When working in a floodplain, permission must be obtained from the local conservation authority. The work must not reduce the storage capacity of the floodplain. MNR approval is also required when working in or immediately adjacent to streams.

## 3.5 Creating or Rehabilitating Isolated Marshes

Isolated marshes are typically situated in low-lying depressions in poorly or imperfectly drained areas. Frequently, they are simply ponds with a fringe of wetland plants around them. At the other end of the scale, they may be damp areas with little standing water. This latter type of wetland is frequently a monotypic stand of an aggressive wetland species such as cattail, reed grass, reed canary-grass or purple loosestrife.

Deepening existing marshes is often done to rehabilitate them and to provide more diverse habitat. This can be an excellent technique to greatly enhance wetlands.

**Caution**

*Many of these wetlands are situated on clay lenses well above the water table. If the lens is punctured by excavation, the entire wetland may dry up.*

When planning creation or rehabilitation of an isolated marsh, review the discussion on depths and substrates under lacustrine marshes. Except for larger marshes, fish are unlikely to be present, and an entirely soft substrate is suitable. Even if fish are present, they are most likely to be minnows or sticklebacks, which do well in areas of soft substrates. Provision of logs for invertebrates, amphibians and turtles should be considered.

**Reality Check**

*If a new wetland is proposed, careful study is required. There are probably some very good reasons why a wetland doesn't occur naturally.*

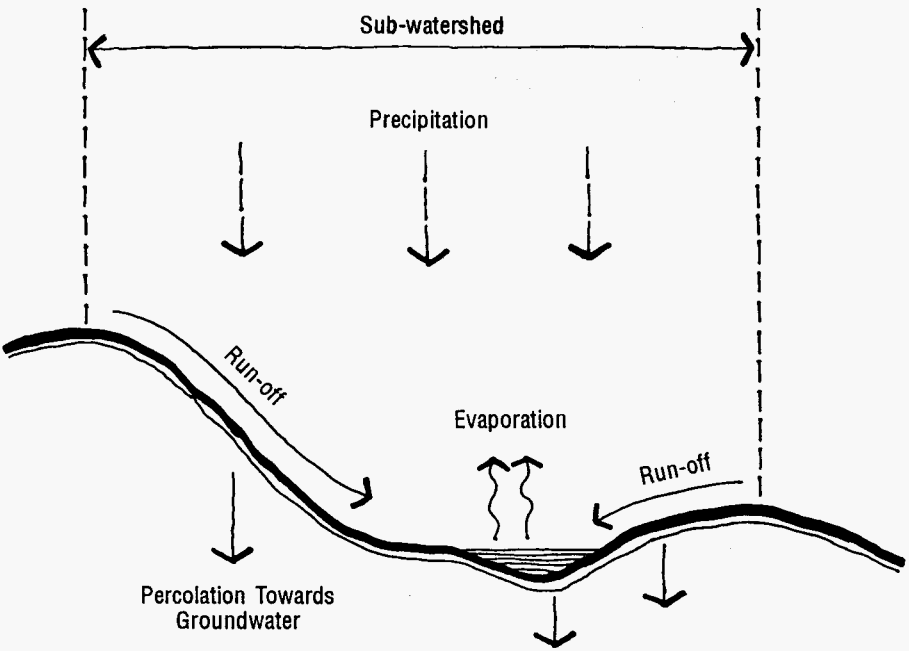
Key parameters to study include:

- watershed area;
- soil types;
- precipitation rates and runoff coefficients;
- evaporation rates;
- depth to water table.

The above work is best done by a hydrologist, possibly with input from a soils scientist.

The study will determine:

- what area contributes water to the potential wetland site;
- how much rain falls in this area;
- what percentage of precipitation soaks into the soil and how much would run into the wetland;
- how much of the water in the wetland would be lost to evaporation;
- if the soils below the wetland are permeable or impermeable;
- if the wetland will be connected to the water table.




