

**The Installation
And Maintenance
Of Fish Ponds
By
A.J.Hartley**

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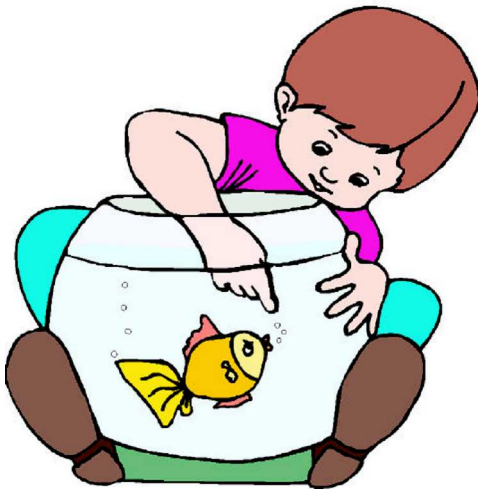
About the Author.

Since leaving school with a good general education, Alan Hartley has had an interesting and varied career. The sometime bank clerk, lifeguard, nurseryman and fish-keeper eventually entered the family business of nurserymen with a thriving garden centre.

As a diversification, Alan began keeping fish in the nursery's water system reservoir and a natural progression soon saw him selling fish. There were relatively few aquatic retail outlets and expansion came quickly, rapidly becoming an important facet of the garden centre.

The philosophy of growing all the stock plants in house was followed as far as was practical with pond plants bought in as cuttings and grown on for sale. After his parents retired, Alan studied for the City & Guilds of London Institute Certificate in Pet Store Management in order to become licensed to run his own aquatic outlet at another garden centre. Whilst there, he began writing articles for the Pets column in the local newspaper in which he advertised. The response to these many contributions to the newspaper encouraged Alan Hartley to assemble them and to edit them into book form and they now form the basis of this book, Installation And Maintenance Of Fish Ponds.

INTRODUCTION



When your children's fish have outgrown the goldfish bowl and your children are of an age to take a further interest in fish-keeping, then you may decide to buy a fish pond. Perhaps you want to add a fish pond as another dimension to your garden for your own benefit. Water features are increasingly popular for their own sake and for the variety of garden birds and other creatures they attract. You may decide to embellish your pond with a fountain and, perhaps, lights

playing on it in the Autumn. Or you may want to increase the variety of plants that you can grow in the expanded environment of wider ranging conditions that a pond offers.

Whatever your reasons, for, adding a pond, to your garden, this book contains invaluable information on, everything from self-contained fountains to large, formal Koi ponds. The Book of Fish Ponds gives a great deal of information on such essentials as pumps and how to operate and maintain them. A lot of facts are included on up-to-date filtration methods that are not to be found in many other contemporary works.

A chapter on pond care through the seasons from Spring cleaning to Winter dormancy is designed to allay common anxieties amongst novice fish-keepers.

To round off, ten common problems that face newcomers to the hobby are dealt with, together with their solutions. The guide is written from the fish-keeper's point of view in a clear and simple style that imparts all the necessary information without becoming over-technical. The content is comprehensive and is clearly illustrated with diagrams and photographs throughout. Alan Hartley draws on 15 years experience in the fish and aquatic supplies trade and from dealing with customers' probing questions.

YOUR FIRST POND



Most children are fascinated by fish and when they visit pet shops or garden centres, they pester their parents for a fish pond. If the children are very young, the appropriate first venture into fish keeping is a goldfish bowl. Then as their fish grow, a small tank is the natural progression, after which, as the children

grow older, it is safe to acquire your first pond.

Ponds can be made in a variety of materials and simple liners are generally the cheapest construction. Where children are likely to be around and about, though, a semi-rigid, preformed pond is advisable. Clearly, if the pond is poked with sticks as children are wont to do, a more durable construction won't puncture. Besides that, if the semi-rigid module is correctly installed, it will stand the weight of a child or the family dog falling in.

Large preformed ponds with long guarantees can be expensive but most manufacturers make what might be termed 'a budget range' of small ponds in a lighter weight plastic. Even though these are of thinner section, they should still last until the children grow up or the interest wanes. If keeping fish becomes a serious hobby then a bigger pond can be purchased but a few goldfish can be kept quite successfully in a 4-foot x 3-foot (1200mm x

900mm) or so pond. To keep fish in a pond, all you need is water, of course, and a little food: Expensive pumps and filtration systems are not necessary. You will, however, have to put up with the water going a shade or two of green. This can be counteracted to some extent by the addition of lots of plants: the more the better.

This is where mum can perhaps be encouraged to take an interest as some suitable plants can be quite colourful. The pond can be installed at any time of the year but fish and plants are best introduced during the spring and summer months.

When buying fish, always pick lively, healthy looking specimens as lethargic ones almost certainly have something wrong with them. After choosing your fish and getting them home safely, always float the bag that they're usually supplied in for half an hour or so before opening it and letting the fish out into the pond. This will allow them to become acclimatized to the pond temperature. After releasing the fish, don't commence feeding them for a few days and then be careful to supervise the children carefully at feeding times so that great handfuls of food are not thrown in. If the fish survive the first month after being settled in your new pond, they should live on and give many years of pleasure.

PONDS TREES AND SUNSHINE.

Most people think that ponds need shade to stop them from going green. This is true but they also need sunshine to make the plants grow, this balance might seem impossible to achieve but really is quite simple. All floating plants whether they are lilies, duckweed, fairy moss or hyacinths will provide a degree of shade as will marginal plants around the edges. For these plants to grow healthily they need plenty of sun; Indeed the most common cause of lilies not Flowering is lack of sunlight.



roots which may well damage a preformed or concrete pond and even split a liner.

The first year that a pond is installed it may need artificially shading for the protection of the fish that can get sunburn but after that sufficient surface area should be naturally shaded by the rapid growth of the plants. Never plant trees close to a pond or position a pool close to overhanging trees for shade. There are a couple of simple and important reasons for this, firstly if it is a deciduous tree such as a willow, which incidentally loves being by water and may seem a natural choice, it will have thick

Secondly trees will drop their leaves every year thus producing an annual problem that lasts for several weeks. The leaves falling onto the pond must be netted and removed regularly or else they will rot and pollute the water. Netting the pond can be a partial but unsightly solution but is never totally effective. Conifer trees next to pools are just as much of a problem. The

roots are fine and fibrous but the needles drop constantly throughout the year and are difficult to remove.



Furthermore they are a lot more poisonous than most deciduous trees as they are acidic in nature. Even flowering shrubs nearby can be a nuisance as the leaves will blow in the Autumn and in the flowering season blossom can become a headache for the pond-keeper blowing everywhere. If you really want to provide shade for your pond and it is a very formal square Koi pond with no, or few plants in it, why not build a roof over it and tile it making a feature out of it along the lines of a Japanese building. This will also keep the snow off it and help to make it a little warmer in winter that will benefit Koi.

TAKE THE PLUNGE BUY A POND

Before installing a pond you first have to decide exactly where you are going to position it. A lot of people buy a pool and then install it without considering its simple requirements that can make the difference between making it an attractive feature and an eyesore. If a waterfall is to be added to the pool then it must obviously be sited next to a suitable raised area such as a rockery. After deciding on the location and size of pool required for the site chosen then the next thing to consider is the type of pool. Basically there are 3 methods of construction available for garden pools;

1. Concrete.
2. Preformed.
3. Liner.

1. Concrete pools are expensive and a lot of hard work to make. They must be 4 to 8 inches or 10 to 20 cm thick depending on the type of soil and the strength of the concrete used. After making the pool it must be waterproofed with either a waterproof coating such as pondseal or else by rendering with a mixture containing a waterproofing additive. Finally a concrete pool must have the lime in the cement neutralized if it has been rendered, by coating it with poolglaze or by letting water stand in it for many weeks and then repeatedly changing it.

