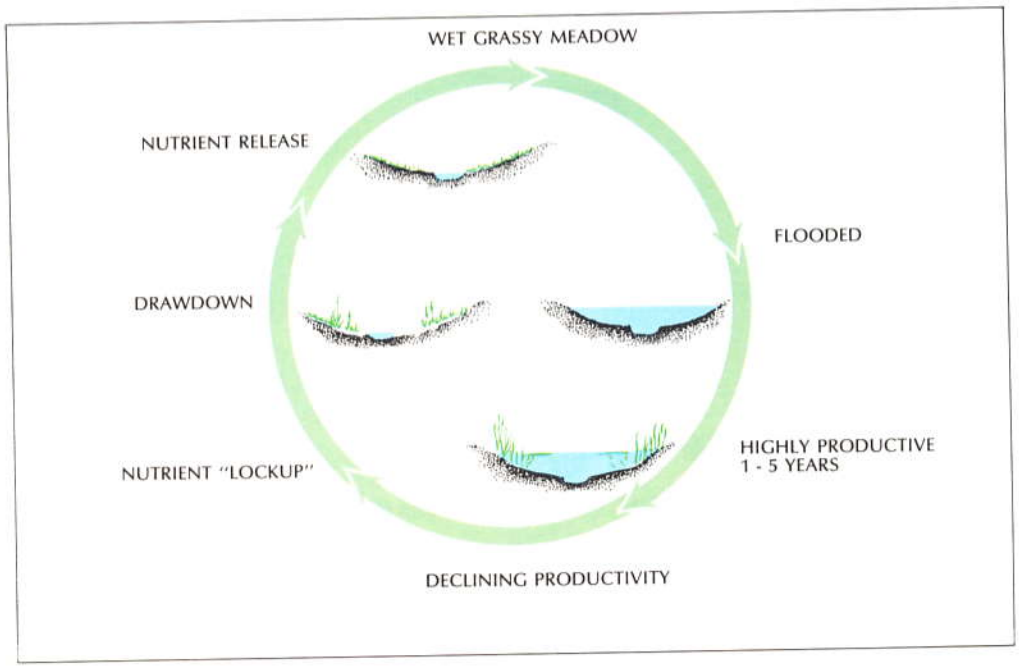

Figure 3B
LONG TERM PRODUCTIVITY CYCLE

THE MAJOR FACTORS WHICH LIMIT WATERFOWL USE ARE:

1 **Too much water** (an old beaver pond or lake) usually characterized by insufficient emergent vegetation.

2 **Too little water** - flooded in early spring and dry by early summer, before young ducks are able to fly.

3 **Insufficient levels of nutrients** (usually phosphorous and nitrogen), which will translate into a lack of food for waterfowl further up the food chain.

4 **Too much disturbance** around the wetland or lack of upland cover.

COPING WITH LIMITING FACTORS:

If you are lucky enough to have a beaver pond or a shallow natural lake on your property then you already have a marsh, courtesy of nature. If it contains sufficient nutrients to support plant growth and invertebrate populations, then chances are ducks will already be using your marsh. Initially you may only have to manage the upland to enhance it.

However, in many cases, marshes can be somewhat improved. Figure 3B illustrates how marsh productivity is cyclical. Management involves trying to maximize the time in the cycle which is productive.

