

creating
**GARDEN
PONDS**
for wildlife



WATER SAFETY

THE NUMBER OF ACCIDENTAL DROWNINGS IN PONDS IS VERY LOW, BUT SMALL CHILDREN ARE PARTICULARLY AT RISK.

- ▶ **Spot the dangers** - water may look safe, but it can be dangerous. Ponds covered in duckweed can look like a solid surface to a young child, for example. Think about all potential problems and keep away from danger.
- ▶ **Always supervise** young children whilst they are near a pond, especially when conducting activities such as a pond dip.
- ▶ **Remain vigilant** - People can drown as a result of accidentally falling or slipping into water. This is especially important for young children and toddlers, whose sense of danger and balance is not yet fully developed.
- ▶ **Talk to children** before dipping to make them aware of the dangers
- ▶ **Wash your hands** after putting them in a pond, especially before eating or handling food. Cover cuts and grazes with a waterproof plaster

▶ **For more information visit the RoSPA website:**
rospa.com/leisuresafety/adviceandinformation/watersafety



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Freshwater Habitats Trust is a national wildlife conservation charity that works to protect life in freshwater. Through practical conservation work, research and outreach, we apply the latest evidence to deliver real change for freshwater biodiversity. With our partners, we are building the Freshwater Network, a national network of wilder, wetter, cleaner and connected freshwater landscapes, to reverse the long decline of freshwater biodiversity.

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Amphibian and Reptile Conservation (ARC) is a UK-based wildlife charity dedicated to conserving two important groups of animals. We do this through our staff and our volunteers, by working with partners and by influencing others through advocacy, education and increasing awareness. In addition to our work in the UK, we also look to make a difference for amphibians and reptiles across Europe and internationally.

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WHY ARE PONDS IMPORTANT?

It's really important for British wildlife that gardeners do their bit for aquatic life – freshwater plants, insects, amphibians and mammals all rely on our commitment.

Alan Titchmarsh

There are around half a million ponds in the countryside of England, Wales and Scotland, providing a unique and biodiverse wildlife habitat, and playing an important role in our history and culture.

Sadly, countryside ponds are threatened by pollution, the changing climate, drainage, and development, and many are in very poor condition. However, we estimate that the nation's gardeners have created a staggering additional two to three million garden ponds. As well as providing much pleasure and enjoyment, these small waterbodies increase the habitat available for our freshwater wildlife, and may link fragmented wildlife communities.

In this booklet we aim to help gardeners make their ponds even better for wildlife, creating habitat for a wide range of aquatic plants and animals.



GARDEN POND 'SHOPPING LIST'

- ▶ Rainwater butt and downpipe conversion kit
- ▶ Liner
- ▶ Play sand or clean gravel
- ▶ Native plants
- ▶ Freshwater Habitats Trust / Amphibian and Reptile Conservation guide to creating a wildlife pond in your garden
- ▶ A love of wildlife!



CREATING GARDEN PONDS

"A garden pond is a joy and you can make one in a weekend.

Alan Titchmarsh

OUR TOP TIPS FOR CREATING THE PERFECT WILDLIFE POND:

- 1 Clean water is essential for making great wildlife ponds.** Rainwater is usually best, as tap water often has high levels of dissolved nitrogen and phosphorus. These nutrients will discourage aquatic plants and encourage growth of algae and duckweeds.
- 2 Waiting for rain?** Set up water butts to collect water from the roof of your house, a garage or an outbuilding a couple of months before you dig your pond, ready to fill it up once it is lined. You can also use this water to top up your pond during the drier summer months. Doing this means you won't have to reach for the hose.
- 3 Provide homes for aquatic creatures by making natural edges with really shallow water.** The greatest variety of plants and animals live at the very edge of the pond, often in just a couple of centimetres of water. The best wildlife ponds have very gently shelving natural edges, fringed by grasses, creating perfect homes for amphibians, and for invertebrates like dragonflies and water beetles.
- 4 Shallow ponds are great.** Unless you are keeping fish, the deepest areas need to be no more than 25-30 cm (1 foot) deep. This keeps all of the pond well oxygenated and well lit. It also means you can see to the bottom, helping you to enjoy your pond more. If you want a deeper pond, try to make sure its surface area is five to 10 times the maximum depth, otherwise there is a good chance you'll suffer from deoxygenation

problems.

5 Pond substrates. Use sand and washed gravel to provide a substrate for planting into, and places for creatures like dragonfly larvae to burrow into.

6 Let wildlife come to your pond naturally. You don't need to add 'sludge' from another pond to your pond to 'get it started'. In the spring, small animals will arrive within minutes, water beetles and dragonflies in just a couple of days, and amphibians within the first year. Even plants will establish in time, with grasses and mosses creeping in to provide good habitats for aquatic creatures.

7 What about fish? In the wild, fish are a natural part of the wildlife of some pond types. But they will usually overwhelm small garden ponds and eat smaller animals, including frog and

newt tadpoles. They can also pollute the water unless you install filters. If you want to keep fish, create some areas of really dense plant cover, encourage lots of grasses at the edges, and make areas that the fish can't get to. You could also make a separate fish pond and have the best of both worlds.

8 Trees and falling leaves. If your pond is near to bushes or trees, the leaves and twigs falling into the water will provide food, shelter and case building materials for caddis flies. They also provide shade, which will stop the pond drying out so quickly in hot summers. Don't make shady ponds too deep, as a thick layer of leaves can build up on the bottom, deoxygenating the water, and reducing its value for wildlife. If there are lot of leaves in the ponds there's no harm in removing some but you don't need to regularly 'clean out the pond'. It's not a bath!

STEP-BY-STEP GUIDE

Step 1 Locate your pond

You need to consider carefully where the best location is for a pond in your garden. Ideally, pick somewhere partially shaded with vegetation but still with plenty of sunlight during the day. Take note of overhanging vegetation that may drop leaves into the water and alter the balance of the pond, and avoid plants that may poison the water.

Step 2 Mark out the pond shape that you want

For a wildlife pond, the shape is not very important, so you can make a pond that has a 'natural wiggly shape', or is a 'formal' square or a circle - it depends on what you think looks good in your garden.

Step 3 Remove the turfs

Start to dig out the turfs but don't dig down too deep. Keep some back to secure the liner around the edge of the pond, but don't put them in the water, as they will add a blast of polluting nutrients.

Step 4 How deep? Shallow water is key for wildlife

Ideally a wildlife pond should have lots of shallow water, with wide shallow margins and gently sloping edges. If you want a pond that is a half metre or more deep it needs to be much bigger or you'll end up with very steep sides.