2. Preformed pools used to be made of fibreglass but as these have become more expensive they have lost favour and now the majority of pools offered for sale are made of plastic. They are available in a wide variety of shapes and sizes although they don't come as big as the fibreglass because of the lack of strength in them. Most of them are black as this has been found to reduce algae growth. The guarantee offered on plastic pools is

generally 20 years, but with some of the cheaper ones is only 10 years. This guarantee is against the sunlight deteriorating the pool and not against puncturing with a fork when breaking the ice or some other careless act. When plastic pools are punctured they can sometimes be repaired with fibreglass or a plastic repair patch but very often they have to be thrown away and replaced.

3. Liners. The main drawback with a preformed pool is the limit to the choice of shapes and sizes whereas with a liner the size and shape is virtually unlimited. Of course a big problem with liners is that they are relatively easily punctured.

The autumn is a good time to install a pool because it has all winter to settle down before spring and the introduction of fish. By the spring the pool will be teeming with insect life of one sort or another which is very good natural food for the new fish and will get them off to a good start.

INSTALLING A PREFORMED POOL.

After buying one of the many different types of pre-formed pools the installation has to be considered, Firstly a site has to be chosen and then the hole has to be dug out. The type of pool does not matter as they should all be treated in the same way. The top quality fibreglass pools are much stronger and therefore more forgiving if the hole is not quite the right shape, whereas plastic pools need a little more care in their installation but even so the more care taken over the installation of the pool the longer will be its lifespan.

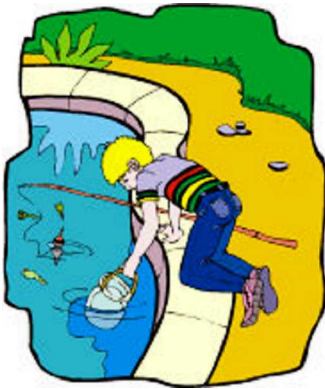
First of all the site should be leveled using a builder's spirit level and a long flat board. Then digging can commence. Mark out the shape of the hole to be dug using careful comparative measurements and a piece of string or hose pipe to get the shape right. When doing this don't forget that the bottom of the pool will go in the deepest and this is almost certainly a different shape to the top so don't dig too enthusiastically until the shape is right. Great care must be taken to ensure that the shelves on the pool are supported by firm soil because these are the weakest parts of the pool. It is worth digging the hole out roughly on day one and then having a rest and going back to it fresh on day two when you have a little more patience. Sculpt the hole as near as possible to the shape of the pool end then go over the hole carefully to remove any stones that may be present. The action of frost and water way cause soil movement and with the tremendous weight of water in a pool (A 100 gallon pool weighs 1/2 a ton when full) a stone could otherwise cause a puncture.

At this point it is advisable to check that the pool is level in both directions. After this is completed obtain a bucket full of soft sand and loosely scatter a very thin layer over the inside of the hole. Next lower the pool gently into the hole, firm it in and remove it again. Look at the hole and you will see

where the pool has touched the sand and where it needs a little more to fill in a small gap. After the gaps have been filled in repeat the process over and over again until it appears that the pool is touching the sand all over the hole. If the sand is damp even the sides can be shaped in this way but it is probably easier to fill these in afterwards by trickling the sand down the sides and firming it from above. When the pool is resting in the hole make one final check that it is level with a spirit level and then it its ready for filling.

Donø forget that if you are going to put plants in it straight away it is easier to put them in while the pool is empty and fill it afterwards. Incidentally this also means that the soil wont be disturbed so much either.

CHOOSING AND INSTALLING A FISH POND LINER.



Fish ponds can be made from many different materials but none are as versatile as a pond liner. They come either pre cut in boxes in a wide range of sizes or some retailers sell them off the roll cut to any length you require. There are 3 distinctly different types of materials that liners can be made from;

1 - PVC

2 - Polyethylene

3 - Butyl Rubber

PVC liners only carry a 5 year guarantee as a rule and can be expected, with care, to last about 10 years. Polyethylene is the same material that dustbin liners are made from but of course pool liners are much thicker. This material has the advantage over PVC that it stretches considerably so is far more difficult to puncture and is UV stabilized so it doesn't go brittle in the same way PVC will. The guarantee on this material is up to 25 years. Butyl Rubber liners also stretch and don't perish but because they have been around successfully for longer their guarantee can be up to 50 years. The length of guarantee on a pool liner is reflected in its price with PVC being the cheapest and Butyl the dearest. Butyl liners have always been

favoured by the serious enthusiast, but PVC are very popular with first time buyers.

Which ever liner you choose they have several advantages over a pre-formed pool. Firstly you can have the pool almost whatever shape and size that you want. Secondly after you have chosen the size, you choose the type of liner to suit your budget and thirdly if it does get punctured repair kits are very cheap. The main disadvantage with a liner is of course if a dog jumps in, its claws may well puncture the liner whereas a pre- formed pool will stand up to this sort of abuse.

After you have bought the liner you need to dig the hole to the size of the liner. Do remember to allow extra liner for the depth and for edging off around the pool.



To measure a hole for a liner, measure the length and breadth and then add double the depth to each measurement. Finally add another foot or 30 cm for finishing off around the sides. When actually digging the hole, shelve the sides so that it goes down in steps. The first shallow shelf will be for marginal plants and the deeper ones for lilies and lily like aquatics. Shape the hole so that it has smooth curves in it as

this will enable the liner to be installed with less creases and folds. Then when the hole is finished, line it with something soft, such as soft sand or old carpet and curtains. This will protect the liner from any stones that may work their way to the surface. Finally put your liner in the hole and carefully position it so that it overlaps all around. It should not be stretched at this stage as this will take the life out of it. Then fill the pool with water and trim and finish edging the sides. After this the pool is ready for fish and plants to be added to bring it to life.

MAKING A RAISED POOL.

A raised pool is slightly safer where young children are involved as they can't run or fall into it. For added security against children and herons it is a simple matter to build a small fence into the top of the brickwork around the pool. This will also stop cats as they won't be able to sit on the side and go fishing. With a raised pool it is very easy to stretch a net over the pool and make it secure against herons, whereas with a more informal shape a net often looks untidy.

Perhaps one of the main advantages of choosing a raised pool is that it doesn't generally involve a lot of digging and indeed on some grounds with underlying rock or pipes etc, this may be the only option. Sometimes a raised pool is chosen because it fits in with a formal garden as a rectangle or circle.



Whatever the reason for choosing a raised pool there are several points to be remembered during construction. The main point is that the walls must be solid enough to stand the water pressure and more importantly the ice pressure when it freezes in the winter. The deeper the raised wall of the pool the thicker the brickwork should be. Also a good strong mortar mix should be used. To get a decent depth on the pool it can be built up about 18 inches or 45 cm and then the middle can be dug out to whatever depth is required. In this case a liner should be used but a raised pool can be made with a pre-formed pool. With this type of installation the surround to the pool must be filled in and packed firmly with soil or sand to take up the shape. This packing will also give some insulation in the winter because it will otherwise freeze from the sides as well as from above. This happens with liner made pools and if this is the chosen method of construction then polystyrene insulation sheets (which are available from builders merchants) should be inserted between the brickwork and the liner. This will also protect the liner from the roughness of the bricks.

The top of the brickwork can be finished off with some flat coping stones that will then enable people to sit on the side. Indeed, a proper slab seat can be made by making the wall thicker in places and then placing a paving slab over it. This would also enable the construction of a small brick chamber to be made into which all the electrical connections, switches and UV system can be hidden.

Whatever the reason for choosing a raised pool it should be planned carefully because it needs a lot more thought than a sunken pool.

