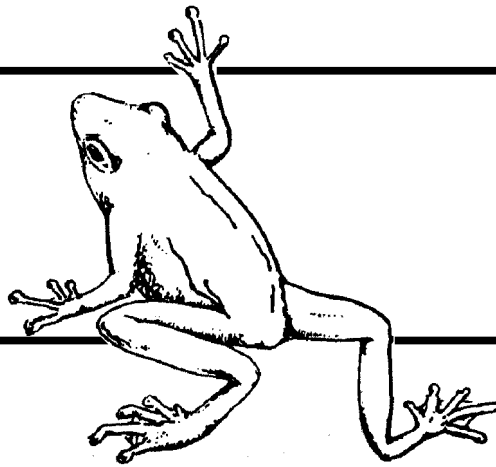

FROGFACTS

No. 2



The Frog and Tadpole
FATS GROUP
Inc
Study Group of NSW

P.O. Box 296
Rockdale 2216

KEEPING FROGS IN YOUR GARDEN

Summary

This leaflet shows you how to establish or modify a garden pond for many of those local frog species that spawn in still or slowly moving water. The pond must be free of predatory fish and of polluting chemicals. It must also have gently sloping sides for the frogs to emerge and vegetation shelter around the pond.

Important

1. Frog numbers of some species are declining alarmingly with several formerly common species now possibly facing extinction. If you can provide a frog refuge in your garden, please do so.
2. Please don't introduce frogs that don't occur naturally in your area. They may introduce frog diseases or upset the local balance in other ways. ("Formidable emerging frog diseases" are a new phenomenon in Australia.)

Advantages to you

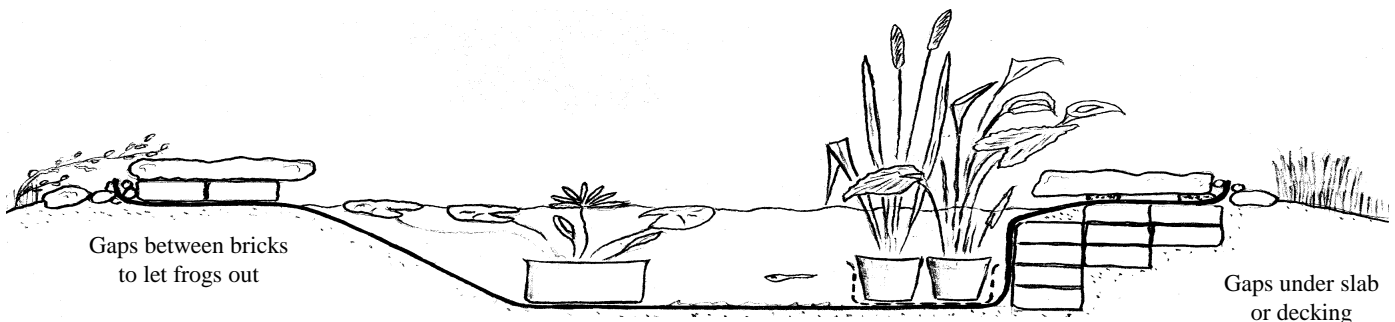
A water garden with flowering marsh plants and water lilies is a very attractive focal point. These plants are generally also resistant to pests and diseases and require little maintenance.

The ability to observe the life cycle of frogs throughout the seasons provides added interest to your gardening. Frogs also help to control insect pests, so you have less or no need to use harmful insecticides.

Location of the pond

An ideal place is part sunny, part shady, but not directly under trees. Give a wide berth to trees that have poisonous leaves (e.g. Oleander, Bleeding Heart, Pines...). To get the most enjoyment from your pond, locate it so that it's visible from the house but in the back garden, a bit away from your own house and your neighbour's houses because frogs can be noisy at times. The taller bog plants should be around the back of the pond. A low garden lamp that is reflected in the water will not only add to your garden's appearance in the evenings but also attract insects for the frogs. Your compost heap, another good source of insects, should be close to the pond. (Part of the heap can be slightly raised on a wire mesh tray or a pallet. Insects and worms that fall through will provide food for the frogs sheltering below). Other shelters at the edge of the pond should consist of vegetation, a rock pile and planks or fallen logs.

Cross section through a small pond that is for safety reasons only 30 cm deep. Note the two different ways of providing a sloping ramp for frogs, of stabilising the pond edge and of concealing the exposed part of the liner.