Factors affecting water retention in a potential wetland site

After completion of this work, you will know if the proposed wetland will hold water and whether or not it will dry up in the summer.

If creating a wetland is feasible, a hydrologist should also do most of its design, with input from a biologist. Water delivery and retention in the wetland will determine its optimum size, shape and underwater contours. These, however, must take into account the preferred water depths and other habitat requirements of the plant and wildlife species that the marsh is being designed for.

Design of isolated marshes must be done on a site-specific basis, since the abiotic factors influencing the site will be unique in each case.

These wetlands should be designed so that they contain water until at least the end of July. Otherwise, they may become ecological traps for amphibians, with the wetland drying up before larvae or tadpoles transform into adults.

Unlike lacustrine and palustrine wetlands, there may not be a nearby seed source of aquatic plants, so planting may be required. The next two sections describe methods of propagating and transplanting macrophytes.

## 3.6 SEED COLLECTION AND PROPAGATION

For many emergents and riparian species, it is possible to collect seeds and raise native stock for planting.

Most aquatic plants flower late in the season, so late summer or autumn is an ideal time to collect seeds. Before embarking on a seed collection program, consider the following.

- Seeds should be collected locally to ensure you have appropriate genetic stock that is climatically adapted.
- Collect only seeds of common species. Collection of rare plants may adversely affect existing populations, and they will not survive in newly created wetlands unless their precise microhabitats are present.

- Do not collect plants from sensitive habitats. A high proportion of desired species can be obtained from roadside ditches or sites that are soon to be developed.
- Collect only native plant species.
- Avoid collecting seeds of aggressive native species such as cattails and reed canary-grass. They are likely to appear in most wetlands without assistance.
- Collect a high diversity of species (40 or 50). This provides a wide range of alternatives in case some seeds do not germinate. It will also provide greater habitat diversity and visual appeal. Collect species that prefer a variety of water depths (riparian, emergent, and submergent species).

When collecting seeds, cut off the entire seed head and put it in a paper bag. Each bag should contain only one species. Label the species, indicate the collection area if seeds have been taken from more than one location, and note the water depth and other important site characteristics.

Dry the collected seeds inside the bags for about three weeks. Once dried, seeds should be planted in fibre pots. A suitable growing medium is 60% potting soil and 40% perlite mixed evenly and kept moist at all times. Maximize the likelihood of germination by planting seeds of each species in rows at various depths and by scattering some on the surface of the growing medium.

After planting, place the pots outside in a cold frame. They should be heavily watered to initiate moist stratification. A simple cold frame can be built of pressure-treated lumber covered with high-density plastic. Water weekly over the winter until the soil begins to thaw in early spring. If planting does not occur immediately, apply an antidessicant to the growing medium to prevent damping-off of the seedlings.

There are advantages to planting in either spring or fall. Spring planting allows early establishment before invasion by aggressive species can occur and allows plants to produce seeds during their first season. The disadvantages of spring planting is that plants will

be small and susceptible to grazing or being pulled out by wildlife species such as Canada geese, ducks, and muskrats.

The primary advantage of autumn planting is that by that time, the plants will be more robust. They may, however, be susceptible to frost heaving. Mid to late summer planting may result in larger plants that may still have an opportunity to grow and produce seed.

If plants are going to be retained until autumn, additional work is required. In spring, remove the cold frame during the day and replace it at night to allow exposure to sunlight and protection from frost. Later in the summer the entire cold frame can be removed. Install overhead cover to reduce daily exposure of plants to the sun. Seedlings should be lightly watered every morning and thoroughly watered every evening. Regular weeding will also be required.

Seedlings can be planted individually, in groups, or in their entire fibre pots. Critical factors:

- ensure planting is done in an area of appropriate water depth;
- the plant or pot is firmly anchored in the substrate.

If backshore areas are being planted with riparian species, they should be dug up and raked prior to planting.

## 3.7 TRANSPLANTING AQUATIC MACROPHYTES

If submergents are desired in a newly-created wetland, transplanting may be required. Some emergents may also be established best through transplanting.