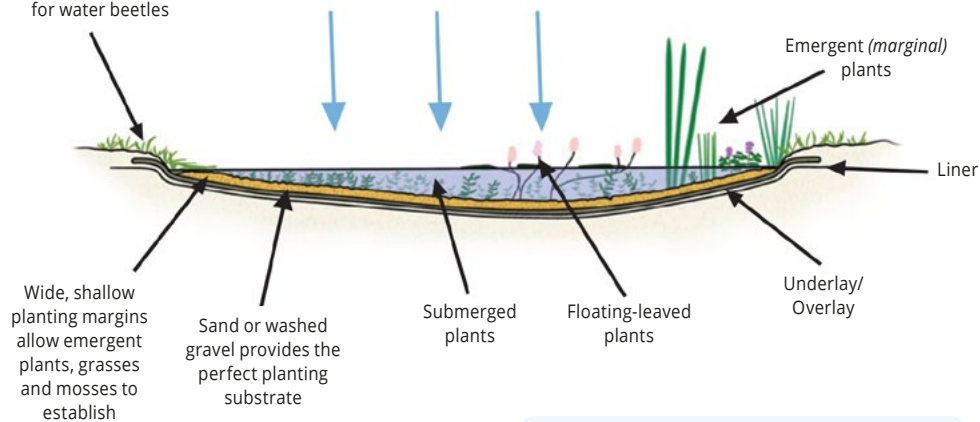
Removing the turfs can also create very steep edges to your pond, so you will need to use the spoil to re-profile the edges.

Step 4 Check the level

It's important to get the pond level, otherwise you will have bare liner showing on one side. You'll need a spirit level on a long piece of wood that will go right across the pond. If necessary, remove the turfs and bank up the lower side to level it up.

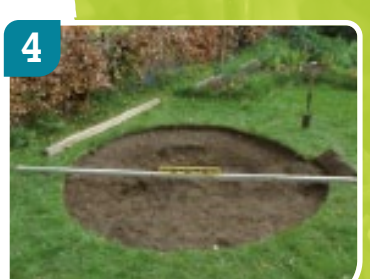
Allow grasses to trail over the edge of the pond - great habitat for water beetles

Fill your pond with rainwater



A perfect garden wildlife pond

Shallow water, a natural sandy bottom, grassy edges and lots of plants



Step 5 Laying the liner

Carefully remove stones from the bottom and sides of the hole that may puncture your liner. Then cushion it further with sand and a layer of underlay. You can also put another layer of underlay over the top of the liner, to further protect it, and provide a better substrate for aquatic plants and mosses.



Step 6 Add the water

If you are patient you can wait for the pond to fill with rainwater or you can collect rainwater in your water butts and use this. In many parts of Britain, it is better not to use tap water, which is usually high in dissolved nutrients, polluting your pond.

Once there is water in the pond you can trim back any excess liner and cover the edges using the turfs you removed earlier. You need to ensure that topsoil can't get washed back into the pond, so place turfs carefully, not sloping into the water. The grasses will soon grow down to the water covering the edges.



© Freshwater Habitats Trust

Step 7 Encourage wildlife

If you want to make the pond more natural looking, and give your plants somewhere to root, add children's play sand to your pond. This is chemically inert so there are no nutrient pollution problems. Another option is gravel – as long as it is washed thoroughly first. Don't add soil or topsoil – and try not to get mud in your pond, as if you start with a pond that looks like a mud bath, it is likely to remain polluted.



And the wildlife? Well that can start to arrive on day one with water beetles flying in!

WHICH LINER SHOULD I USE?

LINER TYPE	ADVANTAGES	CONSIDERATIONS	
Flexible pond liner	<ul style="list-style-type: none">▶ Affordable▶ Synthetic rubber polymers e.g. butyl, EPDM▶ Plastic e.g. PVC	<ul style="list-style-type: none">▶ Flexible▶ Perfect for smaller ponds, such as garden ponds▶ Rubber liners, are very durable and more flexible than PVC▶ Most rubber liners can be made to any size, to order	<ul style="list-style-type: none">▶ Advisable to use underlay protection matting▶ Sharp stones should be cleared reducing damage risk▶ Liners should not be exposed to direct sunlight▶ Harder to shape than natural materials
No liner	<ul style="list-style-type: none">▶ No cost▶ Provides a natural substrate for plants and animals▶ Can be easily shaped▶ Easy to make changes to the pond▶ Lifespan unlimited	<ul style="list-style-type: none">▶ Not many gardens have water-holding soil. If in doubt dig test holes to check this▶ Natural ponds can sometimes be affected by poor groundwater quality	
Concrete	<ul style="list-style-type: none">▶ Very robust	<ul style="list-style-type: none">▶ Expensive▶ Labour intensive▶ Requires a large quantity of concrete▶ Prone to cracks and leaks▶ Requires expensive sealant▶ Cannot be shaped as easily as natural substrates	
Puddled clay	<ul style="list-style-type: none">▶ Provides a natural substrate for plants and animals▶ Repairs and alterations possible	<ul style="list-style-type: none">▶ Requires a large amount of clay▶ Difficult to source▶ Can be expensive▶ Technically difficult to make and labour intensive▶ Liable to crack in dry conditions	
Bentonite	<ul style="list-style-type: none">▶ A natural mineral clay, sold as sodium bentonite, supplied in dry powdered form, or as part of a geosynthetic clay liner (GCL)	<ul style="list-style-type: none">▶ Can be used to boost the natural water-retaining properties of soils▶ Provides natural substrate for plants and animals▶ Repairs and alterations possible▶ Self-sealing around small punctures	<ul style="list-style-type: none">▶ Requires specialist contractors▶ Not suitable for small garden ponds▶ Results variable depending on soil type



To calculate the amount of pond liner you will need in order to create your pond, you can use this equation:

(LENGTH + 2 DEPTHS + 30 cm) BY (WIDTH + 2 DEPTHS + 30 cm)

Example

For a pond with the final dimensions of **10m long, 5m wide and 0.5m deep:**

(10 + (2 X 0.5) + 0.3) BY (5 + (2 X 0.5) + 0.3)
= 11.3m BY 6.3m

This will overestimate the amount of liner needed, but the excess will be useful for anchoring the liner around the edge of the pond, whilst still allowing for a small margin of error.

Calculating the amount of flexible liner required



PLANTING WILDLIFE PONDS

Plants are very important for a wildlife pond. As well as making your pond look beautiful, they also provide homes for your aquatic creatures. To decide which plants will be best for pond wildlife, you need to think about the world from an aquatic animal's eye-view. Almost all pond animals live in the safety of dense vegetation, and most in very shallow water - often only a few centimetres deep. The plants that provide the best habitats are those that create a diverse and complex underwater structure at the water's edge.

Low-growing grasses and marginal wetland plants that grow out in the water are excellent for this. In other parts of the pond you can include different types of plant with a range of submerged and floating stems and leaves to give the widest range of habitat types. Encourage plants to grow in different densities and ranges of water depths.



IT IS INCREDIBLY IMPORTANT TO ENSURE NATIVE SPECIES ARE PLANTED. SEE THE TABLE ON PAGE 13.