CONSTRUCTING A KOI POND.

A koi pond has to be as big as possible with a minimum surface area of about 50 square feet or 5 square meters that is best achieved with a liner. This will give the versatility of shape and size at a relatively low price. A large concrete pool would cost a fortune. Fibreglass pools offer an alternative that can be made on site by fibreglassing the bare hole but again this is expensive. Traditionally butyl rubber liners were used as this was the best quality material available but these days it has become very expensive and cheaper alternatives are available.

When installing the liner it is a good, idea to include a bottom drain in the pond. This will enable water to be drawn from the bottom of the pond giving better filtration and also permitting the removal of most of the sediment. The bottom drain can be connected up to a settlement tank to remove the heavier particles before going into the filter. A good filtration system is considered essential for a Koi pond and it needs to be as big as possible. Vegetable filters are starting to become popular as are ultra violet clarifiers. U.V.ø as they are commonly called are now considered a must for all serious fish enthusiasts although they have only been on the market a few years.

For any filter to be effective it has to be in operation 24 hours a day throughout the summer but in the winter it is advisable to turn it off to prevent damage to the system by freezing.

A lot of Koi enthusiasts use central heating pumps to operate their filters because they can have a very large flow rate and are relatively cheap to buy. However they are not the easiest of pumps to install and it takes a bit of know how to fit them. Large submersible pumps can be bought which are a lot easier to install but they can be quite expensive to buy, although they are becoming more efficient so the running costs are coming down. A

2000 gallon pond pump may cost about £3.00 a week to run. But do buy a pump designed for continuous running because it will last longer.

When installing the pipe-work back to the pond it is a good idea to add a Venturi. This is a simple device that sucks air into the pipe as the water flows through it causing a stream of bubbles to be blown into the pond greatly increasing oxygenation in the process.

MINIATURE PONDS.

Sometimes a tiny pond is wanted so that a water feature can be added to a patio or conservatory. Half a rainwater barrel may be considered but it is now possible to buy specially designed plastic ponds which have a shallow ledge on which plants can be stood in the water, If a fountain is required this is easily added but it will then not be possible to add a water lily because they do not like moving water. However a Water Hawthorn will be safe and this grows very much like a lily with a scented white flower and oval leaves.

A lily can be added if no fountain is installed. A miniature lily must be chosen such as the yellow Pygmae Helvola or the red Pygmae Rubra. The flowers are only the size of a 5Op but are very attractive. Most pond plants grow far to rapidly for such a small pool but Syserinchums in either blue or yellow only grow a few inches tall. Marsh Marrigolds may also be added but the plants will have to be divided regularly to keep the clump small. In such a small pool it is even possible to keep a couple of goldfish for the summer but it will have to be treated like an unfiltered fish tank. Feeding will have to be kept to a minimum and it will have to be cleaned out regularly.

Sticklebacks or perhaps Rosy minnows would be a better choice as these fish don't grow very big and it would be possible to add half a dozen. The main problem with such a small pool is the winter. Because it is likely to be raised from the ground and so small it will freeze solid if left outside in the frost. So the choice is to empty it until the next summer when winter comes or to place it somewhere frost-free such as the garage.

CREATING A BOG GARDEN.

Whether or not you have a fish pond you might like to create a bog garden. It gives you the opportunity to grow many plants well, that you might struggle to grow in your ordinary garden or indeed grow others that just wont grow in normal garden conditions at all. Perhaps a bog garden is a miss-noma as a true bog is a peat filled area covered in sphagnum moss, with acid water lying on the surface in parts and few plants other than sundews, butterworts and some course grasses. A better name to call it would be a marsh garden.

To create a marsh garden you need to dig out the soil in the designated area to a depth of about 12inches or 30 cm. Then you need some sort of liner to retain the water. This can be a proper pool liner which need not be an expensive one or it can even be a sheet of strong polythene. The liner needs to have some holes in it to allow excess water to seep away slowly. It will keep the soil very wet in all but the hottest months.

To enable easy watering in very hot dry months when the plants would suffer, a length of hose pipe with holes in it or some proper seep hose should be placed in the bottom before the soil is put back. When the plants start to wilt it is then a simple matter to connect it up to the tap and water the Marsh garden from below soil level and thus prevent spoiling the effect by constant spraying. As the soil is put back the edge of the liner can be buried. In fact an inch or two of soil over the top of the edge is a good idea because that will also help to prevent the plants from becoming too waterlogged.

For a marsh garden to be really successful it needs to have some patches that are a little dryer and others that are wetter to accommodate the different types of plants and simulate their ideal growing conditions. If you are installing a fish pond at the same time simply allow for the extra width when buying the liner and make it all in one. In this case the soil should be

mounded up in the marsh garden area and held back from seeping into the pool by a small wall. This will enable you to plant in the normal soil but allow the roots of the plants to go down into the very wet soil on top of the liner.

There are several plants that are often grown in gardens that will do very well in the dryer parts of the marsh garden. Ferns are of course one that require very damp conditions and have attractive foliage. Hostas are another plant that will grow very well in damp soil with very large decorative leaves and white flowers. Houttynias will make a splendid show of variegated foliage and astillbes will also grow in the same conditions. These have very colourful plumes of red, white or pink flowers. Primula Denticulata and polyanths will also add colour and appreciate damp soil.

Many of the so called marginal plants normally grown in fish ponds will also grow very well in wet conditions. Marsh marigolds are perhaps the most obvious ones with their yellow or white flowers. They are the first marginal plant to flower in the spring. Lysichitum or skunk lily which smells badly but has very large attractive flowers of either yellow or white is a somewhat taller plant that will also grow in marshy conditions.

Lysimachia nummularia or creeping jenny is an ideal plant for all wet conditions and spreads very quickly with its yellow flowers.

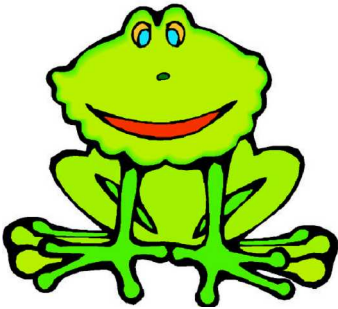
Two native plants that grow in wet conditions are *Mysotis Pallustris* or water forget me not and *Veronica Beccabunga* or brook lime. Both have small blue flowers and grow very well in ideal conditions. Mint is sometimes avoided in the garden because of its rampant habit, but, in an enclosed area, water mint or *Mentha Aquatica* maybe grown a little more safely. It is slightly different flavour to the garden variety and can be used in the kitchen just the same. Another common plant is *Glyceria* which is a variegated grass. Normally it is green and white but in winter it turns to red and green giving a little bit of colour in the colder months.

CREATING A WILDLIFE POND



People are becoming more aware of nature these days and often want to give nature a hand in their garden in the form of a wildlife pond. This will encourage frogs and newts to establish themselves in the garden which will be very good natural predators of slugs and other pests that would otherwise attack the plants. A wildlife pond is best made with a pool liner

which is a tough plastic sheet material. Just dig a hole to the required shape and line it with soft sand. Then finish by installing the liner and trimming it around the edges. Do remember to slope the sides of the hole gently so that hedgehogs and other animals can get out easily if they fall in while having a drink.



