

# EMERGING WILDLIFE CONSERVATION LEADERS

## HOW TO CREATE A FROG POND: SUPPORT MATERIALS



## Table of Contents

Where to Build a Frog Pond.....	3
Toad Ponds.....	4
How Big and How Deep?.....	5
Pond Shapes.....	6
Pond Liners.....	6
Concrete and Fibreglass.....	6
Clay.....	7
Flexible Liners.....	7
Types of Flexible Lines.....	8
Installing Liners.....	8
Digging your Pond.....	9
Water Source.....	9
Overflow.....	11
Maintenance and Repairs.....	11
Liner Repairs.....	11
Controlling Algae.....	12
Attracting Amphibians.....	12
Creating Winter Habitats.....	13
Attracting Other Wildlife.....	14
Vegetation.....	14
Making the Pond Safe for Children.....	16

## **How to Create a Frog Pond**

The following information on creating wetland habitat has been extracted from the Metro Toronto Zoo's Adopt-A-Pond publication: *The Urban Outback: Wetlands for Wildlife*. This book is out of print, but you can find it on the Zoo's website: [www.torontozoo.com/adoptapond/](http://www.torontozoo.com/adoptapond/)

Adopt-A-Pond has also produced a Wetland Curriculum Resource – a "Toadally Awesome Wetland Guide For Educators". You can contact the Adopt-A-Pond coordinator by calling: (416) 392-5999.

## **Where to Build a Frog Pond**

It is very educational for students to participate in creating a pond. They can learn about what makes ponds work, the time it takes to develop a natural balance within a pond, and the importance of protecting the complex ecosystems of established wetlands that nature has taken many years to perfect.



Before constructing your pond you must take into consideration lot lines, property deeds, locations of any overhead or underground lines, and local bylaws requiring fencing or permits. You will also have to determine how existing vegetation, ground water and surface water will affect or be affected by your pond. If you are planning to create a pond on school grounds, make sure that you obtain expert advice on how to site, build and maintain it.

Locate your pond where it can receive meltwater. Look for low ground that naturally collects water and where pools form in the Spring. Water can be directed to this area or retained behind a low dam or berm. If your pond is located near a building, redirect downspout water to replenish the pond each time it rains. Depending on the roofing material, you may need to run the down spout water through a filter or fine strainer. Trees and other plants may be sensitive to particles of tar washing off roofing tiles. Particles of tar entering your pond from down spouts could accumulate and poison aquatic plants and animals. If water is lost quickly to percolation, a clay liner will prevent water from soaking into the ground. Deepen your pool if water evaporates too quickly. You may talk to local contractors or naturalists who can best advise you on your local conditions.

Your pond should be located away from manure, and chemical contamination sources such as runoff areas from composters, pastures, septic tanks and treated fields and lawns. Ammonia, released by manure and many other fertilizers during wet periods, has been found to affect tadpoles of amphibians.

Runoff, in this case, should not be directed to the pond. After a period of drought, nitrate and other salts can be found at high concentrations in the front zones of runoff. Subsequent rainfall then creates a "toxic wave" which prevents frog tadpoles from developing. The high levels of nutrients found in the runoff may also cause algae blooms. A vegetation buffer strip about 2m wide planted around the entire pond will reduce erosion and help filter sediment, fertilizer, pesticide and other contaminants before they enter the pond.

Rivers, creeks and irrigation ditches, with vegetation along the banks and with occasional adjacent ponds, are ideal breeding grounds and dispersal routes for frogs. If you build your pond near such an area, you will have a greater chance of attracting breeding amphibians to your pond. Other dispersal corridors for both amphibians and other wildlife include shelter belts, forest plantations, unused road reserves, remnant woodlands, windbreaks and overgrown edges of roads.

All ponds need time to develop into good amphibian habitat. The quality of habitat is improved when plants and algae are well established, when sediments that cloud the water have settled to the bottom and stay there even after heavy rain, and when a nice layer of detritus (decomposed plant and animal matter) settles on the bottom of the pond. This is a source of nutrients for plants, tadpoles and other aquatic organisms.