**Caution**

*Transplanting programs must be very carefully designed so they do not have adverse effects on an existing wetland. In many cases, there may also be negative public reaction to removal of plants from a wetland.*

If transplanting is feasible:

- pick a nearby wetland;
- identify which species in the wetland are appropriate for transplanting based on water depth preferences;
- minimize the time spent in the existing wetland, and the amount of sediment that is stirred up;
- do not collect large patches of plants. Take only a few from selected beds of aquatic vegetation. After completion, there should be no indication that you have been there;
- do not remove rare species or those that are locally scarce in the existing wetland.

Many plants can be removed by gently pushing your hand into the substrate beneath them and pulling the root mass out. A shovel may be required for some larger emergents. Place the plants into pails of water for transportation to the planting site.

Plant the macrophytes as soon as possible after removing them from the wetland. Make sure they are planted at the same depth and in the same substrate type as where they originally occurred.

There may be some difficulty in getting plants firmly rooted. While not a problem for small plants, larger ones have a tendency to float. For these, tie a small stone or brick fragment onto the root mass with a short length of twine. Then push the weight well into the bottom

and pack substrate firmly around the roots to the same depth as before.

Late summer or early autumn is an optimum time for transplanting because:

- water levels are at their lowest;
- at least some plant species will have developed seeds.

Even if the actual transplanting is not successful, a seed source will have been introduced into the new wetland.

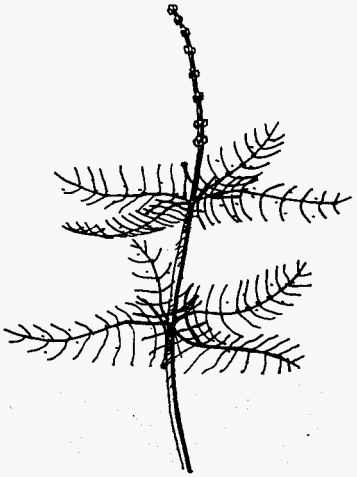
An alternative to transplanting is to transfer some substrate from an existing wetland where even unvegetated areas will contain a seed bank of aquatic plants. This can be done with minimal disturbance. Conversely, it is difficult to know what species are being introduced and there are no guidelines to determine how much substrate is enough.

Vegetative cuttings can also be collected. For many species, these will root and form new plants.

Collecting and propagating seeds or transplanting is practical for relatively small (<1 ha) wetlands. Several thousand seedlings can be raised in a small area. For large-scale planting, consider involving the resources of a conservation authority or Ministry of Natural Resources office. The Royal Botanical Gardens (905-527-1158) has established an aquatic vegetation nursery and may be able to provide plants or assist in seed propagation.

## 3.8 DEALING WITH PROBLEM SPECIES

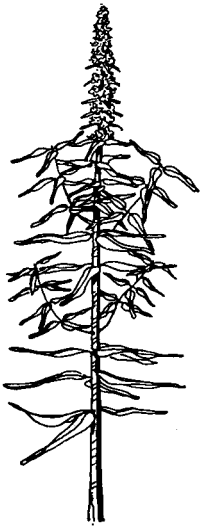
There are three introduced invasive plants that can become major problems in wetlands: Eurasian water-milfoil (*Myriophyllum spicatum*), reed-canary grass (*Phalaris arundinacea)* and purple loosestrife (*Lythrum salicaria).*



Eurasian water-milfoil is a submergent that can grow in water 0.5 to 10 m deep, but occurs mostly at depths of 0.5 to 3.5 m. It reproduces primarily by vegetative fragmentation, with roots developing on plant fragments. It grows so densely that it may crowd out all other plants within the preferred depth range. It is unlikely to occur in isolated wetlands unless it is accidentally introduced. In lacustrine and some riverine wetlands, it may become the dominant or only submergent. At present, there are no known practical control methods. It does, however, provide habitat for aquatic invertebrates and fish.