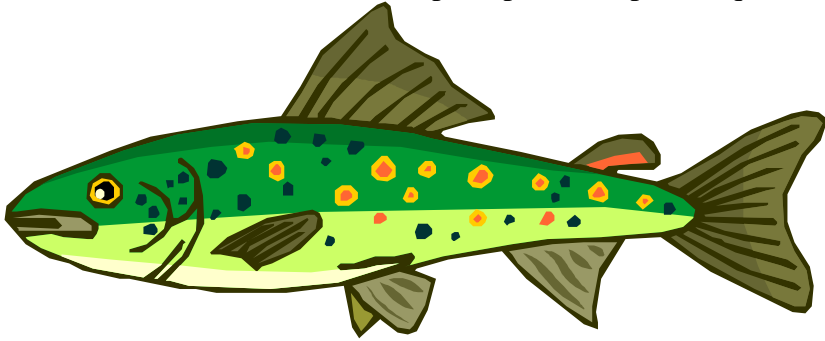
Another important point when digging the hole is to make plenty of ledges about 6 - 9 inches or 15-23 cm deep and 12 inches or 30 cm across. These will be where you grow the marginal plants which like shallow water. Lilies can be grown in the deeper parts. If you wish to keep only native species of plants and fish in it there is plenty of choice and

generally speaking these plants will be cheaper than the more ornamental varieties. Some popular varieties are;

MENTHA AQUATICA- (Water Mint) VERONICA BECCABUNGA (Brook Lime) TYPHA (Bullrush) APONEGETON (Water Hawthorn) and STRATIOTES ALLOIDES (Water Soldier) There is a European water lily, a NUPHAR commonly called Brandy Bottle, because of its strong scent. It

doesn't have a particularly exotic flower but it does have large leaves which will provide shade in the deeper water.

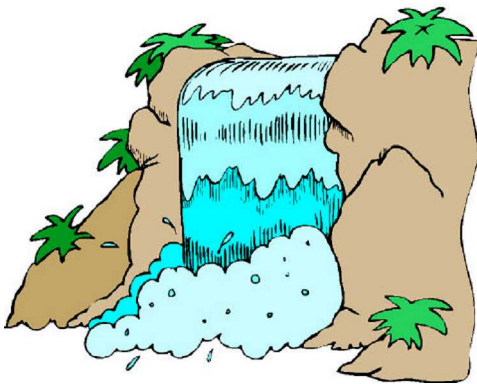
When planting pond plants it is possible to place a thick layer of soil in the bottom of the pond before filling it with water. This will enable you to plant directly into the soil and so avoid unsightly baskets. At first when filling the pond the soil will cloud the water but after a few days it will settle. However if you are going to keep fish in it they will be forever digging into the soil looking for food and the pond will never clear, so in this case it would be better to keep the plants in special aquatic baskets.



As regards native fish to put into your wildlife pond there are green tench, common carp, minnows, mirror carp and stickleback to name but a few. Although, a well planted wildlife pond will soon attract lots of natural inhabitants in the form of frogs and newts, insects such as damsel flies and dragon flies and a whole host of beetles, pond skaters and other creepy crawlies will soon arrive.

ADDING A WATERFALL TO A FISH POND.

The addition of a waterfall to a fish pond can really bring it to life with the sound of moving water. It will also attract birds who will come and bathe in it. If your garden has a natural slope on it the job is made much easier but in most cases you will have to create a raised area next to your pool in the shape of a rockery. The soil mound can be held in place by a small retaining wall or else just sloped with rocks placed on it for effect.



The soil to make it can be bought as topsoil or else you may have the soil already from the installation of the pool. A small header pool at the top of the waterfall will reduce the amount of soil needed. However you make the raised area, the soil must be well compacted before the installation of the waterfall or else as it settles over time the water fall will move and

go out of alignment.

There are basically 3 ways of making a waterfall;

1. Concrete
2. Pre-formed
3. Liner

If you decide on concrete and some large natural rocks for effect, don't be tempted to place the rocks, and cement between them as it is almost

impossible to get a good seal. Furthermore the rocks themselves may be porous and result in constant water loss.

Concrete must also be treated to make it waterproof and when it is set it must be treated to neutralize the lime in the cement or else it may kill the fish in the pond. For a customized waterfall a liner is probably a better bet, but do use a good quality one as it will be exposed to the effects of sunlight much more than a pool would. Better still would be to use the liner double thickness. If rocks are to be placed on it do so very carefully as the weight and roughness of them may puncture the liner. Also make sure that the rocks are not poisonous such as soft limestone that will dissolve or green rocks which may have copper in them. Gravel can be placed in the waterfall as well but it must be washed first to wash away any impurities.



Where the drop is formed in the waterfall it is best to place a piece of slate or wood under the liners edge to give a flat clean drop. This is because if it is not flat and forms a trough then it needs much more water falling over it to make a sheet of water and give a good effect. On the actual horizontal run of the waterfall, little shallow pools can be formed which all add to the appearance and also marginal plants

can be placed in them.

If you are making a proper stream then it wants to be as level as possible except for the drops because otherwise it will need a very big pump to keep it full of water.

Pre-formed waterfalls are perhaps the simplest and easiest option as they have nice flat lips and troughs already shaped and you just have to line them up and put them on the compacted soil. They used to be made of fibreglass but as this became more and more expensive the manufacturers switched over to plastic.

A good selection should be available from most aquatic retailers costing between £10.00 and £25.00 although some heavy duty ones cost a lot more.

When siting the waterfall make sure that the drop is no more than 4-6 inches or 15 cm as any more will result in water loss on all but the calmest of days. Also make sure that the water does not run around the lip of the waterfall as this can result in water loss from the pool as well.

If you have a filter on your pool this can be situated at the top of the waterfall so that it feeds the waterfall. This means that you only need one pump to do the two jobs. With a bit of thought the filter can be hidden by large plants so that it need not look unsightly. When choosing a pump, don't plump for the cheapest you can find as this invariably leads to disappointment.

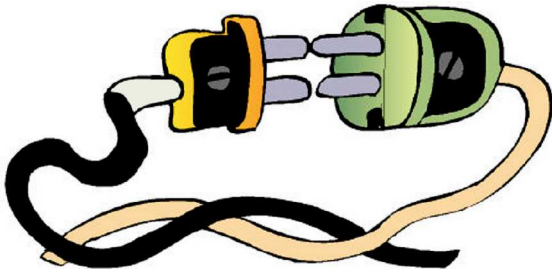
Most pumps have model numbers on them which relate to the number of gallons they pump at a 3 foot or 1 meter head and the bigger they are the more expensive they will be, although some retailers will discount them. Be careful when comparing pumps because some are numbered in litres per hour instead of gallons and this makes them look much bigger than they are. A Waterfall needs a bigger pump than a fountain and the higher the waterfall is the bigger the pump needs to be. Home made waterfalls need a bigger pump than pre-formed ones.

When deciding on a pump measure the height from the water in the pool to the very top of the waterfall and allow 2-300 gallons or 1300 litres at that height, more if not pre-formed. If you are making a stream effect then the bigger the better and of course if you are having a fountain as well you will need a bigger pump.

If in doubt when buying a pump always ask advice from your local aquatic retailer and don't think that he is just trying to sell you a bigger pump for the extra money because he has probably got a lot of experience with pumps.

ELECTRICITY AND THE FISH POND

A fish pond can be brought to life by the sensible use of electrical appliances. If in any doubt about how to install an electrical supply down to the pond then consult an electrician but the average DIY man can, with a bit of thought, do the job safely enough.



If the pond is very close to the house or a garage then the leads on the appliances might reach but if not there are various ways that the

problems can be overcome. First of all the main supply to the pond should be properly earthed, screened cable buried according to health and safety specifications. Once this is done the rest is relatively simple. The supply should be connected to a proper weather proof multi switch box if more than one thing is to be connected or failing this to a socket in a little brick box with a slab for a lid. This can be made into a seat or trailing plants can be stood on it to hide it. Whenever a single connection is to be made a proper waterproof connector should be used. Some are permanent and some are a plug and socket. If the latter type is used, it facilitates the disconnection and removal of the pump for winter servicing and the connection of a pool heater or other item.