### **Toad Ponds**

In a new pond, toads are often the first species to appear. Toads adapt very well to living around homes and gardens, and are a good species to attract to your new pond. In most cases, toads are the model species for new ponds and your efforts should focus on attracting this species. While you are waiting for the first toads to arrive, take delight in the first dragonfly that magically arrives at your new wetland.

Do not worry if your toad pond dries over the Summer (ephemeral ponds) as this is the type of pond that most toads will select. It is not unusual to see thousands of little 1 cm toadlets lined up along the shore of a drying pond basking in the sun and taking in the last of the pond water through the skin of their belly. Because toad ponds are located in open areas with full sun it is essential that cover such as boards, flat rocks, tall grasses, or stumps be provided as shelter for the toadlets while they move away from their birth pond.

Urban populations of toads may have a high level of predation due to large raccoon populations or road kill during migrations to an area away from garden ponds. There have been many documented incidences of toads, unable to climb concrete road curbs, suffering a high death rate due to vehicles or, in one case, being swept up by a road sweeper each morning of the week. Locate your pond where amphibians can enter and exit without risking death. Toads produce over

5,000 eggs and it can be expected, even in pristine areas, that only fifty toadlets will survive their first year (1% of the egg mass).

The location of your pond will determine the kinds of toads and frogs that can breed there. The closer your pond is to existing populations, the more likely that some will take up residence and actually breed in the new pond. You must understand that amphibians are creatures of habit and will not at first want to move from their old breeding pond to the new one. However, after one or two frogs or toads breed in the new pond, their offspring will return year after year to breed in the habitat that you have created.

### **How big and how deep?**

The dimensions of your pond will be determined by:

- the space you have available
- the size required to hold water long enough for the frog or salamander eggs to hatch and for the tadpoles to develop into their terrestrial form
- whether the amphibians you wish to attract hibernate underwater

Amphibian species can require different lengths of time to develop. For example, from 60 days for fast-developing species like the common toad or up to two years for green frogs and four years for bullfrogs! The average time for most salamanders and frogs is 60 to 90 days. Local soils and temperatures also affect the water-holding ability of ponds. Larger or deeper ponds may be required in well drained sandy or gravelly soils while clay soils hold water well and the pond can be smaller with less water.

Amphibians are attracted to ponds by the size of its reflective surface. If the pond surface is too small (smaller than 9 X 6 feet), amphibians won't even notice it! Smaller ponds suffer from temperature fluctuations and take longer to become settled and balanced. There must be enough bacteria and algae on rocks and the bottom of the pond to feed tadpoles, and sufficient aquatic insect production to feed the adult frogs or toads. You will also want to have a pond big enough and deep enough to prevent predators such as crows, garter snakes and raccoons from having access to the centre of the pond. Most amphibians will rest or bask along the edges of a pond but retreat to deeper water when frightened. If you are concerned about the safety of small children you may want to restrict access with a natural looking fence (eg. cedar rail) and gate. However, large rocks can be submerged just below the waterline and these will restrict access to deeper water. The rocks also provide a refuge for frogs and their tadpoles and make it easier for wildlife to enter and exit the pond.

The habitat of small ponds is enhanced by planting gardens nearby to create damp shelters for toadlets. Of course, the bigger your pond the better. Ideally the pond should be 18 feet long and 12 feet wide. Ponds of this size may be

intimidating. However, once set in the ground and planted around the edges to create terrestrial habitat, your pond will appear smaller.

***A word of caution! Many suppliers sell small pool liners indicating that they are suitable for frogs. Although a frog could live in these ponds over the Summer, there is no possibility that the frog could over Winter or breed in these small ponds. Many of the so-called "frog ponds" sold by nurseries in pre-packaged boxes are solid fibreglass. These are deep, with very steep sides and are death traps to amphibians that may fall in and cannot climb out of the water.***

If you are building an irrigation pond please remember that extreme water level fluctuations reduce the ability of native plants and animals to establish themselves. Increasing the size of the pond will reduce the fluctuations in water level.