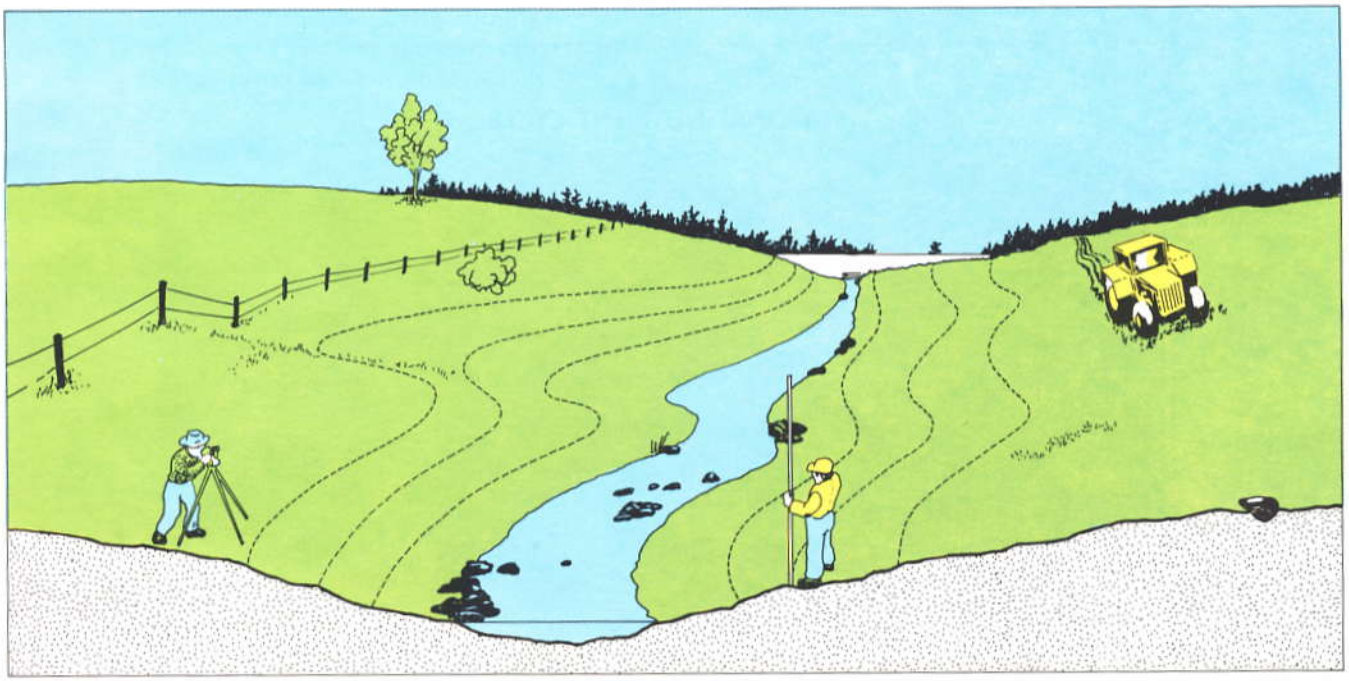

Figure 4
CONTOURS OF WETLAND

Each depth of water supports different plant species. Refer to Figure 2.

A surveyor's level is used to determine exactly the water depths, and where the shoreline will be.

1 Too Much Water:

Excessive water depth will result in an open water marsh with emergent vegetation confined to the shallower water. Coloured water, typical in many Maritime wetlands, prevents light penetration which is necessary for plant growth.

Lowering the water level to an average depth of 45 to 60 cm is a way to make an area more attractive to ducks. Dabbling ducks which feed by *tipping up* will have access to the food supply on the marsh bottom if the water is shallow.

2 Too Little Water:

BUILDING A DAM

Many natural marshes are flooded temporarily in the spring and dry out in the summer. Marshes associated with river floodplains, high saltmarshes, and abandoned beaver ponds are typical examples. Most of Ducks Unlimited's efforts in the Maritimes have involved building dykes, dams and water control structures on larger marshes to retain some water throughout the summer. This same technique can be applied on a smaller scale by a property owner to enhance a natural wetland which goes dry in summer.

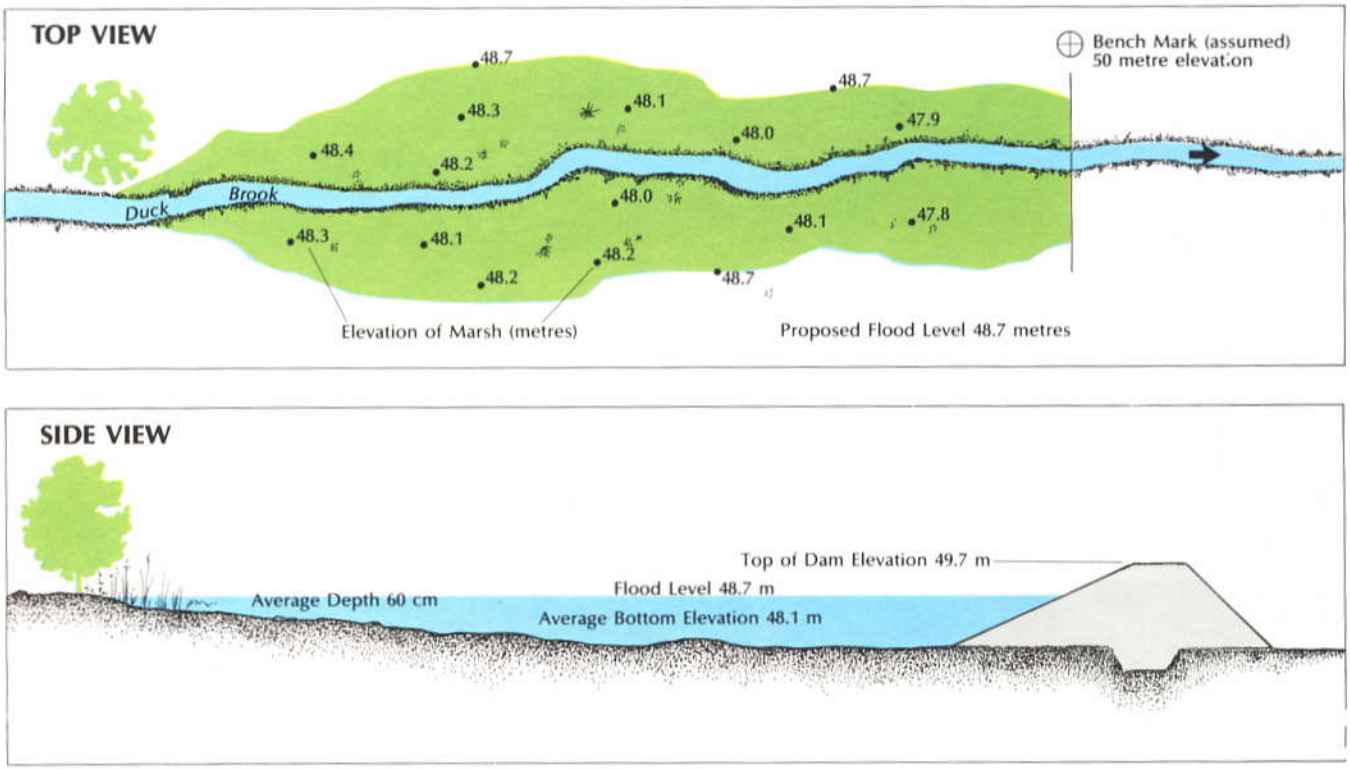

Figure 5
TYPICAL SURVEY OF MARSH ELEVATION

1 To get an average depth of 60 cm over the marsh the water would have to be held at 48.7 metres.

2 The dam would have to be built 1 metre higher, at 49.7 metres.

3 The figures expressed in metres are assumed elevations and only serve to measure the relative height of land on the marsh bottom.