MARGINAL AND FLOATING LEAVED PLANTS

Most native marginal and floating-leaved wetland plants are very robust. They can be introduced to ponds at any time of the year, and are usually best added as small rooted plants pushed directly into the sediment. Wetland plants spread rapidly, so planting densities of two to three plants per square metre will usually give good cover within a year.

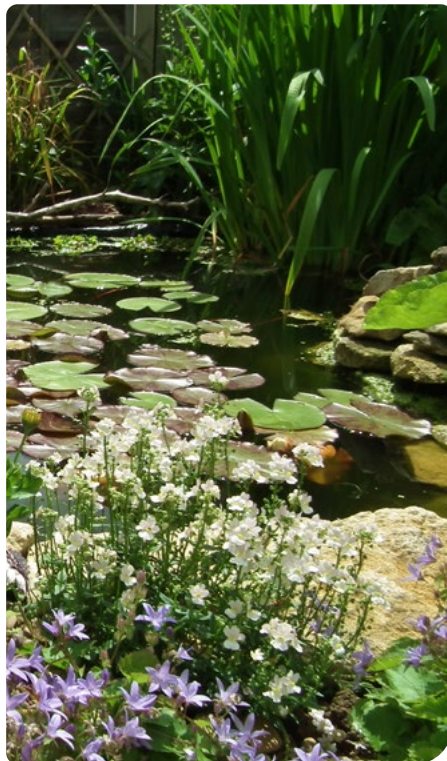
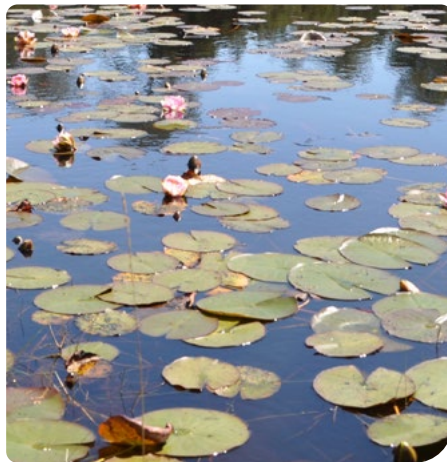
Submerged plants

To successfully establish native submerged pond plants, make sure that the pond has good water quality, low in nutrients. Unfortunately, most garden ponds have a pretty terrible mixture of non-native submerged plants. Focus on the native species in the list below.

Taking care of your plants

Plants may need managing after the first few years, especially species such as Bulrush and Yellow flag, which - if allowed to spread - will eventually dominate the pond. Thinning plants or cutting off the seed heads before they ripen will allow time and space for other species to grow, and prevent a lot of effort at a later stage.

Don't get too carried away with plant management and take out all your plants, even if they are non-native ones. You should always leave some habitat for amphibians and other pond animals, even during the winter months. Any plants removed should be carefully composted, and neither plants nor animals should ever be released into the wild.



CHOOSING PLANTS THAT ARE GOOD FOR WILDLIFE

TYPE OF PLANT	NAMES	COMMENTS
<p>Plants next to the pond</p> <ul style="list-style-type: none"> Plant terrestrial plants in wildflower areas adjacent to your pond. 	<ul style="list-style-type: none"> Cow Parsley (<i>Anthriscus sylvestris</i>) Devil's-bit Scabious (<i>Succisa pratensis</i>) Hemp Agrimony (<i>Eupatorium cannabinum</i>) Teasel (<i>Dipsacus fullonum</i>) Purple Loosestrife (<i>Lythrum salicaria</i>) Red Valerian (<i>Centranthus ruber</i>) Yarrow (<i>Achillea millefolium</i>) 	<ul style="list-style-type: none"> Create a wildflower area near your pond, providing a habitat for amphibians, and the adult forms of some aquatic insects, like hoverflies, which will nectar there. Flat-topped flowers like cow parsley are especially useful because they offer broad 'helipads' to land on.
<p>Low-growing wetland grasses</p> <ul style="list-style-type: none"> Can be planted in dry ground, or a few cm of water. 	<ul style="list-style-type: none"> Creeping Bent (<i>Agrostis stolonifera</i>) - which is often present as a lawn grass, but also likes its feet in water Small sweet-grasses (<i>Glyceria fluitans</i>) 	<ul style="list-style-type: none"> Creeping wetland grasses may look rather boring but they provide an excellent habitat for newts, water beetles and many other creatures.
<p>Marginal herbs and rushes that grow into the water</p> <ul style="list-style-type: none"> Plant in 2-10 cm depth of water. 	<ul style="list-style-type: none"> Lesser Spearwort (<i>Ranunculus flammula</i>) Marsh Pennywort (<i>Hydrocotyle vulgaris</i>) Water Forget-me-not (<i>Myosotis scorpioides</i>) Water Mint (<i>Mentha aquatica</i>) Watercress (<i>Rorippa nasturtium-aquaticum</i>) 	<ul style="list-style-type: none"> Where possible include marginal plants, like the ones listed here, that can extend out into the water and provide a submerged habitat for animals.
<p>Marginal plants with attractive flowers and architecture</p> <ul style="list-style-type: none"> Plant in 2-10 cm depth of water. 	<ul style="list-style-type: none"> Marsh Cinquefoil (<i>Potentilla palustris</i>) Marsh Woundwort (<i>Stachys palustris</i>) Marsh-marigold (<i>Caltha palustris</i>) Pendulous Sedge (<i>Carex pendula</i>) Purple Loosestrife (<i>Lythrum salicaria</i>) Ragged-robin (<i>Lychnis flos-cuculi</i>) Water Dock (<i>Rumex hydrolapathum</i>) Yellow Iris (<i>Iris pseudacorus</i>) 	<ul style="list-style-type: none"> These native species are well adapted for planting on damp banks and in marsh areas.

Tall emergents

- ▶ Plant in 2-10 cm depth of water
- ▶ Branched Bur-reed (*Sparganium erectum*)
- ▶ Bulrush (*Typha latifolia*)
- ▶ Greater Pond-sedge (*Carex riparia*)
- ▶ Hard Rush (*Juncus inflexus*)
- ▶ Lesser Reedmace (*Typha angustifolia*)
- ▶ Reed Sweet-grass (*Glyceria maxima*)
- ▶ Soft Rush (*Juncus effusus*)
- ▶ Tall marginal plants are good for wildlife but some can come to dominate your pond. To keep them in smaller ponds, cut back regularly.

Floating-leaved plants

- ▶ Plant in 15 cm-30 cm depth of water.
- ▶ Amphibious Bistort (*Persicaria amphibia*)
- ▶ Broad-leaved Pondweed (*Potamogeton natans*)
- ▶ Fringed Water-lily (*Nymphoides peltata*)
- ▶ White Water-lily (*Nymphaea alba*)
- ▶ Yellow Water-lily (*Nuphar lutea*)
- ▶ Amphibious Bistort and Broad-leaved Pondweed are easy to establish and their small leaves look appropriate in small ponds. They are also extensively used by invertebrates.