Pond construction

The simplest way is to scoop a hole in the ground and use a pond liner. Local authorities now require that a pond should be no deeper than 30 cm unless you install a safety fence. Because shallow ponds could overheat in summer, include in your planning a way of shading or cooling your pond. You can set up a temporary sailcloth, beach umbrella or gazebo (which may also stop too many leaves from falling in). A planted-up trickle wall will not only cool by shading and by evaporation, but will also act as a non-clogging biological filter and as a vegetation filter, from which you can harvest water cress and other plants. Otherwise you can simply plant part of the pond area heavily with sedges and other emergent plants, to provide shade and cooler water in the denser areas.

The basic 30 cm deep frog pond consists of five parts: the hole, the underlayer of sand or other soft material, the liner, the overflow and the pond edge.

The hole in the ground should have gently sloping sides, so that non-climbing frog species can get out and so that the earth wall does not collapse later. It should also have a flat bottom for shallow planter pots to stand on. Instead of the flat bottom, you can continue the slope down to a depth of about 70 cm, and later, after the liner is in place, put deeper planter pots in the middle and cover the spaces around them with large round river rocks, thus reducing the water depth back to 30 cm. Another alternative is to have vertical side walls, made of a double thickness of brick wall, with a 45° slope only at the top of the wall where the water level will be. You can achieve this by moving the top row of bricks further out, so that the liner will form a small ramp, and by planning for one of several ways of keeping the water level at the height of the ramp. For a very small pond, this method gives you about twice the water volume than the design with sloping sides. It also allows you to hide the above-ground part of the liner better.

The underlayer protects the liner from any sharp objects in the ground that may have escaped your notice. You can use a thin layer of damp sand, a thick layer of newspapers, carpet underfelt if it is free of staples, or one or two layers of an old tarpaulin. Also cover any sharp brickwork edges.

The preferable pond liner should be of heavy duty, flexible rubber and from pond product suppliers. The materials commonly used are UV resistant PVC, polyethylene and EPDM butyl. EPDM is thicker, more durable, less stiff to work with and although more expensive, provides the best long term result. Unless you are building a temporary pond (e.g. on a patio), don't use building grade polyethylene; it would deteriorate in sunlight. The liner must be big enough to cover the hole and sides, and also the surrounding area by at least 40 cm all around.

As you are filling the pond, tug and adjust the liner into place. Use soil from the excavation to surround the pond with a shallow earth berm, to prevent rainwater runoff from entering the pond. Leave an overflow area slightly lower and fly-screen it to keep tadpoles in: lay nylon fly-screen against the overflow (inside the pond) and keep it in position with rocks, to keep tadpoles in during heavy rain. Crumpled fly-screen with a spacer behind is less likely to clog later. If the pond surface is large, place rocks and mortar into the overflow outside the pond, so that the wall there won't wash away and collapse in a downpour.

To form the pond edge, level and flatten the surrounding earth berm so that its top is evenly 10 cm above the water level. Stretch the outer part of the liner over this and anchor it by placing large flat rock slabs on top. Take care the slabs overhang slightly, to hide and shade the dry part of the liner. Also ensure there are spacers under the slabs, or that they rest partly on top of each other, because frogs cannot negotiate an overhang and would eventually drown or starve in the pond. Then cement the slabs together, in enough places to stop them from falling in when standing on them, but without blocking the frog paths underneath.

Cut the surplus liner off above ground level, leaving it upturned and held in that position with rocks or pebbles (see drawing), and taking care the overflow height is still adjustable.

Wait for at least two weeks before introducing any animals, or at least two days if you have added water conditioner. This will ensure that the chlorine, the chloramine and the supersaturated air in the pressurised tap water have gone.

Plants

Add plenty of emergent swamp plants, including those that will look green and fresh in winter, such as water canna and water iris. Water lilies (in a sunny position) and taro (shade-tolerant) provide cover and help discourage marauding birds and algal blooms. Emergents can be grown bare-rooted, held down by a rock resting partly on their roots. They will then take nutrients directly from the water and will improve the water quality. Alternatively, grow them in trays or pots without open drain holes and cover their soil with sand. As they get top-heavy, they may fall over unless you pack the pots into black plastic boxes (e.g. the worm farm type) or secure them with rocks.

Include a some fast-growing submerged aquatic plants. Whenever you thin them out and remove the surplus, you are also removing surplus nutrients from the pond, aiding the water quality.

In time, you should also allow a thin layer of dead leaves to accumulate in the pond. This provides a larger surface area for useful nitrification bacteria and material for browsing by tadpoles.

Place some spreading garden plants around the pond edge, as hiding places for frogs and also to soften the necklace-like appearance of the stone slabs that hold the liner in place.