At the house end of the circuit an RCD or power breaker of some sort should be used for extra safety just in case of accidents. The addition of a pump to a pond enables you to have a fountain, a concrete ornament spouting water or a waterfall. All of these are very good at increasing the oxygen levels of the pond that will benefit your fish and make them more

resistant to problems. Also of course the sound of moving water can be very restful and pleasing on a hot summers day.

There are several type of pump to consider. Firstly there are non-submersible pumps such as central heating pumps. These are sometimes favored by the enthusiast because they are very cheap to buy. However they are not easy to install. Most are not waterproof so need putting in a waterproof box. Also they do not create a vacuum so they must be primed. This means filling the pipe and pump with water every time you turn it on. Alternatively a foot valve or non-return valve can be installed but these are expensive. Another way is to connect a pipe to the side of the pond below water level and have the pump sited below ground so that the water continuously runs from the pool to the pump under gravity to flood the pump and prime it.

All this persuades most people to buy a submersible pump which sits in the pool and is just plugged in.

Transformer operated low voltage pumps are-available for added safety but these are more expensive than ordinary submersible pumps and the transformer has to be sited close to the pond in a cool dry place (not a greenhouse) that puts a lot of people off. Most popular are by far, the ordinary mains submersible pumps. They are available in a range of sizes to suit every need from a little £20 pump operating a modest fountain to very large expensive pumps capable of pumping thousands of gallons an hour.

When buying a pump it is important to consider exactly what you want the pump to do because buying a little one to save money is often wasteful in the long term because a bigger one sometimes has to be bought later when more things are added to the pond. A pump enables the addition of a biological filter which if set up correctly will ensure crystal clear healthy water. To go with the filter a UV system can be added.

Another thing which can be added to the fish pond to bring it to life is coloured lights. These all operate from a transformer for safety and can be

quite expensive but are just the thing to bring your pond to life late at night if you are a night owl. Some people like to install a big air pump near to the pond to oxygenate the water. Also of course in the winter it will help to keep a small patch free of ice by the action of the bubbles. The final electrical appliance which is useful in a fish pond is a pool heater. These are fairly inexpensive to run and don't heat the pool up but what they do is to create a slightly warmer patch of water on a cold winters night and keep that small patch free of ice. This is enough to allow the harmful gasses out of the pond and life giving air into it.

BRIGHT COLOURFUL PONDS.

When you have a late night barbecue and all your friends come around to admire your patio lights why not bring life to your pond at night as well by installing pond lights. Adding light to your pond can be done in one of two ways. Either, by an external spotlight, or, by actually installing lights in the water. External spotlights can be mounted in a high place such as a tree to shine down into the water or on the ground to shine up on to the fountain. Lights placed in the pond need careful installation as the waterproof seal must remain intact to prevent short circuiting. As another safety feature all garden and pond lights should operate off a transformer which give out low voltage so that if anything goes wrong there isn't enough power to cause any harm.

The only drawback to low voltage systems is that the transformer has to be kept near the lights and kept cool and dry. A nearby garage or shed is ideal but not a greenhouse. This is because the transformer may overheat. Another alternative is to build a small brick box to house the transformer and place a slab over the top to keep it dry and make a seat out of it.

Pond lights come as sets of 2 or 3 or singularly and in a wide range of colours. Some are weighted and others have to be weighted to stop them floating. This can be done quite simply by drilling a hole in a house brick and screwing the light to the brick by the use of a small bracket. Do use a brick and not a concrete block as the lime in the concrete may poison the pond.

Well placed lighting on a fish pond can have a quite magical effect especially on a sparkling fountain. Lit properly the fish pond will become the focal point of your garden in the evening and the envy of all your friends.

THE DANGERS OF A FISH POND

Fish ponds attract animals of all kinds, some to drink from it and some such as cats are attracted by the fish. If the sides are vertical most will have difficulty in getting out so the sides should be shelved or better still sloped. Hedgehogs are one of the biggest victims of fish ponds because the more difficulty they have in getting out the longer they are in the water and more likely they are to get hypothermia. So special care should be taken in construction of the pond if you think you have hedgehogs in your garden.



Perhaps the most serious danger is to very young children. The water is a great fascination to them but sadly every year a small number are reported drowned in fish ponds. It is no good making the pond only a few inches deep for plants and frogs because a child can drown in 6 inches or 15 cm of water. You may think that your children are grown up but there are always grandchildren or the children of friends and neighbors. A small fence around the pond may give a little peace of mind or

a raised pond may be the answer. But remember a raised pond must be a little deeper than the traditional sunken one because it will freeze harder and deeper. Insulation material around the sides may help matters.

A far safer solution is to install a pond the size of a bucket and make a feature out of the waterfall. The tiny pond will be big enough to hold the pump for the waterfall but will be so small as not to prove much of a risk. Then when the child is a little older a bigger pool can be added to the set up.

If you want the sound of running water but are worried about the dangers of a pool then there are other features available such as self contained fountains. These have the pump and water reservoir built into the fountain and don't need a pool at all. They can be very expensive but other features such as millstones and water barrels are available. You can even make your own water feature using a small liner, several bags of cobbles and a small pump. You dig a shallow impression out with a bucket sized hole in the middle and place the liner in it. Then put your pump in the deeper hole and fill the whole thing with cobbles. The 'pool' will only hold a couple of buckets of water and as it's filled with cobbles will be absolutely safe but will enable you to have a fountain. Apart from the risks of drowning the next serious risk from a fish pond is that of electrocution.



Water and electricity are a recipe for disaster so extreme care must be taken when installing electrical appliances. Low voltage pumps and lights are available which are very safe but unfortunately there is only a poor selection of low voltage pumps. If a dog chews through a cable or it perishes then there will be a direct short to earth and the only thing that will save you is an earth leakage trip switch which will cut the power. Most modern houses have them but it is always safer to check and they don't cost a lot to install.

Another point to be aware of is that proper waterproof connectors should always be used. They are a little more expensive but are far safer in damp conditions outside.



The cable to the pump should be buried 2 foot or 60 cm down in conduit to prevent accidentally cutting it with a spade or fork. if in doubt about installing electricity in the garden then always consult an electrician. There are other minor dangers associated with having a fish pond.

When treating fish with medicines it is often a good idea to wear rubber gloves because a lot of them will stain your hands blue if you get it on them and one or two are actually poisonous in their concentrated form straight from the bottle. Leeches are another reason for wearing gloves when dealing with the fish pond. They will do no great harm if you get them on you but can be difficult to get off. A simple treatment can be bought for ridding your pond of them.

There are a couple of diseases that can be contracted from having a fish pond, one of which is very serious but thankfully quite rare. These diseases that can be passed on from animals to humans are called Zoo-noses. The most serious one is Wiels disease that is passed from rats living in and around water. Medical treatment is needed urgently if this rare disease is caught. One disease that can be caught from fish is coldwater T B. This is very rare and not serious in the least as all it produces on humans is a rash like infection on the hands or arms which will be readily treated with antibiotics. There is one bizarre case of a patient developing an infection on his arm and his doctor told him it was fin rot which he caught off his infected fish. But probably this was simply a case of his doctor having a little joke at the patients expense. All of the afore mentioned dangers can be avoided with a little care and a little advice from your local aquatic store may be helpful.



CHOOSING A PUMP

There are many things to consider before buying a pump. You have to have a firm idea of what you want the pump to do immediately and also what you might want it to do in the near future. It is no good buying a small pump for a fountain if next year you are going to add a biological filter and waterfall.

Pumps come in a wide range of sizes from tiny ones costing about £20 that are capable of producing a 12 inch or 30 cm high fountain up to giant ones costing hundreds of pounds, able to produce massive waterfalls. To put it simply the more you want the pump to do the bigger pump you will need and it's no good buying a pump because it is cheap. You have to ask yourself why it is cheap, it may be because it is very small or because it is a discontinued model. Either way you may be disappointed.