Submerged plants

- ▶ Float in deep water.
- ▶ Common Water-starwort (*Callitriche stagnalis*)
- ▶ Curled Pondweed (*Potamogeton crispus*)
- ▶ Rigid Hornwort (*Ceratophyllum demersum*)
- ▶ Spiked water-milfoil (*Myriophyllum spicatum*)
- ▶ Common Water-crowfoot (*Ranunculus aquatilis*)
- ▶ Submerged plants can be fussy and many native species fail, particularly if pond water quality is poor.
- ▶ These are some of the most tolerant.

NUISANCE PLANTS - THE ALIEN INVADERS

Do not introduce non-native species as these can be extremely invasive and harmful to the pond, and to other habitats nearby.

Their ability to spread rapidly can put whole wild pond habitats at risk. Plants to avoid are included in the table below.

REMEMBER:

THERE IS ALWAYS A NATIVE ALTERNATIVE TO USING NON-NATIVE SPECIES.

Plants to avoid

These plants are not recommended as they are invasive, non-native species that could rapidly overwhelm your pond, replacing less vigorous native plants. They can also escape into the wild, causing many problems and considerable expense to remove them.

New Zealand Pigmyweed (*Crassula helmsii*)
Parrot's-feather (*Myriophyllum aquaticum*)
Water Fern (*Azolla filiculoides*)
Floating Pennywort (*Hydrocotyle ranunculoides*)

Do not introduce non-native plants into ponds in the wider countryside.
Compost any plant materials removed.

These plants are vigorous non-native species, but will be providing habitat for your pond creatures.

Curly Waterweed (*Lagarosiphon major*)
Nuttall's Pondweed (*Elodea nuttallii*)
Canadian Pondweed (*Elodea canadensis*)

Do not introduce non-native plants into ponds in the wider countryside.
Compost any plant materials removed.

New Zealand Pigmyweed



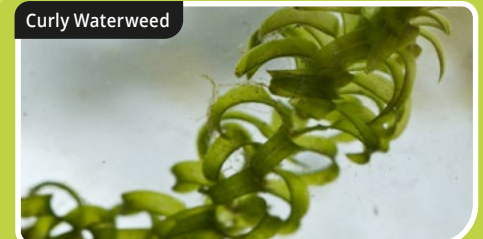
Water Fern



Parrot's-feather



Curly Waterweed



MANAGING YOUR POND

THE POND CALENDAR



SPRING

MARCH-MAY

Wildlife

Frogspawn is laid from January onwards (sometime even before Christmas), starting in the west/south west of England and Wales.

Newts (Smooth, Palmate or, for the lucky few, Great Crested) and Common Toads begin laying eggs from early Spring sometimes into summer. Newts wrap their eggs in the leaves of submerged plants.

On warmer days backswimmers, water beetles, pond skaters and lesser water boatmen will be flying to the pond.

Shrimps, water slaters, pond snails and other animals start to breed as the water warms up; Pond Olive mayflies begin to emerge.

Brightly coloured yellow and black hoverflies will visit the pond: their rat-tailed larvae which live in the water are the ultimate ugly ducklings!

Marginal and underwater plants start to grow.

Management

New plants grow quickly at this time, plant them in inert sand and gravel.

Marginal plant thinning/dividing: you can trim plants back to keep things tidy, but for wildlife don't remove more than 25% of plant cover.

Be mindful that this is a key time for amphibians, in particular newt spawn. It may be best to manage submerged vegetation in the winter.

SUMMER

JUNE-AUGUST

Wildlife

- ▶ Alderflies visit the pond to lay eggs on rushes and reeds in the late spring or early summer.
- ▶ Damselflies start to emerge: the Large Red Damselfly comes first followed by the blues. Adult frogs may be lurking to catch them.
- ▶ Frog tadpoles metamorphose and leave the pond.
- ▶ Pipistrelle Bats may be hunting over larger garden ponds.
- ▶ Dragonflies emerge later.
- ▶ Adult damselflies and dragonflies lay eggs all summer. The Brown Hawker could still laying its eggs into plants, at, or just below, the water line into autumn.
- ▶ Caddisflies skim over the water at dusk in mating swarms.

Management

- ▶ Water levels fall during the warm weather. Tadpoles, and other animals enjoy the warm shallow water. However, if it becomes too hot or dry, consider moving them to 'mini-ponds' in more shaded areas.
- ▶ If you want to top up, use rain water, and do not reach for the hose.
- ▶ Skim off unwanted duckweed: this will also help reduce nutrient levels, but don't leave it on the edge of the pond – put it on your compost heap.
- ▶ Plants can be thinned in the summer, if they're not providing essential cover for animal life. Remember to dispose of them on the compost heap.

AUTUMN

SEPTEMBER-NOVEMBER

Wildlife

- ▶ Smaller animals have finished egg-laying, some are hatching and tiny larvae are getting ready for winter.
- ▶ Frog and newt tadpoles may over-winter.
- ▶ Plants begin to die back.

Management

- ▶ Pond clearing. Gently remove some leaf litter but remember it can be a good habitat and food source for smaller animals.
- ▶ Remove non-native and other unwanted plants, and dispose of them on the compost heap.
- ▶ Avoid leaving plants on the banks near the pond as the nutrients locked up in the plants will drain back into the pond.
- ▶ To save the pond animals, wash plants and leaves out in a tub of water. If you leave them on the bank, most pond animals will die rather than finding their way back into the water.