4 To calculate water depth at any given point subtract the marshes bottom elevation from the flood level.

The building of a small dam to retain water is an idea that requires careful planning and design. Such development requires the approval of your Provincial Department of the Environment and Fisheries and Oceans Canada. These regulatory agencies must be assured that the project can be constructed in an environmentally safe manner and that there is minimal impact, to other properties or to the wildlife habitat. The potential for siltation of stream and fish habitat is of prime concern. Dams might also be barriers for passage to fish spawning habitat.

The design and construction require some basic engineering skills and construction expertise. If your dam is to exceed a certain height (1 to 1.5 metres) drawings prepared by a licensed professional engineer may be required before government approval is granted. The risk of a washout will dramatically increase with a higher dam and larger watershed. Only a properly engineered and built water control structure will prevent this from happening.

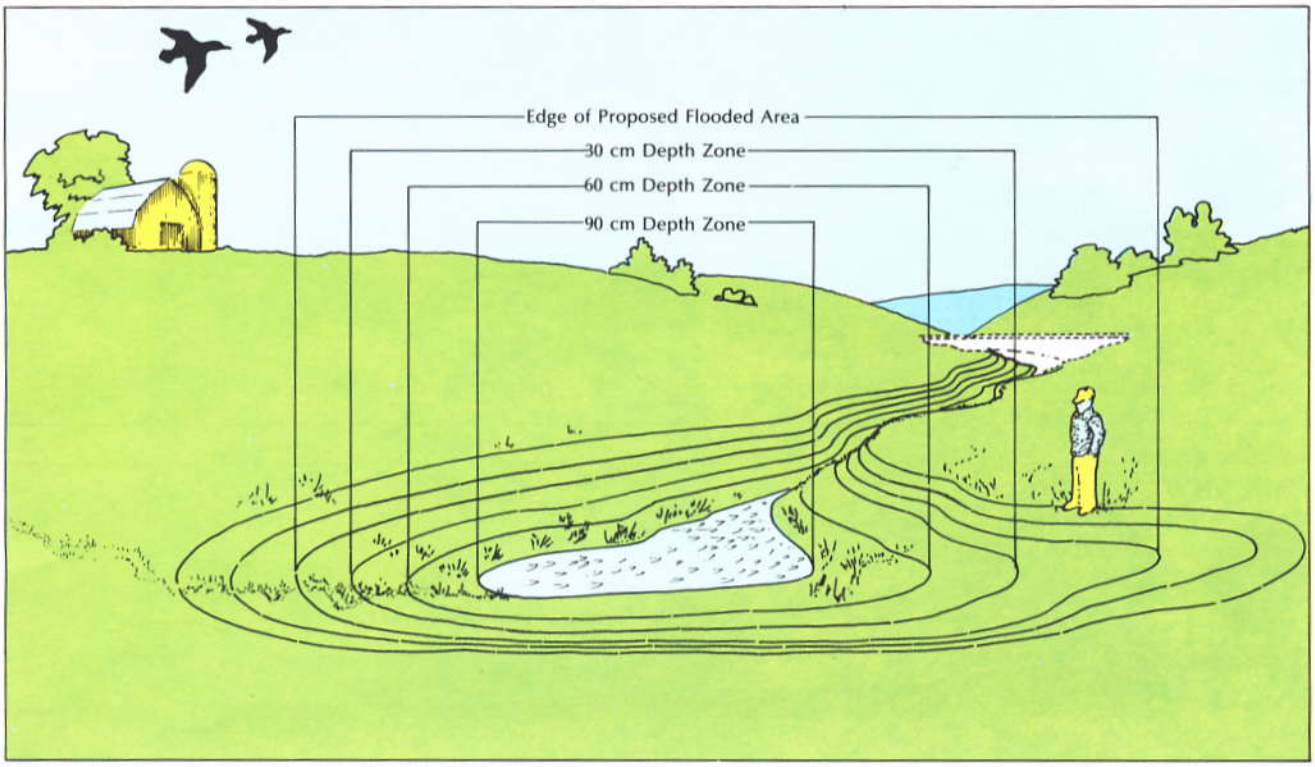

Figure 6

USING A CONTOUR SURVEY TO DETERMINE THE POND SIZE, DEPTH AND DAM HEIGHT

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.

The basic steps in planning for a small dam construction are:

1 Survey the area to be flooded to determine the desired flood depth, height of dam and the size of the pond. Refer to Figures 4, 5 and 6 for details of a contour survey.

2 Determine the watershed area that drains to the dam location from topographic maps or field reconnaissance.

3 Determine the size of the water control structure needed to safely handle the flood without overtopping the dyke.

4 Prepare plans showing the details of the flooded area and spillway drawings showing the elevations of the creek bottom, the pond water level and the top elevation of the proposed dyke. Refer to Figure 5.

5 Apply to your Provincial Department of the Environment for a construction permit. The permit will likely include stipulations such as timing of the work and methods to control siltation to watercourses. Construction will probably be restricted to the low flow months of summer (i.e. June to September).