Algae can be a nuisance. Control them by shading the pond in mid-summer, by reducing the sunlight through more water lily cover and by avoiding a build-up of nutrients in the water. Adding ½ teaspoon of potassium chloride per 400 litres of pond water, monthly in the growing season, will enable your water plants to make full use of any phosphate in the water and so starve out the growth of algae.

Circulating pump

In larger ponds, the addition of a small submersible pump (a low voltage one is safest) gives you these advantages:

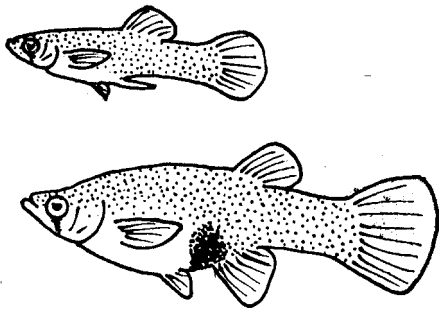
1. The pump allows you to construct a shallow creek bed leading down to the pool. The creek is fed by the pump outlet hose which is easily hidden in a rock fall. Line the creek bed with black rubber pond liner. Cover this with thin flat sandstone slabs, including up the sides, and spread rounded pebbles, gravel or mulch between the rocks. Have small pools of varying depth in the creek, provide some overhanging

vegetation and a small sand beach. This habitat, although very small, may be suitable for some stream-side frogs.

2. As the pump will need a pre-filter, it will also improve the water clarity. A pre-filter is usually a sponge or fibre mat that stops stones and leaves from getting into the pump. Ensure that the filter surface is large enough so that small tadpoles don't get sucked against it. If you can attach a long length of perforated agricultural pipe to the pump's intake, with the pipe's far end closed off and with many layers of black flyscreen or shade cloth wrapped around the pipe, then you have achieved three advantages: This pre-filter won't clog, you won't suck small tadpoles against the pump, and you have created a large oxygenated surface on which good bacteria will settle to help keep the water clean.

3. You can remove water for gardening purposes from the rock fall* without scooping tadpoles out. The pump is also useful if the pond ever has to be drained. [Partial water changes, as with fish tanks, are beneficial for water quality - see later.]

4. Flowing water is pleasant and allows easier maintenance of water quality. It is better oxygenated and less likely to stagnate and it reduces overheating of the top water layer.



The introduced Plague Minnow (Gambusia holbrooki), male 35mm, female 60mm. It is destructive and must not be in frog ponds.

Fish

All pond fish eat tadpoles! A few small species will leave the older tadpoles alone, but all will eat the eggs and tiny hatchling tadpoles. While tadpoles don't eliminate mosquito larvae, some will eat the egg rafts laid by mosquitoes on the surface of the water, which helps control the number present. If your pond has a good balance of plants and tadpoles and some gentle water circulation (many pond frogs don't like too much water movement), you will find very little problem with mosquitoes, as they don't like moving water. If you must add fish, never introduce the predatory Plague Minnow - formerly called "Mosquito Fish" (*Gambusia holbrooki*) shown above - or goldfish, carp etc. into the pond. One species that can be less harmful to larger tadpoles is the **White Cloud Mountain Minnow** (*Tanichthys albonubes*) available from aquarium shops. If you can purchase only a few male fish, you will avoid most problems with tadpoles you already have, as the fish population will of course not increase, and it does not take more than five fish to control mosquito larvae in an average-size garden pond. If you find the fish population increasing because a female was accidentally included and your pond could be subject to flooding such that your fish could end up in a local creek, you may need to remove all fish and

introduce only a few male local native fish from your own watershed region. Select very small species. Cautiously recommended are:

Australian Smelt (*Retropinna semoni*), coastal south-eastern Australia, southern Queensland - transport with care

Pacific Blue-eye (*Pseudomugil signifer*), coastal eastern Australia

Fire-tail Gudgeon (*Hypseleotris galii*), coastal eastern Australia

Ornate Rainbowfish (*Rhadinocentrus ornatus*), north-eastern NSW, south-eastern Queensland

Fly-specked Hardyhead (*Craterocephalus stercusmuscarum*), eastern Australia

These fish will still eat many newly hatched tadpoles and frog spawn. More will survive if you collect the spawn and keep the young tadpoles in a separate container until they are 15 mm long.

Other predators

Pets and small children can be discouraged by a surrounding bog area or dense prickly ground cover. Birds should be allowed access to drink and while some may eat a few tadpoles, this is a normal part of the balance of nature and most tadpoles will survive by hiding beneath vegetation in your pond. Tortoises should not be put into a small frog pond.