WINTER

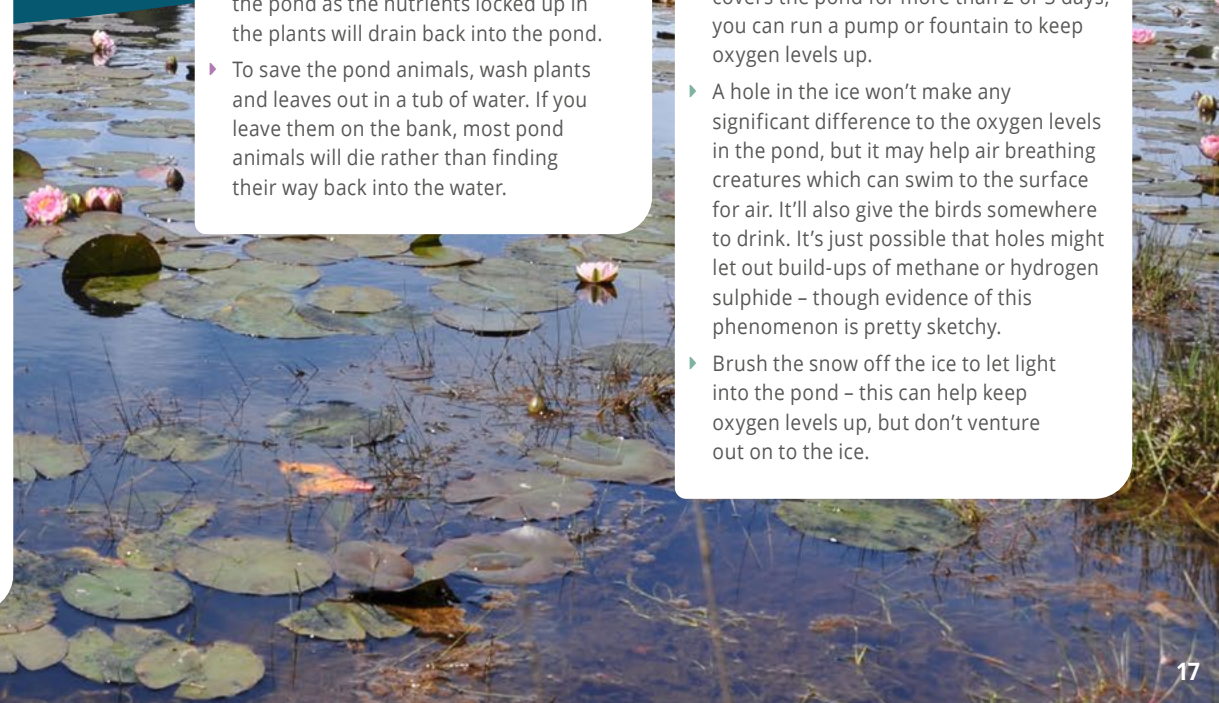
DECEMBER-FEBRUARY

Wildlife

- ▶ Under the water, life goes on, with the larvae of mayflies, dragonflies, and water beetles over-wintering under the ice. You may have hibernating frogs and sometimes newts in the water too.
- ▶ Most plants won't start growing until February, unless you have clean enough water to support 'winter-green' stoneworts.

Management

- ▶ Under ice cover, shallow ponds with plenty of underwater plants and light will remain well oxygenated.
- ▶ If you have fish or amphibians, and ice covers the pond for more than 2 or 3 days, you can run a pump or fountain to keep oxygen levels up.
- ▶ A hole in the ice won't make any significant difference to the oxygen levels in the pond, but it may help air breathing creatures which can swim to the surface for air. It'll also give the birds somewhere to drink. It's just possible that holes might let out build-ups of methane or hydrogen sulphide – though evidence of this phenomenon is pretty sketchy.
- ▶ Brush the snow off the ice to let light into the pond – this can help keep oxygen levels up, but don't venture out on to the ice.



PROBLEM SOLVING WITH OUR POND CLINIC

Help, my pond has turned green!

Green 'pea-soup' pond water is caused by tiny green algae. These, together with filamentous algae (blanket weed), and small floating-leaved species, like duckweed, are boosted by too many nutrients in the water - especially nitrate and phosphate.

New ponds or ponds that have recently been dredged often have temporary algal blooms. These are usually short-lived, and the system will settle down within a season or two, as the number of tiny zooplankton (water fleas like Daphnia) build up and eat the algae. However, older ponds which have a persistent surface cover of duckweed or green-coloured water are harder to manage.

Controlling algae and duckweed

Controlling algae and floating plants like duckweed can be difficult - particularly for larger ponds. The best solution is to reduce the levels of nutrients in the water. Other methods are less satisfactory because they only deal with the symptoms, so you'll need to repeat the treatments.

Controlling algae and duckweeds

The long term solution: PREVENTION

Reduce nutrient levels by: removing bottom sediments; preventing soil or fertiliser running into the pond; and using rain water, not tap water, to top up the pond in summer.

Natural Predators

Populations of zooplankton (such as water fleas) build up naturally during the spring and eat the algae.

Manual Clearance

Clear blanket weed using a rake, or by twisting it on a stick. Duckweeds and Water Fern can be scraped from the surface using a board or a sieve. Compost the plants away from the pond. Don't forget blanket weed is often home to newt larvae and huge numbers of microscopic animals, so do not completely clear.

Encouraging submerged plants

Submerged aquatic plants (often called oxygenators) can help soak-up the pond's nutrients. However, many native submerged plants will not grow in nutrient polluted water, so only add them when you have improved the water quality.

Shade

Shade can reduce problems with algal growth, so locate your pond in a shady spot. Larger leaved floating plants can also provide shade on the water surface.

Barley Straw

Barley straw rots down to produce a range of chemicals that kill many types of algae. It takes up to a month to become active, and it's best to add it in spring and remove it when it has turned black, about six months later. However, barley straw is not a cure, so applications will need to be ongoing.

Pond filtration systems

You can buy a wide range of pump and filter systems that will remove nutrients and algae from the water. There are a number of different types, including biological filters and ultraviolet (UV) light-based systems. These can be run alone, or if you have fish, in combination.

Pond dyes / colourants

Pond dyes work by blocking some wavelengths of light, so that algae cannot grow. The dye degrades naturally over a number of weeks and then needs to be reapplied to remain effective. Although non-toxic to animals, these dyes will also kill your other submerged pond plants.

Other treatments

There are a number of other products containing enzymes, bacteria and minerals available for reducing blanket weed and/or algae in your pond. To be effective always follow the instructions.



WHY IS MY POND WATER

BROWN?

THERE ARE TWO TYPES OF "BROWN" WATER:

- ▶ **Clear with a brown tint** – the colour of a cup of tea before you add milk;
- ▶ **Muddy brown** – like tea after you've added milk!

If your water is clear but tinted brown, it is likely to be tannins, which have leached out of leaves in the pond. If your pond has an inflow from a peaty area this will also colour your water brown.

If your water is a cloudy or muddy brown (or grey) colour, then this is usually sediment stirred-up from the pond bottom. The most common culprits are fish, but sometimes ducks and dogs cause problems. Some new ponds can remain cloudy for weeks or even months, whilst the bottom sediment settles back down again, particularly where the pond has a clay base. If your pond is new and still settling down, it is best to wait patiently. However, if the banks above the water level are bare then it's worth trying to plant them up fairly quickly, for example with a grass-mix, to prevent more sediment from washing into the pond.

WHAT TO DO IF YOUR POND DRIES OUT

People often worry when their water levels fall in summer. However, in natural ponds, a water level drop of at least 0.5 m is typical in summer. These falling water levels create one of the most biologically rich areas of a pond – 'the drawdown zone'.

You can let pond levels drop quite low before losing any animals (except fish). Most creatures, including tadpoles, will be happy in just two to five centimetres of water – especially if there are plenty of plants or algae to keep the water oxygenated.

Overheating may be a problem in shallow ponds. If the water temperatures get to over 35 °C (which is possible even when air temperatures are around 30 °C), then some animals, including tadpoles and water slaters, will die. At this stage it is worth topping-up.