### **Pond shapes**

In most instances people create very unusual shapes when they start their first pond. You should confine these shapes to crescents or ovals. It is best to stay away from too many curves and square corners because it is difficult to fold most liners into unusual shapes, and water ends up stagnating in the folds.



A shallow 10-18 cm deep shoreline or shelf provides growing areas for emergent plants and spawning areas for egg laying. Alternating shoreline depths allows you to create different habitats including a wet meadow, a rock garden and a cattail area. In Winter the shallow bank will allow ice to expand out of your pond so damage does not occur to the liner.

### **Pond liners**

#### **Concrete and Fibreglass**

It is recommended that flexible pond liners be used instead of concrete and fibreglass. Concrete ponds are expensive, requiring footings, reinforcements and several solid inches of concrete. Although concrete ponds should have a long lifespan, it is not uncommon to find cracking within a few years. Construction of a large concrete pond often presents technical problems that are best handled by professionals.

A fibreglass pond costs approximately three times that of a PVC flexible liner, and is not very natural looking. When placing a fibreglass pond in the ground, use a thick layer of brick sand which is free of stone to pack under and around

the pond. Soil can trap water under a fiberglass pond and cause it to heave up out of the ground. Before adding water, check the top of the pond with a spirit level to make sure that it is level in all directions.

Several fiberglass ponds can be placed side by side to create one wetland. Leave enough room between the ponds for access and remember to place rocks or logs in deep or steep sided pools for toadlets and froglets to climb out.

## **Clay**

If you have sandy, silty soil with a clay content of at least 10%, soil compaction is the easiest way of sealing the bottom of your pond. Alternatively, soils with a clay content of more than 20% can be imported for compaction.

Although clay lined ponds are the most natural looking, clay is not the best choice of impermeable barriers for constructed backyard ponds. The clay itself is very heavy and can leak if not installed correctly. Bentonite clay is applied at the rate of 1 to 3 pounds per square foot, tilled in, and then rolled to compact the particles. Use a sprinkler to wet the bentonite before compacting. Bentonite swells when wet but if complete drying occurs bentonite shrinks and may compromise the seal. After preparing the clay liner, add water immediately otherwise the clay will dry out and crack. If you empty the pool, the clay must not be allowed to dry out. A layer of a mixture of sand and earth should be placed on top of the clay to protect it from mechanical damage.

Geotextile clay liner is a product that sandwiches bentonite clay between two layers of felt. The felt is sewn so that the clay cannot move and collect anywhere along the width or length of the roll. Geotextile clay liners are expensive and are generally used for large farm ponds.

Alternative methods of applying bentonite clay include adding bags of clay directly to the pond. A water barrier forms as the clay particles wash out of the bags and settle onto the bottom of the pond.

## **Flexible liners**

It is best to decide on the type of liner you wish to buy and see what sizes it comes in before you decide on the shape of your pond. Some bulk liner rolls come in increments of 1.5 m starting at the 3 m width. If you have dug a pond and need a 4 X 7 m liner, you will need to buy a 4.5 X 7.5 m liner.

To calculate the size of the liner you need, measure the length and width of a rectangle that your pond will fit into. Add twice the maximum depth of your pond and 1 m to each of these measurements and you will have the size of the liner you need.

$1 \text{ m} + (2 \times \text{maximum depth}) + \text{length of rectangle} = \text{length of liner}$

$1 \text{ m} + (2 \times \text{maximum depth}) + \text{width of rectangle} = \text{width of liner}$

### **Types of flexible liners**

There are generally four types of flexible pond liners. Most of these liners are manufactured in black and natural tones of brown and green to create a more natural look and give your pond the illusion of depth.

1. EPDM (45 mil) liners are flexible, UV stable, resistant to air pollution, have a lifespan of 20 years, are non-toxic to pond life and are very inexpensive. This liner type is actually more flexible than PVC, therefore making it easier to install. Some retailers will only sell the EPDM 45 mil rubber liner because it has proved to be the best liner for cold climates. It does not crack even in temperatures as low as -40 C.