Some pumps are more economical to run than others, such as central heating pumps, but these can be difficult to install as they need priming to run every time they are turned off. If safety is a concern then low voltage pumps are available but again these can be more difficult to install as the transformer is not usually waterproof, so a special chamber has to be built to house it near the pond. However, with R.C.D. or earth leakage trip switches fitted to most houses these days, it is usually considered safe to use mains voltage pumps and these are by far the most popular types sold.

When comparing pumps the manufactures usually help by numbering their models with their performance in gallons at a standard 3 foot or 1 meter head or sometimes now we are going metric in litres per hour. Hence a model 300 will pump 300 gallons per hour and a model 2000 will, unless it is a very expensive model, pump 2000 litres that is about 450 gallons per hour. Some simple guidelines about choosing a pump are as follows: Up to 200 GPH or 900 liters the pump should be considered for fountains only. 200 to 500 GPH can be used for a fountain and waterfall depending upon the height of the waterfall and the construction. Models above 500 GPH or

2250 liters per hour can be used for high waterfalls or large filtration systems.

Running costs of pumps increase with the size of the model concerned but very roughly in continuous use it is about 1 1/2 pence per watt per week. So a 70 watt model will, if run for 24 hours a day, cost about £1 a week to run. When you consider the rest of the money you have spent on your hobby of fish keeping , this cost is a small price to pay for the pleasures that a pump can bring and the life that it can create in your garden.

SOLAR POWERED PUMPS

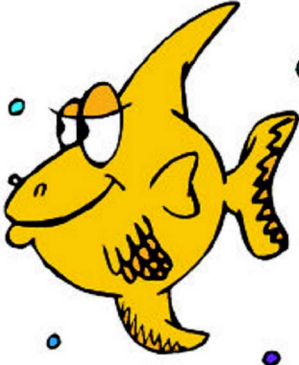
As with all modern technological applications, advancements are being made with pond pumps. Firstly it was the newly designed impeller and then it was the ceramic drive shafts.

The latest advancement concerns the power source for pond pumps. Until now pumps have always been powered by mains electricity whether it was low voltage off a transformer or full 240 volt mains, but the latest development uses solar power to drive the pump. Admittedly it is only low power, operating a fountain about 1 ½ feet or 45 cm in height on a bright sunny day but you can be sure that in years to come that the power rating will go up.

The solar powered pump costs about as much as a small to medium sized pump but obviously it saves a fortune on cables that you would normally have to run across your garden to your pond. Also of course there are no running costs that over the years can mount up to a lot of money.

The pump itself is as unconventional as its power source looking more like an upside down dome in shape than the usual cylindrical shape of most pumps. The inlet to the pump is underneath where there is a fairly large foam pre-filter to stop debris from being sucked up into the pump. This will of course need cleaning regularly to keep the pump operating at peak efficiency. The photo-electric cell covers the whole top surface of the circular pump with the fountain nozzle in the middle. The cell has to be kept clean and free from leaves which otherwise might mar its performance as it floats around the pool. This pump has much going for it as regards suitability for small pools and only has a couple of drawbacks. The first is its low power as it will not yet drive a waterfall, but this may come in time. The other small point to be wary of is that on no account should the pump be left in the pool for winter. Ice will form and as the pump floats on the surface will, damage the pump so it should always be removed and stored somewhere dry and dark until the Spring.

LOOKING AFTER YOUR PUMP



There are quite a few simple actions that you can take to extend the life of your pond pump. After all it is an expensive item to purchase and you don't want to replace it any sooner than you have to. The length of the guarantee seems to get longer on new models as the years go by but with neglect they still have a limited life.

The main problem that occurs with pumps is that they burn out. If this is due to the bearing becoming so worn that it ceases to turn allowing the pump to overheat there is little you can do. But there are many other causes which can make the pump overheat, indeed it is such a common problem that some pumps have a thermal cut out switch to protect them built into the body of the pump. Even so it is advisable to make sure that if the pump is turned on then water is flowing at all times.

The First thing to check daily is that the Fountain is working. Fountain heads are notorious for getting blocked up with fine particles of muck which have been sucked up by the pump. A little poke with some fine wire will easily cure a blocked fountain.

A good filter on the inlet side of the pump will help alleviate this problem to some extent and large foam blocks can be added to the inlet of some pumps to assist in this matter. Even so the inlet filter must also be cleaned regularly in a bucket of fresh water. You will be surprised at how much muck this will hold.

Regular maintenance of the pump itself is also important. This is easily done on most modern pumps because they come apart with a simple twist of the wrist but do be careful.

If it is a modern design with ceramic shaft extreme care must be used because the ceramic, whilst being very hard and durable, is very fragile and will break much more easily than a pencil. A little too much pressure when re-assembling at the wrong time can easily snap the shaft in some smaller pumps.

Often when a pump jams it is a little bit of fine grit got in to it and a thorough clean will cure the problem like magic.

The older type steel shafted pumps have their own problem when removed from the water and that is that they can be prone to rusting and seizing up. So in all cases it is advisable to leave the pump in the pool for winter. However do make sure that it is well below the ice level because if ice freezes inside it, it will shatter the case of the pump.

When winter comes it is best to clean the pump thoroughly because if left stationary any algae in it might solidify and jam the pump in the spring when it is turned on again. If you want to leave it running all winter, which is not to be recommended, then make sure that the filter box does not freeze up or else your pump will empty the pool. Also make sure that none of the pipe work freezes because if it does then your pump will burn out.

Another problem that can sometimes occur with pumps is that they start leaking water around the cable inlet and then they short out. This is invariably due to the pump being lifted but of the water by the cable. Never do this. Some pumps have a handle to prevent this but if your pump does not then lift the pump out by firmly holding the main body of the pump.

Cables sometimes perish due to the action of the water and sunlight. This is especially true of rubber cables that are attached to certain makes of pump. If this happens it may be possible to reposition the pump nearer to the side of the pool so that more cable can be attached to it using a special connector. Don't try to join it under water. Some cable connectors claim to be waterproof but they eventually leak due to incorrect installation. If you are lucky it may be possible to send your pump back to the manufacturer to have a new cable fitted, but this can only be done with certain makes.

POND PIPEWORK.

When using pipe-work in connection with the pond it is important to use the right sort for the job. Many stone ornaments use copper or lead pipes in them but under no circumstances should these be used in the pool generally as both metals are poisonous. Rubber or plastic pipes should always be used. As rubber perishes in time plastic is usually the preferred material. With 1/2 or 3/4 inch pipes they do not need to be reinforced but for 1 inch or 1 1/2 inch the pipe will kink very easily round corners unless reinforced or rigid pipes are used.

Most modern pumps will accommodate a variety of sizes of hose pipe with 1/2, 3/4 and 1 inch being the most common. Usually stone fountains use 1/2 inch pipe although some use 3/8 inch which will fit onto the fountain adapter of most pumps. Where a larger flow is required such as for a filter or a waterfall 3/4 or 1 inch should be used.

For a very large flow such as for a stream effect then 1 1/2 inch should be used in conjunction with a very large pump.

Again where pipe-work is attached to the inlet of the pump to suck water up out of the pool a large pipe should always be used so as to allow the best flow into the pump. Rigid pipes are seldom used except in connection with filters. Here they are often used to return water back to the pool. A large pipe is needed because the water is usually not under any pressure and travels along the pipe under the influence of gravity only.

All plastic pipes should be bought from reputable dealers because the plastic should be of 'Food Quality' so that it has no extractable cyanide compounds in it as do some of the cheaper garden hose-pipes.