If you have clean water ponds filled with rain water, and want to avoid adding unwanted nutrients and chemicals to your pond, what can you do?

- ▶ **Use water from rainwater butts** to maintain a few centimetres of water in the bottom.
- ▶ **Just let the pond dry out** – annual drying out of ponds has been a natural process for hundreds of millions of years. Many creatures are specially adapted to cope with it, and the pond will recolonise quickly.
- ▶ **Rescue your creatures** – and put them in the shade. Transfer plants and animals into buckets or tanks, making sure there is somewhere where amphibians can rest and climb out (or they can drown). Add the remaining pond water, so you can build up a good zooplankton population to help prevent algal blooms. If you have to fill the buckets with tap water, sieve out the creatures and plants when you return then to the pond (in an ordinary plastic kitchen sieve).
- ▶ **Add a little tap water** – you could add the minimal amount of tap water to keep the pond going.

I'VE GOT TO DRAIN MY GARDEN POND HOW CAN I SAVE THE WILDLIFE?

You should not fill in large ponds unless there is absolutely no other alternative. Ponds have enormous value for wildlife in urban areas - allowing populations of amphibians to thrive as well as providing important places for dragonflies and other pond invertebrates to live and breed. But you can be realistic – a 10-year-old garden pond is not the same as an ancient woodland or an ancient pond that has been around for hundreds or thousands of years. It is quite natural for small ponds to come and go in the landscape.

If the pond needs to be completely drained, you can do a number of things to help the existing inhabitants.

- 1 Let animals fly off.** Most adult water beetles and water bugs (like backswimmers) can fly. So, if you first draw the pond down to a very low level (more or less damp mud), and leave the pond for a day, many animals will fly off to find new homes, especially on a warm day.
- 2 Provide temporary accommodation.** Save plants and pond animals in temporary mini ponds. Fill the containers with the pond water, and make sure that there are plenty of aquatic plants, so the animals can find shelter and food when you transfer them. The plants may also have eggs attached, since many animals including damselflies, lay their eggs on and in plants. Adult amphibians can be removed and placed in a dark, damp area in your garden (such as a log pile).
- 3 For creatures that can't leave, when is the best time of year to drain my pond?** There's no best time of year to drain a pond, as animals at different life-cycle stages are in there all year round and, whenever you do it, some will suffer. However, if you've got a species protected under law, like the Great Crested Newt, you should avoid draining the pond whilst they are present.
 - ▶ Late summer is a good time to drain ponds for water beetles and bugs, because the adults can easily fly away in warm weather.
 - ▶ Autumn is often the best time to drain a pond with amphibians, since most young will have emerged from the pond and adults will mostly have hopped or crawled back into the surroundings anyway.
 - ▶ If you have fish, avoid draining ponds in warmer summer months when oxygen levels in the water will be lower and they will be more susceptible to stress from handling.

Note: If you have Great Crested Newts in your pond then legally you are not allowed to move them, or change their habitat, without a license. Very few garden ponds have Great Crested Newts so if they do occur in yours, think of this as a piece of good fortune!



SILTED UP PONDS AND DREDGING

You might need to dredge a pond if it is full of polluted sediments which are degrading the water quality and wildlife potential. However, dredging is not always appropriate, and sometimes you can cause greater damage by disturbing the wildlife in an old pond.

Dredging garden ponds

Small ponds or parts of pond can be cleared by hand using a net to gently skim off coarse material including leaves.

Remove semi-solid silt with buckets. For larger garden ponds you can use a sludge pump, which works like a giant vacuum cleaner sucking up mud from the bottom. Sludge pumps and pond vacuums come in a variety of sizes and are available to purchase, and sometimes hire, from your local aquatic retailer.

Spoil disposal

Before you start, you need to think about how to safely dispose of the spoil. In most cases, semi-liquid spoil may be safely pumped onto your flower beds. However, under no circumstances should it be discharged into neighbouring stream or ditch. Large quantities of muddy water will cause considerable pollution.



WHAT'S LIVING IN YOUR POND? DO THE BIG POND DIP!

/// *Make a garden pond and you'll be astonished at the wildlife you encourage - from pond skaters and water boatmen to dragonflies and damselflies, frogs, toads and newts.*

Alan Titchmarsh

WHAT YOU NEED

All you need to survey your pond is a net or sieve and a tray:

- ▶ **Nets or Sieves** – A small net or kitchen sieve is perfect for getting in amongst the plants at the edge of the pond. Don't forget to cut the hooks off the sieve, so that you can get into all the little nooks and crannies where the animals might be lurking.
- ▶ **A white tray** – A white tray is best, because it's much easier to see pond animals against a white background. You can make your own tray by sticking a sheet of white paper onto the bottom of a baking tray. Put a centimetre of water in the tray to keep the animals happy, but keep it shallow so that you can see them easily.

Where to dip

To find all the different kinds of animals in your pond, it's important that you check all the places they may be living in. Most animals live at the edge, and amongst plants, rather than in open water, so the best places to look are:

- ▶ Grasses trailing into water
- ▶ Roots of marginal plants
- ▶ Stems and branches trailing in the water
- ▶ Under the leaves of floating plants
- ▶ In the blanket weed (it's often full of life!)
- ▶ Amongst the leaves and twigs on the bottom of the pond



ANIMALS IN YOUR POND



► **Mayflies** – There are more than 50 different kinds of mayfly in Britain. About 10 of these live in ponds, but the most commonly found is the Pond Olive (*Cloeon dipterum*). Pond Olives are fast colonisers of new ponds, including ponds in gardens. To make good habitat for Pond Olive nymphs all you need is clean sand and gravel, though they also live happily on submerged plants, and on the grassy edges of ponds.



► **Caddis flies** – Astonishingly, there are more than 200 kinds of caddis fly in Britain. Most caddis larvae have a 'case', made by gluing bits of plant or sand grains together with silk to camouflage and protect themselves from predators, but not all. The underwater larvae are much easier to find than the adults, which are nocturnal. Watch out for swarms of fast darting flies with very long antennae low over the water at dusk - they will almost certainly be caddis.



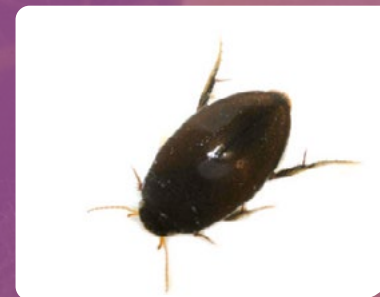
► **Alderflies** – Although for the alderfly adult life is short - just a week or two from late April to the end of June - the larvae can live underwater for several years. They are one of the predators of the pond bottom, and are happy living in silty, vegetation-rich environments. There are only three different kinds of alderfly in Britain, and the commonest, the Mud Alderfly (*Sialis lutaria*), is the one you are most likely to find in garden ponds. Of all the animals associated with good quality ponds, alderflies are the scarcest and most difficult to attract. However, the better quality the pond is, the more likely they are to come, so providing clean water, plenty of plants and natural edges will help.