2. The 40-80 mil PVC liners with ultraviolet inhibitors have a lifespan of 10 years or more and are non-toxic to pond life. PVC liners tend to crack along the folds during the Winter, and have poor patching ability.

3. Butyl rubber pond liners are UV resistant and generally have a 20-year lifespan. Some types of these liners contain toxic ingredients that may leach into the water, therefore make sure you ask about it before making a purchase. These liners are not readily available, very expensive, do not come in many sizes and are difficult to patch. Butyl rubber liners are flexible, but the 40-50 mil weights are thick and are hard to fold at corners and curves.

4. HDPE liners are very stable, non-toxic, have the same life expectancy as PVC but cost 1/3 the price. HDPE liners are not readily available, are difficult to work with in cold climates, and come with no guarantee.

### **Installing liners**

Before installing the pond liner you should remove all sharp objects and make sure the soil is packed down hard and level. Once the liner is in place, the bottom should be covered with an 8 cm layer of washed sand topped with a layer of gravel.

When you build your pond try to pick a sunny day with no rain forecast for a couple of days. The sun warms up the liner, making it a little more malleable. Do not leave your liner out on the grass in the sun, because the heat generated by the liner can kill large areas of grass.

Check the liner for manufacturing defects such as holes and weak points. Before installing the liner, line the pond with 8 cm of sand or a geotextile layer to protect it



from any sharp objects in the soil that you may have missed. Old carpets or layers of newspapers are not recommended for this purpose since carpet bulks up in the corners and makes it difficult to lay the liner smoothly, and soggy newspapers are easily penetrated by sticks or rocks.

It is advisable to have four people to help you place your flexible pond liner. Each person can take a corner and make sure the liner is equal at all areas over the pond. Install your flexible liner by placing it over the hole and weight it down with bricks or stones all the way around the edge. Place a garden hose in the middle of the pond and start filling it with water. Starting at the centre, the weight of the water will settle the liner to the shape of the pool. When the pool is filling with water, someone should get into it with their shoes and socks off to create the folds in the corners.

Care should be taken to ensure that no air spaces are created under the liner and that it is not being pulled down unevenly as the pond is being filled. Gaps under the liner and uneven tension can cause leaks when the pond is completely filled. There is no danger of the liner snapping back under water when the weights are removed because the water pressure will keep it firmly in place.

When the pond is filled, make final adjustments to the edge of the liner edge or to direct overflow to the intended area. Tuck the edges of the liner under 15 cm of soil or keep it hidden underneath stones placed around the edge of the pond. Leaving some flex around the edges will help to prevent the liner from tearing.

### **Digging your pond**

There are a couple of things you should do before you start digging your pond. It's a good idea to outline your pond in the proposed area with a piece of rope or flexible hose. Take into consideration lot lines, property deeds, locations of any overhead or underground lines, and local bylaws requiring fencing or permits. Also consider where water overflowing from your pond will flow to.

Natural debris removed from your pond area may be useful when creating wildlife habitat around your pond. When stripping off turf, save large pieces for use around the edge of the pond. Smaller pieces can be placed in a compost pile. The pond should be dug out in layers so that the topsoil can be kept in a separate pile. Keep the bed of the pond as level as possible while digging down to the required depth and reshape the surrounding area to blend in with the shape of the pond. When you have dug out the pond area, make sure that you have taken into your calculations the thickness of the layer of protective geotextile matting or sand under the waterproof liner and the 8 cm layer of sand on top of the liner. The 8 cm layer of sand should cover the entire pond bed.

### **Water source**

Locate your pond where it can receive meltwater. Look for low ground that naturally collects water and where pools form in the Spring. Water can be directed to this area or retained behind a low dam or berm. If your pond is located near a building, redirect downspout water to replenish the pond each time it rains. Depending on the roofing material, you may need to run the down spout water through a filter or fine strainer. Trees and other plants may be sensitive to particles of tar washing off roofing tiles. Particles of tar entering your pond from down spouts could accumulate and poison aquatic plants and animals.