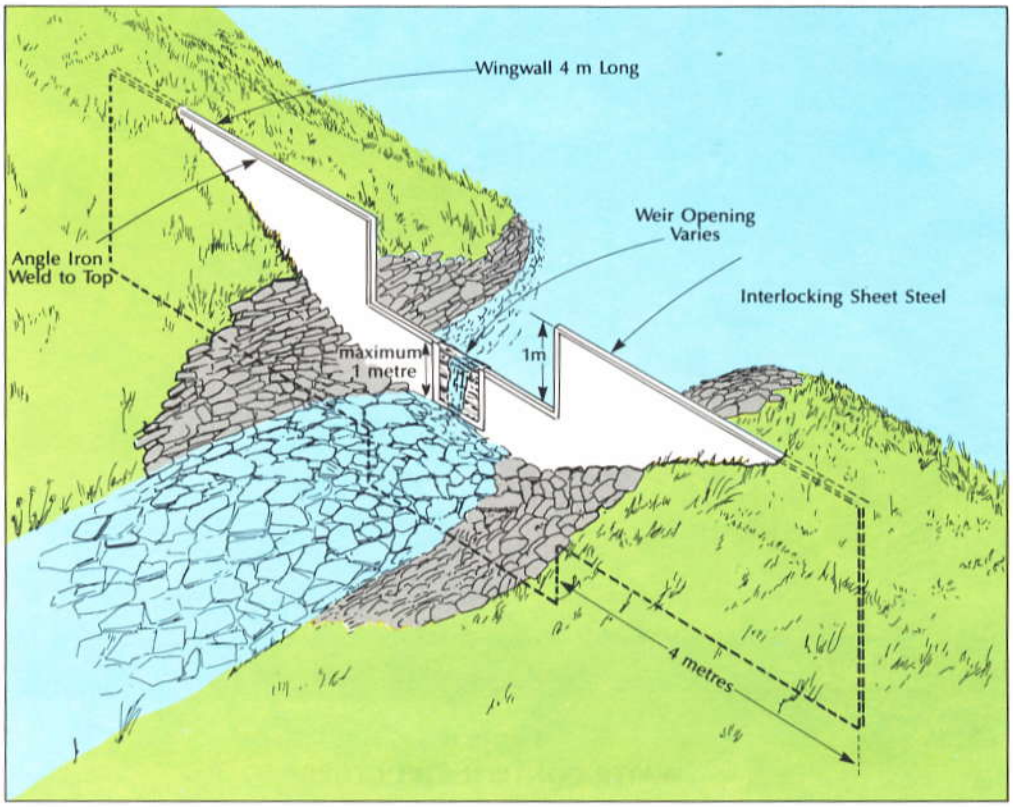

Figure 7
STEEL SHEETING WEIR

1 This weir should be used only where the difference between the pond water level and creek bed will be less than 1 metre.

2 The top and sides must be reinforced with angle iron.

3 Place rock rip rap around sides to prevent erosion.

4 The wingwalls should extend a minimum of 4 metres on both sides.

5 The weir opening needed is dependent on watershed size. Seek professional help.

6 The sheeting must be a minimum of 3 metres high.

Each of these steps are crucial and none may be omitted. Of equal importance are the construction techniques employed to build the dam and water control structure.

Figures 7, 8 and 9 illustrate some basic designs for the construction of dykes and water control structures for low head dams. There are, no doubt, examples of poorly built or washed out dams in your area. The washouts are typically caused by a number of factors, including insufficient capacity of the structure to handle the runoff, dykes built of poor material or without enough freeboard, pipes set above the elevation of the creek and pipes without a cutoff wall. These situations can all be avoided by the correct planning, design and construction of the project. Several hints to follow during construction are discussed below.

Work in the dry. Construct the water control structure to the side of the existing channel and divert the water to and from the control after it has been completed. Always set pipes structures about 20 cm below the channel bottom and install a cutoff wall and backfill with Class 'A' gravel as shown on Figure 8.