INSTALLING A FOUNTAIN

The sound of moving water and the sun sparkling on water spray brings a fish pond to life. A pump is required but when you have this installed there are various options open to you with regards a fountain. Stone ornaments can be bought, some of which stand in the pond and some stand on the side spouting a column of water back into the pool. Some are fitted with a spray head which can be changed, giving a pattern of fine droplets falling onto the ponds surface. The ornaments can be animals, fish, birds, frogs or cherubs, some are made of concrete and some are made of a strong durable plastic and they come in a wide range of finishes.

If you don't fancy an artificial ornament you can settle for the fountain that comes with most pumps. Interchangeable heads are available to give a variety of patterns and only cost a few pounds. There are more exotic fountain heads sold which create a bell or tulip shape of water spray. These are ideal in a small water feature or pond as the wind can't catch them so easily and empty the pond on a windy day.

It is usually necessary to stand the pump on some bricks in the pool so that the fountain head is above the water level but in shallow pools at least it is possible to buy fountain extensions.

Not only is a fountain aesthetically pleasing, but, the water movement oxygenates the water, pumping air into it on a hot summers day when the fish might otherwise be gasping at the surface. The fountain can be left on if turned down to a safe level but do bear in mind that the small holes of most fountain jets block up easily and constantly need cleaning with a piece of fine wire to keep them free.

In the winter it is usually best to turn off the fountain to prevent it freezing and damaging the pump. This facilitates the removal of the pump and enables you to give it an annual service and clean that can easily be done with most pumps. Then it can be stored away until the spring comes again and the pond starts with new activity and life returning to the pool.

SELF-CONTAINED FOUNTAINS



If you have young children you may come to the conclusion that you can't have a water feature in your garden. This is not true as it is possible to buy a self-contained fountain. This can be a large stone ornament with a fountain attached and its own water reservoir. These are entirely safe as the water reservoir in the fountain may be less than a bucketful so there is no risk of drowning. This type of fountain costs from about £200 upwards depending on the nature and the size of the fountain, some feature children and others mermaids. The problem with these fountains is often that on a windy day the water will be blown out of the fountain so that the ornament needs constant topping up or else the pump will burn out.

Another type of self-contained fountain is wall mounted. This is again an ornament with its own water supply but it is secured firmly to a wall where it is out of the wind and so should loose less water. Some of these ornaments are made out of plastic and are a little more modest in their price. Nowadays it is also possible to buy small stone fountains that are small enough to go in the house on a sideboard or table.

Millstones are used as another popular self-contained water feature. With these the millstone is place over a waterproof container with a pump in and the fountain (often a miniature geyser) spouts up through the middle. One way of making an inexpensive water feature is to have a small hole lined with a pond liner and filled with cobbles. The pump is buried in the middle and a few buckets of water added.

With this, the fountain sprays onto the cobbles giving a child proof water feature. With water features the pump is often an integral part and if it malfunctions obtaining a replacement can sometimes be a problem especially with foreign made fountains. So do check before buying a fountain that replacement pumps are available.

GREEN PONDS

There are various types of algae. There is one that turns some aquariums red and another type of algae we are all familiar with which most people don't realize is algae and this is seaweed. Another type of algae that comes in large strands is blanketweed. This takes fine particles of silica or sand out of the water making it very tough. Most fish can't eat it but grass carp are said to be able to tackle it. Most fish ponds get it at some time. It may be on bought plants or brought by ducks or other birds on their feet.

Blanketweed is best described as looking like green candy floss. In the water it looks a lot but when you get it out it looks a very small amount. It will choke lilies and oxygenators and also block pond pumps. You can remove some of it by twisting a bamboo cane in it or you can buy a special tool for the job. The only way to deal with it permanently is to poison it with a selective weedkiller. This is not as dangerous as it sounds to fish and other life if you follow the instructions carefully.

Algae magnets are another way of reducing the problem. They consist of a large permanent magnet that ionises the water as it passes through it. This prevents the blanketweed from growing or so the theory goes.

The type of algae which all fish pond owners are familiar with is the single celled variety which causes green water. In the Winter when it is cold and light intensities are low with shortened daylight hours the algae like most green plants does not grow so the fish pond becomes clear.

But as Spring comes and everything comes to life the pond often goes green. This is due to the availability of minerals in the water from decaying vegetation and fish droppings etc. There are several ways to clear green ponds. The most healthy and natural way to do it is to cut down on the fish food and put some more plants in the pond. Oxygenators are available in several varieties and are quick growing so they are one of the best plants. When the weather is warmer water hyacinths, lettuce and chestnuts are very useful. Duckweed and fairy moss will help clear the pond but can

become a nuisance in their own right as they will cover the whole pond in a few weeks.

A properly installed biological filter is a very good solution to clearing green water. This works by physically removing the particles of muck floating in the water with foam sheets or filter brushes. Also it has a media in it which has a large surface area for bacteria to live on. These nitrifying bacteria feed off the chemicals in the water thereby removing the food that would have caused the algae to grow.

The addition of an Ultra Violet system will give clear water as this sterilizes the water when it passes through it killing the algae. They are very good but don't remove the cause of the problem that is free minerals so it is recommend that a biological filter is used as well. There are many chemicals called algicides that kill the algae and give clear water but the effect is temporary and you have to repeatedly dose the pond every few weeks.

One new method of clearing green water in a pond is by using a small quantity of Barley Straw. You can buy this in small packets mail order but other types of straw have a certain amount of success.

The straw is tied in a bundle and immersed in the pond where it slowly decays. Research has not shown conclusively whether it is the bacteria on the rotting straw or a chemical that is called Hydrogen Per-oxide that is released from it, into the water, that clears the pond, but it will clear it for many weeks until it has become too rotten and then it has to be removed otherwise it will rot further and pollute the pond.

FISH POND FILTERS

There are many sorts of filters sold for fish ponds and one or two more types that you can make yourself. There are small pre-filters which are just foam blocks and fit onto the inlet of the pump. A second sort is a small inline filter which is a plastic container sealed by a rubber ring containing a foam block. Some small filters are built into a waterfall that hides them completely. However with all of the small filters they are too small to do any real good and can only help the problem of green water a little bit in all but the smallest of pools. One sort of small filter that does claim wonderful things contains scinted glass. They are overrated and will only really work if the pond is already fairly clean.

One filter which can work efficiently if set up right and is often used in Japan is an under gravel filter. This means having a deep layer of gravel in the bottom of your pond and a network of pipes embedded in it with holes drilled in connected to your pump. The water is then drawn through the layer of gravel which filters it.

The drawback with this system is that it is a major job to clean it out when it becomes overloaded with dirt. The most widely used successful filter is a filter box which can cost from about £20 treating 500 gallons, to very big ones treating many 1000s of gallons and costing hundreds of pound.

Most box filters sold commercially contain reticulated foam or filter brushes and some sort of plastic medium. There are usually 2 or 3 layers of foam that is graded from course to fine. The foam is a special sort that does not contain cyanide compounds that are extractible in water and highly poisonous. The foam is shaped like an egg box or reticulated to give it a larger surface area. Filter brushes are a bit like a chimney sweeps brush and like the foam will filter out the larger particles that would otherwise pass through the filter. The plastic in the bottom comes in many shapes from different manufacturerø but all of it does the same job. The water

passes through it easily so it does not get blocked but it has a large surface area on which the nitrifying bacteria can live.

The main advantage of the modern filters over the early gravel ones, is that they are very easy to clean.

You can of course make your own filter using a cold water header tank and buy the filter medium to go in it from your local aquatic retailer. Foam filter pads, filter brushes and various forms of plastic media are readily available as are other sorts of media. Gravel, Canterbury spa chippings and Lytag are often sold for filters but Zeolite is sometimes available and much better. Zeolite is a naturally occurring mineral which has the unusual property of absorbing chemical impurities in water. So it will remove the nitrites and ammonia from a fish pond.