If you have a water meter, take a reading before and after you fill your pond to give you an exact reading of the amount of water in your pond.

When filling your pond with tap water, let it stand for a few days before transferring plants and animals. Chlorine, commonly found in tap water, can kill tadpoles and other amphibious larvae. There is no need to purchase de-chlorinating chemicals. Letting tap water stand for a few days allows the chlorine to dissipate from the water.

Placing your hose at an angle to create a spray while filling your pond increases the evaporation rate of the chlorine. Note: If your municipality now adds chloramine instead of chlorine to the water supply you may lose all the wildlife in your pond when you top up the pool with a hose. Chloramine does not evaporate so you have to use a chloramine neutralizer. You will be risking the life in your pond by not using a chloramine neutralizer.

Although you can use tap water if you are not adding any more than 10% of the total water volume, it is best to top up your pond with water that has been standing for over a week, or with collected rainwater. Use water as close to the temperature of your pond as possible. You can attach a float valve to an underground water supply which automatically tops up your pond as it loses water to evaporation. Remember to drain the hose before Winter.

If you are filling a concrete or fibreglass pond, you may want it to naturally fill up with rainwater. A pinch of powdered or crushed lime can be added to the water if you live in an area affected by acid rain. Measure the pH before and after your treatment. It is best to seek professional advice from your water garden nursery before altering the chemistry of your pond.

If you are considering diverting water from natural streams or using waterways as sources of water you should consult your local Ministry of Natural Resources or Regional Conservation Authority because there may be regulations in place to protect local fish stocks and water supplies.

There are some concerns about the creation of new ponds for "recreation" and large scale irrigation. In some areas of the Niagara Escarpment, there is a

moratorium on pond construction until the cumulative effects of increasing numbers of ponds on water quality is understood. Ponds are used as catchments for water runoff that may be loaded with organic nutrients, pesticides, herbicides and other toxins. Water flushed from these holding areas during heavy storms may contaminate ground water supplies if the wetland serves a water recharge function. In addition, water brought to the surface in ponds may increase the temperature and evaporation rate of underground water causing the water table to drop. Ponds lined with an artificial liner and constructed with a mud bottom last for about 20 years and do not rob local groundwater supplies.

### **Overflow**

Make sure the pond is level! Use pegs, a straight board and a spirit level to make sure the water level will be the same on all sides of the pond. To prevent flooding, an overflow area should be built beyond the edge of your pond. This overflow area consists of a hole dug down to a free-draining layer which you should break up, backfill with clean stones, bricks and then cover with a filter and topsoil. The filter could be a piece of old carpet or fibre matting covered with topsoil. Vegetation suitable for a wet meadow can be planted in the overflow area. If your pond is built on uneven ground, make sure the overflow is built at the lower end.

### **Maintenance and repairs**

Once a pond becomes balanced, annual care and maintenance should be minimal. If there is excess nutrient release from organic matter or fertilizer, your pond water may lose clarity and become foul. You should try to remove the source of excess nutrients. Excess organic matter such as fallen leaves, needles and dead stalks should be removed in the Spring and/or Fall to prolong the period between major cleanings. A good way to keep falling leaves out of your pond in the Fall is to place a protective screen over it in the Fall. The screen should be made of fine nylon so that it will not trap amphibians or fish. Where water flows or seeps into the pond, avoid using fertilizers and keep compost heaps and bins well away from the pond. A buffer zone of vegetation between the pond and the compost pile helps to reduce the amount of nutrients that may seep into the pond.

### **Liner repairs**

Existing concrete ponds that have cracked during the Winter can be repaired by placing a sheet of flexible pond liner over the dried and cleaned concrete surface. A number of nurseries carry a liquid epoxy E.P.D.M. liner. The liquid E.P.D.M. painted onto a clean pond surface hardens to take the exact shape of the pond. A patching kit should be available for each type of flexible pond liner. Check with local nurseries before purchasing a liner.