► **Dragonflies** – Dragonflies are quick to colonise new ponds, and are usually present in all good wildlife ponds, feeding on other small pond animals. Fifty or so species have been recorded in Britain, but the first dragonflies to come to a new garden pond, are likely to be the Common Darter or the Broad-bodied Chaser. If you look amongst underwater plants you may also find the larvae of Emperor Dragonflies, and in shady, silty and overgrown ponds, Brown and Southern Hawker dragonflies.



► **Damselflies** – Damselflies are related to dragonflies, and ponds are an important habitat for them too. A good wildlife pond will nearly always have damselflies, and they quickly colonise new ponds. You will often see two or three common species, such as the Large Red Damselfly, the Azure Damselfly and the Blue-tailed Damselfly. Like dragonflies, damselflies are predators feeding on any small pond animals they can catch. Adult damselflies lay their eggs on aquatic plants but also on floating grasses, the stems of garden plants trailing in the water and fallen leaves – so don't pull these out if you want to encourage them.



► **Water beetles** – Water beetles are one of the most diverse groups of freshwater animals with around 250 species in Britain. You are most likely to find one of the commonest water beetles, the Common Black Diving Beetle (*Agabus bipustulatus*), but in a good wildlife pond there should be lots of different kinds of water beetle – there might be 15 or 20 different species in the best ponds. Don't forget to look out for their larvae too: these mini-monsters live on the pond bottom and look a bit like alderfly larvae but with big and powerful jaws.



► **Water bugs** – The term ‘water bugs’ is sometimes used for everything that lives under the water. But bugs are only those insects that have piercing mouthparts. There are around 70 different species of water bug. You might be able to spot: backswimmers, lesser water boatmen, water scorpions, water measurers and water stick insects in your pond. Bugs are often very good fliers – so they’re usually some of the first creatures to arrive at new garden ponds. Water bugs of one kind or another should always be present in a good quality wildlife pond. They’re not particularly sensitive to pollution, and some can live in the most unlikely of places including ponds with lots of bare, polluted, sediments, and rather polluted water.



► **Pond skaters** – You will find pond skaters on the surface of practically every pond in Britain. The common garden species are all good fliers, which can move from pond to pond easily, and live on other insects on and just under the water surface. Pond skaters all look very similar to each other, but there are actually 10 different species found on ponds, lakes and even rivers in Britain.



► **Freshwater shrimps** – In most garden ponds you will find a small introduced American species of shrimp called *Crangonyx pseudogracilis*. The more familiar freshwater river shrimp, *Gammarus pulex* does occur in ponds with inflowing streams and springs, but isn’t very happy in most garden ponds. People believe that freshwater shrimps are good indicators of whether a pond is polluted or not. Actually, this isn’t true as they are quite tolerant of all sorts of pollutants, so they can live in good ponds and bad.



► **Water Slaters** – Water slaters are relatives of the familiar garden woodlouse, and are often found living in dead leaves at the bottom of ponds. There are only two likely to be seen in Britain: the Two-spotted Water Slater (*Asellus aquaticus*) with two white spots on its head, and the slightly less common, One-spotted Water Slater (*Asellus meridianus*) which, as the name suggests, has only one spot on its head. Water slaters cannot fly and have to move to new ponds by hitching a lift. Despite this, they are one of the most common creatures found in garden ponds, in part because they are able to tolerate low oxygen levels.



► **Snails** – There are more than 40 different kinds of water snails in Britain, and you will find some in almost every pond. They vary in size when fully grown from the tiny Nautilus Ram’s-horn, which is just 2 or 3 mm across, to the Great Pond Snail which grows up to 4 cm. The more common water snails are good at getting around from place to place. Most are probably carried by birds or amphibians, or attached as eggs to bits of introduced plant. It’s sometimes said that snails are important for keeping a pond clean. However, although snails will thrive in polluted ponds, grazing on the algae, in reality they are just recycling the nutrients. The idea that they can clean up a polluted pond is a bit of myth.



► **Wiggles** – Worms, fly larvae, leeches, flatworms and other worm like creatures tend to get lumped together as together as ‘wiggles’. Many of these animals are nature’s hoovers, gobbling down rotting organic matter, or feeding on those that do. But the ‘wiggles’ are such a diverse group of animals that you can find just about every possible different way of living amongst them: from docile grazers to fierce predators.

ATTRACTING AMPHIBIANS & REPTILES

COMMON FROG

(*Rana temporaria*)

In most British gardens, the Common Frog is a staple and can be found in almost any habitat near suitable breeding ponds. Adult frogs can grow up to 9 cm long. They are usually olive-green or brown in colour, with a dark stripe (or 'mask') behind the eyes that extends towards the ear. Common Frogs can vary greatly in colour from yellow-orange, red, green, brown even to blue, with dark blotches on their backs, and dark stripes across their back legs.

Often the first amphibians to be seen in the new year, spawning from January onwards (or even earlier in the south-west), the tadpoles usually take around three to four months to metamorphose into tiny froglets, though some overwinter in this larval stage. 'Mature' frog tadpoles can be readily distinguished from Common Toad tadpoles by their faintly speckled gold/brown colouration, where toadpoles are black. Frogs can hibernate at the bottom of ponds in soft mud, so be careful if you clear your pond out during the winter.

Common Frogs really prefer garden ponds with shallower edges, as they lay spawn in these warm shallower depths. It is advisable to avoid paving slabs or any sort of concrete around pond edges as these provide little shelter and can heat up and dry out rapidly – something frogs be put off by.



COMMON TOAD

(*Bufo bufo*)

Despite its name, the Common Toad is no longer as common as it once was and is now considered an 'at risk' species. Toads can be distinguished from frogs by their drier, and more warty skin, their very striking coppery eyes, and their habit of walking, rather than hopping. Both adults and tadpoles have glands in their skin containing powerful toxins which deter predators and are unpleasant to fish. As a result, they sometimes live undisturbed in fish ponds.

Toads usually only congregate in early spring for a week or so to breed, and then move away from ponds to resume a solitary lifestyle. Toadspawn is laid in strings or ropes (not clumps), the tadpoles taking around three months to metamorphose into adults.



Common Toads are most active at night when they hunt their favourite foods, including snails, slugs, ants and spiders, and may remain in your garden for long periods over the summer. However, as temperatures drop in the autumn, they will start to look for somewhere to hibernate. You can encourage toads to stay in your garden by providing suitable hibernation structures such as a log pile, rubble piles, or man-made structures like an old flower pot.

Despite being less aquatic than Common Frogs, Common Toads really prefer a bit of depth to a pond, as they lay their spawn in deeper areas than frogs. Other things to consider are creating entrances and exits to your garden, as barriers to their migration routes can be a big factor in preventing toads from inhabiting your garden.