Reed canary-grass has both native and alien strains. A perennial that can reproduce asexually by dense rhyzome growth, it is able to inhibit or eliminate other species to form monotypic stands. Large-scale control techniques are unknown. In small areas, removal by hand two or three times a year can be very effective. The best method of control is to make the habitat unsuitable. Reed canary-grass does well where soils are saturated or near saturation most of the year, but does not persist in areas that are inundated throughout the growing season.

Purple loosestrife is an aggressive perennial with prolific seed production (2.7 million seeds/plant) that also can spread vegetatively by roots, shoots and broken stems. It can form dense stands at the expense of native species, particularly where existing wetlands have been disturbed or altered by human activities. As yet, no practical, widespread control measures are known. Removal by hand and herbicides may be partially effective in small areas. Control techniques must be continued for many years due to the long-term viability of the seeds. However, it does not do well in water much deeper than 30 cm, so wetlands should be designed to include deep areas.



Two native plants, common cattail and reed grass, can also form dense, monotypic stands. These can be controlled to a limited extent by cutting and/or burning on a regular basis. Of the two, cattails can withstand deeper water, up to a maximum of about 60 cm. Deeper areas will provide open water and habitat for submergents.

Reed grass provides very limited habitat for fish and wildlife species and is generally not desirable. Cattails, however, are used by a wide variety of species, some of which prefer large monotypic stands. Therefore, there will be many instances where pure cattail stands are desirable.

Marsh creation or rehabilitation can also be thwarted by some fish and wildlife species. These include carp, Canada goose, and muskrat.

Carp uproot submergents and some emergents when they are foraging. Their feeding habits also increase water turbidity, which in turn decreases light penetration into the water and inhibits submergents. The effects of carp have been devastating in many marshes, including those in Cootes Paradise and Lake St. Francis. Chain-link fencing is currently being explored as an option to keep them out of Second Marsh. Large-scale removal plans and barriers

have so far met with limited success. Barricades around small areas can be made with snow fence or other materials that keep out large fish. On a site-specific basis, these can be highly successful. However, they will also exclude large specimens of desirable fish and some wildlife species.

Canada geese will graze on young shoots and pull recent plantings out of the ground. A flock can quickly decimate a planted area. Consider this before planting and discuss appropriate control techniques with MNR. Mute swans can reach down a metre into the water to pull up plants.

Muskrats graze on emergents, particularly cattails. They are a problem only when extremely abundant.

## 3.9 MANAGEMENT

The most common and necessary management practice will be the control of invasive plant species, particularly purple loosestrife and reed grass. This will be a long-term program unless the habitat can be altered to discourage them from spreading.

## 3.10 MONITORING

Monitoring of restored wetlands is an essential part of the restoration process. It can reveal additional opportunities for habitat enhancement, such as introducing new plant species, adding more structure for fish and other aquatic fauna, improving the mix of vegetation and open water, and altering water depths or water level fluctuations.

At the very minimum, restored wetlands should be checked for the presence and abundance of undesired plant species, and whether they are on the increase.

Since there is limited information on constructed or enhanced wetlands in Ontario, monitoring can provide invaluable data that may lead to significant insights. Some of the key questions that monitoring can answer are:

what species pioneer in different types of wetlands?

- what species transplant well and what is the best time to move them?
- what species do not transplant well?
- what are the optimum water depths for individual species?
- what species do well or fail when propagated from seed?
- what are the best ways of treating seeds to ensure germination?
- what are the optimum times for planting seedlings of various species?
- does the relative abundance of different plants change annually in response to changing water levels and other factors?
- what wildlife species are present and how long did it take them to colonize the wetland?
- was the timing of wildlife colonization related to the establishment of particular plant species?
- did some expected species fail to inhabit the wetland? if so, why?

Managers undertaking wetland creation or enhancement are strongly encouraged to disseminate their knowledge by publishing the results of their efforts.

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