## **Control of algae**

All ponds will have algae and this is a natural component of all wetlands. Algae, attached to rocks and the sides of your pond, provide most of your pond's oxygen and are the most important food source for tadpoles. However, green water is caused by microscopic algae living in the water column. You cannot create a "balanced" wetland in a few days. Your pond will require time to reach its own natural balance and for the nutrients which may create algae to be used up by all the plants. Do not use algicides as they are only a short term cure and can harm aquatic organisms. Oxygenating plants submerged in your pond help to keep the nutrient cycle balanced. They compete with algae for nitrogen and other nutrients in the water, thus decreasing the amount of algae in your pond. Plants with emergent or floating leaves also take up nutrients and reduce light penetration into your pond and to the algae. The extra cover provided by the plants with floating leaves may reduce evaporation and help to keep the pond cool.

Algal blooms often occur in the Spring due to nutrient runoff and the lack of shading from plants. As previously mentioned you can try and prevent nutrients from entering the pond. Otherwise you will have to wait until plant growth shades the pond, retarding algal growth, or until nutrients are used up by the rooted plants. During this time you can remove the excess algae by lifting it out with a rake or by placing a stick in the middle of the algae mass and twirling it onto the stick.

Before placing the excess algae into your compost pile, make sure there are no amphibian eggs or tadpoles caught in it! The algae can be flushed in a bucket of pondwater first to prevent this from occurring. Removing excess organic material from the bottom of the pond at the end of the growing season may also help to reduce the amount of nutrients available for algal growth the next Spring. Make sure that you do not throw out any green frog tadpoles with the organic matter.

In the Fall, all tropical plants must be moved indoors for the Winter. If your pond is at least 2 m deep, you can move hardy potted plants into deeper parts of the pond where their roots will be below the frost line.

## **Attracting Amphibians**

Special consideration should be given to the species of animals you wish to attract. Besides bringing diversity to your garden, amphibians are good controllers of insect pests.

In contrast to birds, amphibians are completely carnivorous, eating insects and not the leaves and fruits of your plants. One toad will eat thousands of insects a year including slugs, beetles, cutworms, flies, grasshoppers, Gypsy moths, sow bugs, pill bugs, centipedes, millipedes, mole crickets, ants and earwigs. A single toad might eat up to 1,500 earwigs in a Summer! In addition to the above insects,

larger female toads also tackle Japanese beetles and June bugs. Although a toad may eat the occasional beneficial insect, over 81% of its diet consists of pest insects (Organic Gardening, May/June 1994). Toads are not the only amphibians that can help a gardener. If you are close to a permanent body of water you might lure insect-eating frogs to your yard. Salamanders, the third branch of the amphibian family, eat slugs, grubs, worms, spiders, beetles, ants, mosquitoes and many other insects.

The American toad is our model urban amphibian. It spends most of its adult life on land and thrives in our gardens. Toads hibernate on land below the frost line and breed in warm, shallow temporary ponds or the shallow shorelines of larger wetlands. The model rural amphibian (including the American toad) is the green frog which requires permanent water for the tadpole which takes two years to develop into a mature frog. Both the tadpole and the adult frog thrive in deep, warm, rich wetlands and ponds like those often found around farms. They hibernate underwater and require ponds that do not freeze to the bottom.

All amphibians require water to survive. Besides building a pond, you can provide moisture by having shady areas where dew collects, moist patches of soil and rotting vegetation. Let the edges of your garden grow wild to provide amphibians with places to hide from the hot sun. A few rock piles and logs around the pond will provide places where amphibians can find shelter and hide from predators.

Rocky retreats for toads can be made by placing stones to form a rocky burrow about 10 cm high with a sandy floor where toads can dig. Use small sections of brick drain pipe covered with rock or pieces of concrete blocks broken to allow access to the toad chamber. Plant ferns to shade the area or, if it is too dry, a garden sprinkler can be used to increase moisture levels.