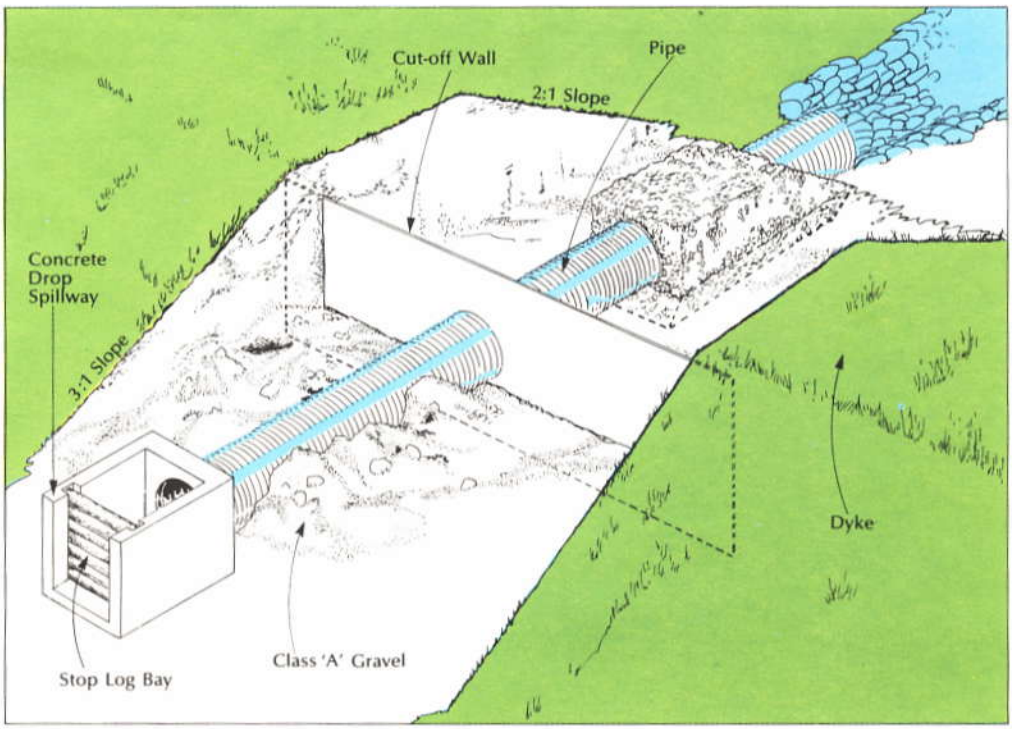

Figure 8
WATER CONTROL STRUCTURE

1 This type of structure can be used for small watersheds where the difference between the pond level and channel bottom does not exceed 1.5 m.

2 The cut-off wall should be located about 4 metres from spillway. It should extend 30 cm above pond level, 70 cm below pipe bottom and 3 metres on either side of pipe.

3 Place 30 cm of Class 'A' gravel around the circumference of the pipe. This will guard against washout.

4 The size of the pipe and concrete spillway will depend on numerous factors such as watershed size and height of the dam. Seek professional help.

5 It is essential that the pipe bottom be set at or below the natural channel bottom. *Never set the pipe higher than creek bed, use a cut-off wall and Class 'A' gravel around the pipe.*

After the structure has been completed and water has been diverted through it the dyke construction can proceed. Figure 9 shows a cross section of a dyke for a low head dam. Carefully select the source of material for the dyke. It must be free of all organics such as topsoil, roots, peat, stumps, etc. Avoid sandy soil. A well graded pit run gravel composed of at least 10 percent clay particles is preferred. Save the top soil for placing on top of the dam. This will support grasses thus preventing erosion.

Start the construction of the dyke by removing the organic base where the dyke will sit. Dig the key, as shown, so that the imported material will have a water tight bond with the ground. This will prevent seepage under the base of the dyke.

Place and compact the fill in 20 cm layers with a dozer, making the upstream face a 3:1 slope or flatter to minimize erosion by waves from the pond. All exposed surfaces left by the construction, including borrow areas that may drain to watercourses, must be stabilized immediately to prevent siltation by covering with hay mulch. Seed with oats, wheat and or grass to facilitate immediate growth of cover. It is also advisable to wait for at least 60 days before flooding water against the dam to allow complete settlement and consolidation of fill around the water control structure.

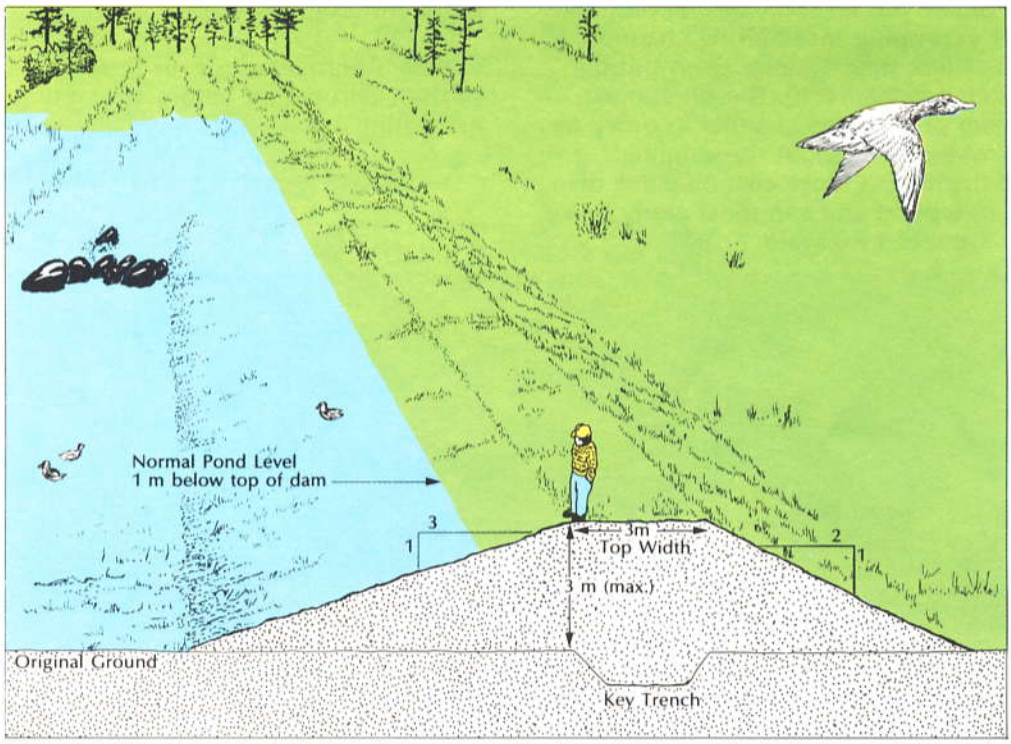

Figure 9

TYPICAL DYKE SECTION

1 Dig the key trench along the centre of the dam and backfill with common fill.

2 Common fill should be clean, that is free of all organic matter such as roots, sod, etc. A well graded *pit run* gravel is ideal if it has at least 10 percent clay particles.