NEWTS

There are three native species of newt in Britain: The Great Crested Newt (*Triturus cristatus*), the Smooth Newt (*Lissotriton vulgaris*) and the Palmate Newt (*Lissotriton helveticus*). There are also a couple of introduced alien species, particularly the Alpine Newt which occur in gardens, usually as a result of (very unwise) release from aquarium enthusiasts.

Over the last 100 years, Great Crested Newts have disappeared from many sites across Britain and Europe, mainly as a result of pond loss and intensive agriculture, and they are now strictly protected under British and European law. Smooth Newts are more common, and this is the species you are most likely to encounter in your garden pond. Palmate Newts are less frequently seen, because

they prefer shallow ponds, on acid rich heathlands and woodlands. However, if you live near this type of habitat, then it is worth taking a second look, as you may be lucky enough to spot one. They will live in small garden ponds.

▶ **Great Crested Newts** Growing up to 15 cm in length, Great Crested Newts are the heavy weights of the newt world. They are dark brown or black in colour, with a 'warty' skin, and a bright orange underside with contrasting black blotches. In the spring, males develop an impressive jagged crest along their back, and a flashy white stripe along the tail.

▶ **Smooth Newts** The smaller Smooth Newt is light beige to olive brown in colour, with a yellow/ orange belly speckled with small black spots (in both sexes). Under their throats are yellow with spots. The males develop a continuous wavy crest along their back and on the top and bottom of their tail, during in the breeding season.

▶ **Palmate Newts** The Palmate Newt looks very similar to the Smooth Newt. The key differences are that they are slightly smaller, and have a pink throat often without spots. The male also has a long, bare filament at the end of his tail, and black webbing on his back toes.





During spring, male newts undertake an elaborate courtship display, with lots of extravagant tail waving. After mating, the females lay hundreds of individually wrapped eggs amongst the leaves of pond plants which hatch into larvae and metamorphose into efts, that begin to emerge from the pond in August.

All newt species come and go from ponds. The adult males arrive at their breeding ponds in the spring as soon as the weather gets milder, and then start to leave from May onwards - though some may stay until as late as October, and very rarely overwinter in the pond. By late September, most will be looking for damp sheltered places to hibernate, like tree roots, burrows, and log or rubble piles.

If you have newts in your garden then you can help them by providing some undisturbed hibernation places for them, away from cats or other predators.

Another factor that will improve the quality of your pond for newts is including submerged pond plants for them to wrap their eggs in. The best species include Water Mint (*Mentha aquatica*) and Water Forget-me-not (*Myosotis scorpioides*) for their short, broad leaves.



GRASS SNAKE

(*Natrix helvetica*)

Although found throughout England and Wales, Grass Snakes are declining nationally. Britain's longest snake, growing to a metre and sometimes more in length, Grass Snakes are usually grey-green in colour, with a distinctive yellow to orange-red and black collar around the neck, and black markings down the sides of the body. This beautiful non-venomous snake is extremely timid and will vanish rapidly if you disturb it. However, they are excellent swimmers, and like to come to garden ponds, particularly to hunt for fish and amphibians, which are favourite foods.

Grass Snakes are Britain's only egg-laying snake. The females lay around 40 off-white, leathery eggs in June or July, in warm places, including garden compost heaps. The eggs hatch into miniature versions of the adults in the late summer months. You'll probably only ever see Grass Snakes in your garden ponds if it is quite large and your garden is near to other areas of higher quality habitat than the typical suburban garden can provide.

If you see Grass Snakes in your pond, it is advisable to avoid any netting around the pond as it may trap, injure or even kill individuals.

MONITORING THE WILDLIFE: HOW TO MAKE A DIFFERENCE



Record Pool

Freshwater Habitats Trust Pondnet Spawn Survey

Each year, Freshwater Habitats Trust runs this survey to map Common Frog and Common Toad spawn across the UK. Anyone can take part by uploading records of spawn they have spotted in garden ponds or out in the countryside. Visit the Spawn Survey on the Freshwater Habitats Trust website and you'll be asked to provide some information on your sighting, including a grid reference to identify its location.

ARC & ARG UK Recordpool

The Record pool collects ad hoc data on herpetofauna (reptiles and amphibians) in the UK and to makes it available, locally and nationally, for conservation purposes. It aims to capture data that would otherwise be lost to the conservation community. Online recording forms are designed to make it quick and easy to report reptile and amphibian sightings using your computer, tablet or phone. Thousands of members of the public, enthusiasts and experts from across the UK have already recorded their sightings using the Record Pool.



ARC'S Garden Dragon Watch

Garden Dragon Watch is ARC's online garden reptile and amphibian survey. Our ponds can be bases for amphibians and reptiles - and that's important when so many places that were once good for wildlife have disappeared. Whether you're 8 or 80, become a garden herpetologist. Take time outside exploring your own pond and fill out the online form on the ARC website.

FINDING OUT MORE

Amphibian and Reptile Conservation have a series of FAQs about garden ponds on their website that can be found at arc-trust.org/pond-faqs if there are any further queries about ponds.

Williams P., Biggs J., Whitfield M., Thorne A., Bryant S., Fox G., and Nicolet P. (2010)

The Pond Book: A guide to the management and creation of ponds

2nd Edition, Freshwater Habitats Trust, Oxford

Amphibian & Reptile Conservation (2009)

Dragons in your garden

ARC Bournemouth

Baker, J., Beebee, T., Buckley, J., Gent, T., Orchard, D. (2011)

Amphibian Habitat Management Handbook *ARC Bournemouth*

Beebee, T. (1992)

Pond Life (British Natural History Series)

Whittet Books Ltd, London

Beebee, T. (1985)

Frogs and toads

Whittet Books Ltd, London

Brooks, S.J. (1997)

Field guide to the dragonflies and damselflies of Great Britain and Ireland

British Wildlife Publishing, Hook

Field Studies Council (FSC)

Freshwater Identification Guides

www.field-studies-council.org

Greenhalgh and Ovenden (2007)

Collins Pocket Guide - Freshwater Life

Collins

OTHER USEFUL ORGANISATIONS

British Dragonfly Society (BDS)
dragonflysoc.org.uk ▶

Environment Agency
environment-agency.gov.uk ▶

Royal Horticultural Society
rhs.org.uk ▶

Scottish Environment Protection Agency
sepa.org.uk ▶

RETHINK NATURE

rethinknature.co.uk ▶

A group of leading species conservation organisations combining extensive knowledge and experience to catalyse the action that species need across the four nations of the UK.

Bat Conservation Trust
bats.org.uk ▶

Buglife
buglife.org.uk ▶

Bumblebee Conservation Trust
bumblebeeconservation.org ▶

Butterfly Conservation
butterfly-conservation.org ▶

Plantlife
plantlife.org.uk ▶

RSPB
rspb.org.uk ▶