Some nurseries now sell clay toad shelters, but you can make one yourself out of a large clay flower pot. Just drill a series of holes around the edge of where you want the toad-sized opening to be and chip out the drilled section with a hammer. Place one or two of these upturned flower pots in shady locations in your garden. You might want to install a toad light up to one meter above ground level within the toad habitat to attract insects for the toads. The light should not be placed near or in a garden as it may attract unwanted pests to your garden.

Place lawn edging around window wells so that amphibians do not fall into these death traps. If this is not possible, place rocks or logs inside the window wells so that amphibians can climb out.

### **Creating Winter habitats**

The hibernating habitat required by an amphibian will depend on the species. If the amphibian species you wish to attract hibernates under water (Bullfrog, Pickerel frog, Mink frog, Green Frog, Northern Leopard frog, Mudpuppy, Northern

Two-lined salamander), your pond will have to be at least 2 m deep to prevent it from completely freezing. A pile of leaf matter should be placed in your backyard if Gray Tree frogs, Wood frogs, Spring peepers, Striped Chorus frogs and Four-toed salamanders are to hibernate there. The Blue-spotted salamander and the Jefferson salamander hibernate in underground tunnels, log piles and compost heaps. Spotted salamanders hibernate in underground tunnels while Red-spotted newts hibernate under logs. American toads hibernate in sandy soil below the frost line, or in your backyard compost heap.

### **Attracting other wildlife**

Both your pond and yard can become home to many other species of animals besides amphibians. A rock or earth island will provide a safe habitat for nesting waterfowl and basking turtles. Submerged rocks and logs provide habitat for dragonfly and other insect larvae. Partially submerged logs provide basking areas for turtles and frogs, and hunting posts for herons.

You can fill your pond's surrounding habitat with butterflies and hummingbirds by growing specific plant species to attract them. Birdhouses for both upland and waterfowl species are often very successful around ponds. Waterfowl nesting structures and houses can be placed on poles in the pond to protect them from predators. Nest box and structure design can be obtained for virtually any native bird species from your local Conservation Authority or Ministry of Natural Resources..

Every time you see a new animal in your wetland habitat, it means you are closer to having your own balanced ecosystem. Depending on the size and location of your pond, natural succession over the years may allow your pond to become home to rabbits, deer, muskrats, bats, turtles, crayfish, snakes, geese, ducks and herons. Some of the animals you can attract are important seed dispersal agents that will, over time, help to increase plant diversity in your created wetland.

### **Vegetation**



All ponds need time to develop into good amphibian habitat. The quality of the habitat improves when plants and algae are established, and when decomposed plant and animal matter has settled to the bottom, forming a source of nutrients for tadpoles and aquatic life.

Plants provide sources of food and shelter for a large number of animal species. Plants must suit the soil type, water levels, and the amount of available sunlight.

Planting should be done in moistened soils. The plants should be dug no more than two days prior to planting and kept cool and damp. With appropriate approvals, clods of plants can be removed from existing wetlands. If you are transplanting plants from a wetland destined for destruction, remove strips of vegetation. If mechanical removal is possible, include the underlying soil profile. If you are planting individual plants, plant one 10 cm potted aquatic plant every 2 m<sup>2</sup>. Slowly raise water levels as the plants grow or place the plants on bricks until they grow enough to be lowered into deeper water. If the water level is too high, new plants can become stressed and will grow poorly or die. Invasive plants like cattails can be eliminated by raising the water level. The shoreline can be graded to provide a variety of elevations that match the depth tolerances of the plants you want to grow.

If your pond contains insufficient sediment to grow rooted plants, potted plants can be placed along the edges. You should place your plants in pots with 8 cm of organic material covered with a 2-5 cm layer of coarse clean sand. Placing your plants in pots also prevents them from taking over your pond. If you do not have enough sand to directly root your plants into the bed of the pond, wrap the plant roots and soil ball in burlap with a few stones added to weigh it down. Sew up the sides of the burlap. Roots will grow through the burlap into the sand as the burlap decays and the soil ball will be contained by the plant's roots.