3 Build the dyke in layers less than 20 cm thick, compact each layer with a dozer.

4 The flatter (3:1) slope is needed on the upstream side to prevent erosion.

5 Mulch and seed all surfaces upon dyke completion.

6 Do not impound water until 60 days after the dyke completion.

Dam construction is not as simple as it might appear. Short cuts on the design to save money or time will increase the likelihood of failure and there are many testimonies to this fact including ruined fish habitat, damaged property and financial loss.

Seek professional engineering expertise if you are unable to perform any of the essential steps. Hire experienced contractors that have built dams before and be sure to have all regulatory approvals before you start work.

EXCAVATING PONDS AND LEVEL DITCHING

In many situations it may be impossible to construct a dam to impound an area that lacks open water. Here the property owner can excavate shallow ponds or better yet, level ditches. Level ditching consists of excavating meandering channels 6 metres wide and less than 1 metre deep through the wetland. Refer to Figure 10. The ditch must not join a stream or drainage channel in order to remain full of water throughout the summer months. Level ditching is more cost effective than excavating a large pond and can most easily be completed by a tracked excavator.

In order to create level ditching or ponds, the wetland must be relatively flat and contain a clay or mineral soil base. Excavated channels in peat or pure sand may not remain full of water and will have a poor nutrient content. Level ditches and ponds located adjacent to larger wetlands will be more effective than those in an isolated situation.

An example of where a series of small ponds or level ditching might be used is on low flat land with no defined stream, but with a high water table. This might even be a wooded swamp, in which case some trees may have to be removed first. The earth material may be piled close to the excavated channel creating denning sites for muskrats and loafing sites for waterfowl.

As with dam construction, extreme caution must be taken near a stream to avoid damage to fish habitat through siltation.

Obtain a permit from your Provincial Department of the Environment before attempting any excavation.

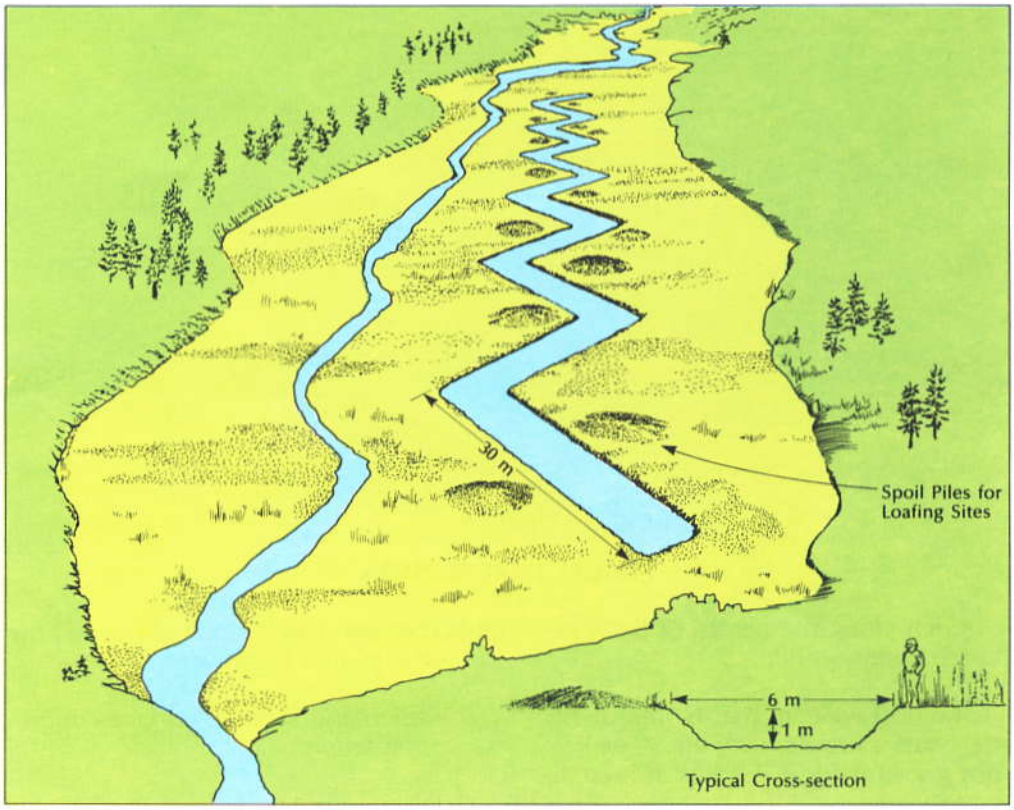

Figure 10
LEVEL DITCHING
Creating Open Water in an Overgrown Marsh

3 Low Nutrient Levels

Many wetlands in the Atlantic region have low productivity because of a lack of available nutrients. The more productive wetlands lie in the fertile soil zones or receive nutrients from outside sources such as agriculture.

In the more sterile areas, one potential enhancement technique to increase productivity is to artificially fertilize the wetland. The technique is not yet fully perfected, so little information is available to the public. Ongoing studies will soon tell us if fertilization is a viable option.

Another problem that will limit productivity on a marsh is caused by prolonged flooding. The nutrients become trapped in the partially decomposed plant material and in the marsh sediments. Removing the water from the marsh periodically stimulates decomposition of plant litter causing nutrients to be released back into the food chain upon reflooding.The length and duration of the temporary drawdowns may vary. In nature, beaver ponds may last 5 to 10 years before the beavers abandon thus creating a drawdown which may last a year or more until a new colony is established.