Cane Toads

If you live in a cane toad area, surround your pond by a 70cm high wall which they cannot climb but many tree frogs can. Leave 20mm holes in the bottom of the wall (e.g. as gaps between bricks) through which most ground dwelling frogs fit, but not adult cane toads. Remove any juvenile toads found in the pond. If you can't build a wall, inspect the pond every few days, in hot weather every day, and remove any cane toad spawn (very long and entangled gelatinous strands that look quite different to frog spawn).

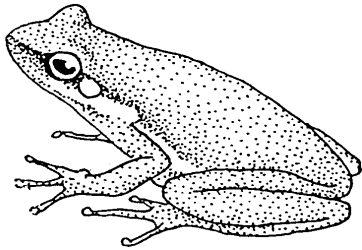
Tap Water

Tap water often contains sufficient chloramine or chlorine to kill tadpoles. Pond and aquarium shops sell water conditioner that will safely remove both chemicals. However, in an aged pond containing plants and detritus, there is no need to condition the tap water, provided your regular water changes are very small. If your pond is without a circulating pump, replace no more than 5% of the water at a time, and do this often enough to prevent algae from taking over (weekly if the pond receives much sunlight). You can give a pond with much plant material and good biological filtration a 10-20% water change with untreated tap water, provided you spray or mix it in slowly.

Periodic partial water changes are useful in removing accumulated nutrients, toxins and acid or alkaline substances. Don't change more than 30% of the water on the same day (even with conditioner), to allow tadpoles time to adjust to the new water.

Pollution

Frogs and tadpoles have permeable skins and are particularly susceptible to pesticides. Tadpoles are also affected by fertilisers and manure, especially by its ammonia component. Keep these substances well away from the pond and don't let rainwater runoff or compost heap runoff enter the pond.



The Eastern Dwarf Tree Frog (Litoria fallax) ranges from green to brown and is only 25mm long. It hunts at night among reeds and



floating plants.

Striped Marsh Frog (Limnodynastes peronii). This frog is common in gardens on the east coast. Its call is a loud "pock".

Getting the frogs and tadpoles

This is usually the least worry, because your local frogs will almost invariably find the pond before long and will lay eggs in it.

With the current outbreaks across Australia of the frog disease known as chytrid fungus, it is now more important than ever that you don't bring tadpoles or frogs in from the wild. This is also illegal in NSW and several other states. If you accept tadpoles or spawn from other gardeners, they should be from the same or an adjacent suburb or you may run the risk of infecting new areas with this frog killing disease!

Generally, there is no point in releasing frogs in a garden. If they were not raised in your pond, they have a homing drive and are unlikely to stay.

Providing the metamorphs with a head start

Newly metamorphosed froglets suffer heavy losses from drying out. In dry conditions use your lawn sprinkler in the vicinity of the compost so that the heap remains accessible to them. Also, place fruit scraps on top of the heap to attract fruit flies (if there is no problem with orchards) and cover this loosely with a sheet of plywood or similar.

Converting a goldfish pond

Remove the goldfish, drain and dry the pond to remove their spawn and fry. Arrange for sloping side(s) at surface level and ensure there are plenty of plants and moist sites around at least part of the pond. Fill, and when the water is matured, add White Cloud Mountain Minnows. Wait for your local frogs to find the pond.

Further reading

Anstis, M. (2002). Tadpoles of South Eastern Australia. New Holland Publishing, Chatswood, NSW.

Anstis, M. (2013). Tadpoles and Frogs of Australia. New Holland Publishing, Chatswood, NSW.

FrogCall - Bimonthly newsletters of the FATS Group

FrogFacts information sheets of the FATS Group. (You can look up a list of titles at www.fats.org.au.)

Frog information sheets in "Our Australian Animals" series, National Parks and Wildlife Service, P.O. Box 1967, Hurstville NSW 2220.

Robinson, M. (1994) A Field Guide to Frogs of Australia - from Port Augusta to Fraser Island, including Tasmania. Australian Museum/Reed Books, Sydney.

Wellington, R., Haering, R. and Voigt, L. (2001). Helping frogs survive - a guide for frog enthusiasts. NSW NPWS (poster).

Further information

FATS Group, P.O. Box 296, Rockdale NSW 2216. When requesting *FrogFacts*, please send a small donation for photocopying and postage.

Meetings: Every first Friday of every even month, 7:30 pm at the Australian Museum in Sydney (William St. entrance).

FATS web site (with links to other frog groups): www.fats.org.au

Frogwatch Helpline: 0419 249 728, (02) 9599 1161, (02) 9371 9129.

Frog Hygiene Protocol on NSW NPWS web site: www.npws.nsw.gov.au/wildlife/licence/frog.html

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