Submerged, aquatic plants are important egg laying sites and provide cover for frogs and tadpoles. A general rule of thumb to use when determining the number of plants required for your pond is one water lily and three bunches of pond plants per square metre of pond surface (Merilees 1989). Make sure most of the green pond plants are oxygenating plants which help keep a balanced nutrient cycle in the pond. Include an island of rocks or a weathered stump set in about a metre from the edge of the pond. These areas can be used as safe resting places away from predators such as raccoons and pets.

To improve the area around the pond, place native emergent plants around the edge to provide cover for adults and emerging toadlets and froglets. Large emergent plants should be placed on the north side and at the back of the pond so that they do not obstruct your view. If you are worried about the safety of children or pets, a thick boundary of plants around your pond will discourage them from approaching the edge. Trees should be at a distance from the southern edge of the pond because excessive shading reduces wildlife diversity and productivity. Any dead timber can be left standing to provide habitat for species such as beetles and woodpeckers.

Aquatic plants rarely grow below 2 m, unless the water is very clear. Most emergent plants are found in water 5 to 30 cm deep. Typically, submerged plants are found in a zone 0.5 to 1.0 m deep. If an excess of nutrients becomes a problem, let duckweed grow to shade out algae. The duckweed can be raked off periodically and used as a nutrient-rich compost.

Most emergents, including trees and shrubs, tolerate Spring and Fall flooding but suffer during the growing season if water levels do not drop. Grasses tolerate shallow flooding (2-5 cm).

Look at local wetlands to identify the species that are likely to grow in your pond and buy local stock grown in soils with a similar water regime.

Select a variety of marsh and swamp species depending on the desired habitat. Most emergents germinate from seed banks exposed in warm muds as water recycles. It takes three or four years for seed banks and the first animal communities to fully develop.

When transplanting plants from a wetland that is slated for development, you may bring some beneficial plants and invertebrates to your pond, but you may also import some highly invasive, non-native plant species. Non-native plants are often aggressive due to the lack of natural controls in their new habitat and can out-compete or choke out native species. Some invasive plants to watch out for are Flowering Rush, Eurasian Milfoil and Purple Loosestrife.

Purple Loosestrife threatens wetland habitats by taking over the wetland and choking out native plant species and the animals that depend on them for survival. Purple Loosestrife is a 1-2 m tall, deep-rooted perennial with several woody, four-sided stalks. The entire plant must be removed to minimize the chance for regrowth. Dig out the root mass, making sure you have removed all the pieces. Once removed, the plant must be stored in a safe place such as in a plastic bag until it can be burned or packaged for disposal.

If you cannot remove the plant, you can at least retard its spread by removing the flowers before they seed. If you like the "look" of the plant, you may replace Purple Loosestrife with Spiked Speedwell, Spiked Gayfeather or Garden Sage. The Ontario Federation of Anglers and Hunters (OFAH) has produced a video on Purple Loosestrife called "Project Purple". Write to OFAH, Box 2800, Peterborough, Ontario K9J 8L5.

### **Making the pond safe for children**

If you are concerned about the safety of small children you may want to restrict access to the pond with a natural-looking fence and gate. Large rocks can be submerged just below the waterline to restrict access to deeper water. Rocks around the edge provide a toe-hold and something to hang on to in the event that someone falls into the water. The rocks also provide refuge for frogs and their tadpoles and make it easier for wild life to enter and exit the pond.



Photograph by Robin Moore



In ponds without a liner, some schools have installed a layer of strong metal mesh or grating three to four inches below the surface of the water and extending out into the pond by about three feet from the edge. The mesh serves as a safety net. Since the mesh has to be supported on posts set at regular intervals around the inner edge, this method would not work if a pond liner had to be installed. Spaces must be left between the mesh and the bank for wildlife to enter and leave the water.

It is very important to teach water safety. An awareness of the potential dangers and how to act responsibly around water will benefit our children and the wildlife that depends upon water for its survival.