Many natural wetlands undergo a seasonal partial drawdown due to evaporation and transpiration. Nutrient recycling may occur here every year. Drawdowns have a dramatic effect on marsh wildlife. A drawdown from August 15 to October 15 every few years may have the least negative impact on non-waterfowl species such as muskrat, while reducing the risk of a vegetative overgrowth which can happen by leaving the marsh dry all year. Proper nutrient levels will result in the availability of both animal and plant foods, which is possibly the most important attraction for waterfowl.

4 Disturbance

As some waterfowl species are very susceptible to disturbance, the surrounding upland can be as important as the marsh itself. Fencing is a way to keep livestock away from the marsh edge. With good escape cover in and around the marsh, waterfowl can tolerate moderate amounts of disturbance. Refer to Figure 11.

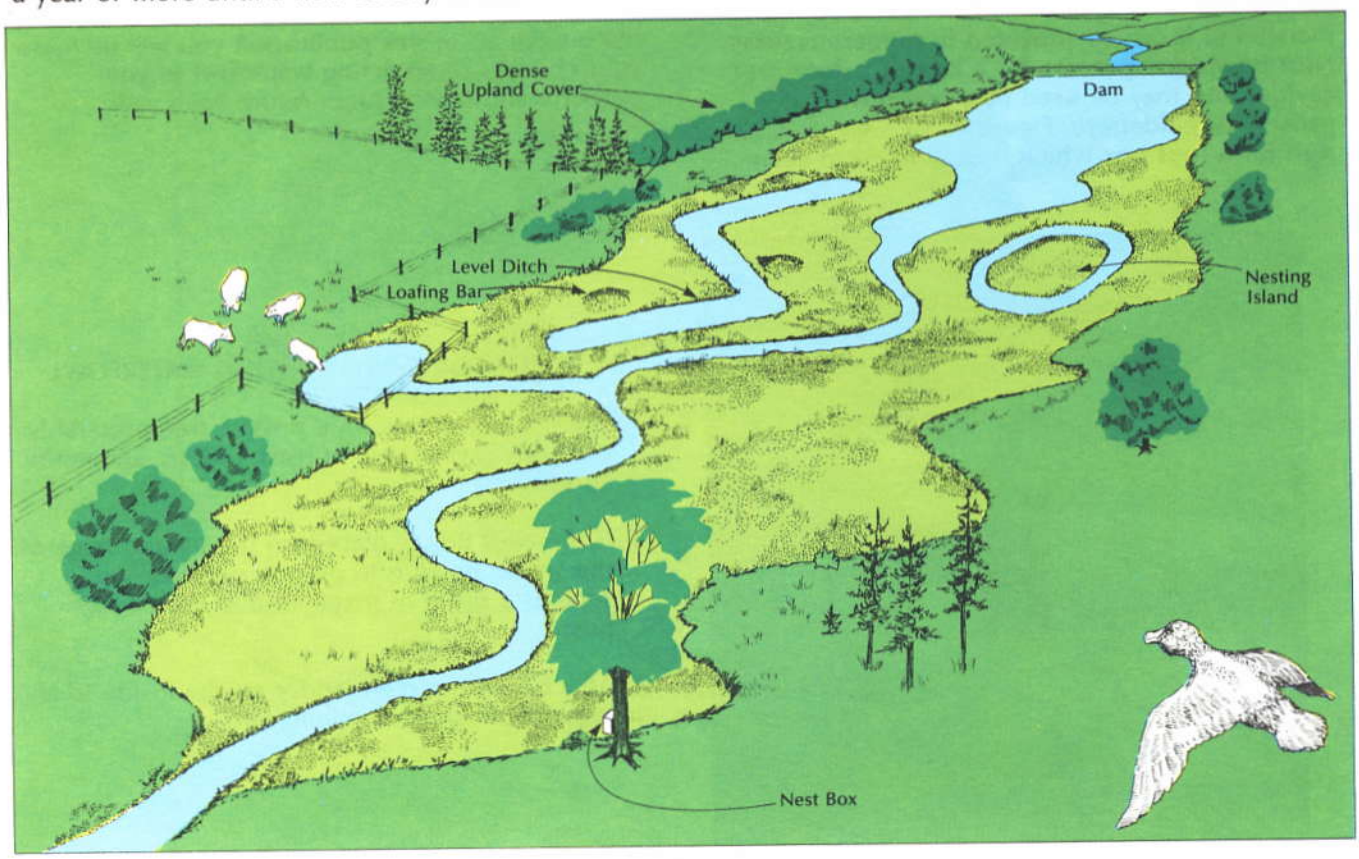

Figure 11
INTENSIVE MANAGEMENT

ADDITIONAL IMPROVEMENT IDEAS

Marsh characteristics are continually changing. One problem managers have is to maintain the right combination of water, food and cover.

A marsh may eventually become overgrown with vegetation. In the case of cattail overgrowth, open water can be created by cutting the plants off below the waterline in late July or August. Again, keep in mind that the *hemimarsh* is the ideal situation to create, so don't remove all the vegetation.

Muskrats are usually attracted to properly managed waterfowl marshes. They are beneficial in that they create open water by cutting plant growth to build houses, which in turn are used as loafing sites for ducks.

Food production can be enhanced by introducing plants such as wild rice. Spreading straw on the pond bottom, to be decomposed by bacteria, will result in increased invertebrate populations further up the food chain. Invertebrates are a high protein food preferred by ducklings. Do not use insecticides on uplands draining into the marsh.

Escape and nesting cover is essential around the marsh and it can be provided in numerous ways. Nest boxes compensate for a lack of natural tree cavities and may be used by wood ducks, mergansers or goldeneye. Figure 12 shows a good design for a nest box which is easy to clean each year after the nesting season. Dense cover around the marsh can be achieved by fencing out livestock and not mowing to the waters edge. Island construction, installation of loafing logs or placement of large round hay bales provide secure nesting and resting places within the marsh. Prohibiting spring burning on the uplands will protect nesting females.

WHAT TO EXPECT

As previously stated, waterfowl use different wetland habitats during different times of the year. While numbers of ducks using a particular small wetland may be relatively low, collectively these small areas are very important to the overall waterfowl population. Without a tremendous food supply, ducks usually do not use ponds much smaller than 1 hectare for brood rearing except when it is associated with a larger wetland complex. Like most wildlife, ducks are creatures of habit and they return to areas where they were successful in obtaining their survival requirements. By following the guidelines in this publication you will increase your chances of attracting waterfowl to your property and having them return each year.

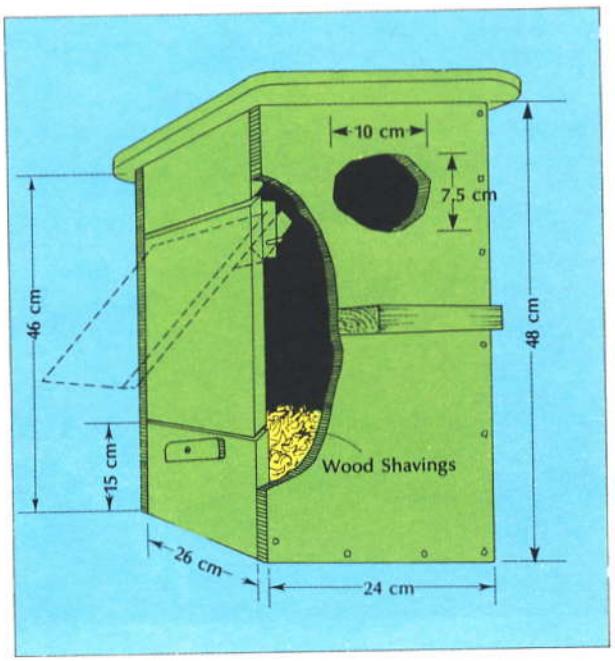

Figure 12
NEST BOX FOR CAVITY NESTING WATERFOWL

1 Place the Nest Box on a post or tree preferably over open water and at least 1 metre above the surface.

2 If the Nest Box is placed on the upland edge of the water, be sure to place a predator guard such as a piece of metal around the tree or post.

3 Attach a wire screen ladder on the inside to allow the ducklings to climb out.

WHO TO CONTACT FOR ASSISTANCE

Ducks Unlimited has two offices in the Maritimes. You may contact them for technical assistance at:

Ducks Unlimited Canada
9 Havelock Street
P.O. Box 430
Amherst, Nova Scotia
B4H 3Z5

Ducks Unlimited Canada
Hodgeson Road (Vanier Highway)
P.O. Box 726 Station 'A'
Fredericton, New Brunswick
E3B 5B4

The Canadian Wildlife Service can also be contacted for assistance.

Canadian Wildlife Service
P.O. Box 1590
Sackville, New Brunswick
E0A 3C0

The regulatory agencies, through which you must seek approval for wetland work, are:

Nova Scotia
Department of the Environment
P.O. Box 2107
Halifax, Nova Scotia
B3J 3B7

New Brunswick
Department of the Environment
Operations Branch
P.O. Box 6000
Fredericton, New Brunswick
E3B 5H1

Prince Edward Island
Department of the Environment
P.O. Box 2000
Charlottetown,
Prince Edward Island
C1A 7N8

You may also wish to contact your nearest Provincial Department of Lands and Forests or Department of Natural Resources or Provincial Fish and Wildlife Office.

Other Ducks Unlimited contacts across Canada:

Ducks Unlimited Canada
710 Rue Bouvier
Bureau 260
Quebec, Quebec
G2J 1A7

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3rd Floor, Centurion Plaza
Edmonton, Alberta
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GLOSSARY

Borrow Areas - The area of land from which earth material is taken to construct the dam.

Brood Rearing Habitat - Wetlands chosen by hen ducks to raise their broods.

Class 'A' Gravel - A processed *crushed* gravel conforming to Provincial Department of Transportation specification for 0 to 20 000 sieve (maximum) gradation.

Coloured Water - A natural staining of rivers, lakes and streams caused from water running over bogs and other partially decomposed plant material.

Drawdown - Taking water from a wetland exposing the bottom to the air for a specified time.

Emergent Vegetation - Aquatic plants which have their roots on the marsh bottom and extend above the surface of the water.

Floodplain - Low lying lands adjacent to watercourses that become flooded during periods of heavy run-off when the stream is unable to handle all the flows.

Food Chain - A natural order whereby one level of organisms uses another level as a food source.

Invertebrate - An animal which lacks a spinal column.

High Salt Marsh - That part of a tidal marsh which is flooded only by the monthly high tides.

Loafing Sites - Small objects on which ducks prefer to sit and rest including stumps, rocks or muskrat houses.

Pairing Territories - Small isolated bodies of water which individual waterfowl pairs use during the early part of the breeding season.

Staging Area - A place where birds gather. This may be a single family unit of birds or a large flock which builds prior to migration.

Transpiration - Water vapor lost to the atmosphere through plants.

Water Control Structure - A Structure such as a concrete weir or spillway that is used to control the water levels in the pond.

Watershed - That geographic area which contributes surface run-off water to a particular site.