Then when it ceases to be effective, which you can tell from regular water checks, you can soak it in a strong salt solution to clean it and make it effective again. The drawback is that it is quite expensive to buy.

Another type of filter sometimes used is a sealed pressurized filter. The main advantage of this type is that it can be external to the pond for ease of maintenance and this also allows it to be hidden away from the pond.

In the past sealed filters were either too small to be effective on a decent sized pond, such as the early foam filled ones, or else the better ones were prohibitively expensive both to buy and to run.

Now several leading manufacturers have come up with a new design which is both more effective and which sells for a reasonable price. These new designs incorporate modern filter media instead of sand unlike the older more expensive models. The cases of the filters are of course made from durable plastic and should give many years service.

The main problem with this type of filter is that it can only hold a certain amount of muck before it blocks up and needs to be cleaned out thoroughly. Backwashing on a regular basis may be necessary to keep it in

operation. Another point to bear in mind is that most modern pumps are very low pressure but high volume and the very nature of the filter offers some resistance to the flow of water through it. The resistance will increase dramatically as the filter absorbs the particles of suspended matter out of the pond water, so to work the filter effectively you will need a more powerful pump. This is especially true if the outflow is to be used to operate a waterfall as well as this will be reduced.

Alternatively an older style pump that has a less efficient flow rate but a higher operating pressure may be a good choice. It is a simple matter to decide whether the pump is low pressure or not by measuring the outlet on the pump. The narrower the outlet the higher the pressure assuming that the flow rate is the same.

In other words most pumps use a 1 inch or 1 ¼ inch outlet nowadays but if you can find a pump with a ¾ or even a ½ inch outlet producing the same flow of water it follows that it must be higher pressure. This type of pump will use slightly more electricity but this will be negligible compared to the cost of setting up the pond and filter system. On the other hand if the pressure in the flow of water is too high the filter won't work at optimum efficiency anyway.

Another benefit that using a sealed filter has over the standard box type is that the outflow is still under pressure so this can be used to operate a fountain ornament.

One way to chemically remove impurities in the fish pond is to add an activated carbon filter pad to your filter. This is a filter-mat that has been impregnated with specially treated carbon that will react with any chemical in the water. It does have a limited life but when the carbon is used up you still have the filter mat.

Settlement tanks are occasionally sold which aid filtration (see section called Improving Your Filter)

Ultra Violet units are now available which will clear the fish pond and aid filtration (see section on Ultra Violet Systems)

When buying or making a filter you have to decide on the size and to do this you need to know how many gallons your fish pond holds. First of all work out the volume in cubic feet by multiplying the length, width and depth together and then multiply by 6.25. This will convert cubic feet into gallons. For the filter to work it needs to have the right amount of water going through it for the size of pond. The whole volume of the pool should pass through the filter every 2-4 hours. So A 1000 gallon pond should have about 250-500 gallons going through the filter every hour.

When choosing a pump to operate a filter, always allow a little bit extra on the quoted flow rate so that when the flow rate drops as the pump gets dirty it is still doing its job properly. To save having 2 pumps to operate a filter and a waterfall simply site the filter at the top of the waterfall so that the water runs out of the filter box and into the waterfall but make sure your pump can cope with the extra height to the top of the filter.

When started the filter must be run 24 hours a day from the beginning of March till the end of October. This is not as expensive as it sounds because most pond pumps are very efficient and use less electricity than a light bulb. Typically a pump will cost less than £1 a week to run which is not very much expense for a hobby.

When the filter has been turned off for the winter it should be thoroughly cleaned out in the spring before it is turned on again because the aerobic nitrifying bacteria will have died and been replaced by anaerobic bacteria which are poisonous to fish.

HOW A FILTER WORKS.

When a filter is first set running, whether it is in a tank or a fish pond it will simply be a physical filter for its first few weeks of operation, This is because it takes 8-10 weeks of constant running for a sufficiently large enough colony of nitrifying bacteria to establish itself to do the job properly of purifying the water. The whole process can be speeded up by adding bacteria in solution or freeze dried bacteria to start the colony off.

Nitrifying bacteria are aerobic, that is to say they live in highly oxygenated water feeding off the ammonia in the water. That is why it is essential to keep the pump running continuously.

Nitrogen compounds are poisonous to fish as can be seen by the fact that when farmers spread fertilizers on their fields and it rains washing them into the canals and rivers the fish die. Nitrates are to be found in fish wastes along with ammonia that is very toxic. In a filter different types of bacteria break the ammonia down into nitrite and then nitrate which is a less harmful and more stable compound and then eventually into nitrogen gas.

Ammonia-----Nitrite----Nitrate----Nitrogen gas
NH₃ N₂O N₂O₃ N₂

If a filter isn't working properly you can soon tell without even testing the water because where the water reenters the pond you will see white bubbles. This is ammonia being oxidised to form a white scummy solid. If this happens do a partial water change immediately. If in any doubt about the nitrite or nitrate levels then simple test kits are available. It is probably worth keeping an eye on the PH levels as well because this can swing wildly if the filter isn't working properly. A PH reading of 7-8 is fine, 7 being that of neutral tap water.

As a filter matures small water creatures will also establish themselves in the filter. These will help break down the larger particles of matter into a chemical solution that will again be neutralized by the bacteria. If the filter should be turned off for any length of time such as when the pump breaks or for the duration of winter then the aerobic nitrifying bacteria will die and anaerobic bacteria will flourish. These produce a poisonous waste that may kill the fish when the filter is turned back on again. So the filter should be washed thoroughly before starting it up again and it should be treated like a new filter.

IMPROVING YOUR FILTER

There are several ways of improving filter, such as adding a U V system or enlarging your filter. Simply placing more filter medium in your filter will help but the latest idea to start catching on with the trade at least is the installation of settlement tanks.

As everybody knows if you pump water down a narrow pipe under pressure it will carry fine particles with it. When the water slows down as it does when it enters a filter box some of the suspended matter will settle out.



This can be seen by the amount of muck that accumulates at the bottom of the filter after having passed through the foam or nylon brushes. The more muck that goes into your filter the more often you will have to clean it out. The best thing is to have the bulk of the suspended matter settle out before the water enters the filter. This can easily be done by the addition of a settlement or vortex tank. This is simply a round or even conical tank through

which the water from your pool passes. The water is pumped in half way up at an angle so that it causes a current in the tank. The water spirals round and round rising up the tank and is piped out at the top. The heavier sediment laden water slowly sinks and the particles settle out at the bottom of the tank forming a thick sludge which can be piped off with a bottom drain or tap.

It is possible to buy ready made settlement tanks constructed from fibre-glass but they are very expensive. It is a relatively simple job for a keen DIYer to make one out of a rain-water barrel. The pipe fittings need a good seal which is not easy with a round barrel but a tube of aquarium sealant should solve any problems. Installed correctly a settlement or vortex tank can improve water clarity considerably on an overloaded filter system and can cure brown water completely.

ULTRA VIOLET STERILIZERS.

Interest in fish pond filters has grown enormously in the last few years. People not only want to add them to their ponds but want to improve their effectiveness in keeping the water clear and healthy.

The biggest thing to affect filtration is the Ultra Violet Sterilizer. These should not be confused with filters as they do a completely different job. A standard UV system consists of a quartz sleeve into which fits a fluorescent tube. Instead of emitting white light it gives out light only at the ultra violet end of the spectrum. As this radiation is extremely harmful to living tissue and eyes causing cataracts and skin cancer the whole assembly is shielded with a casing. Water is then pumped through the quartz crystal tube so that the UV light shines on to it. This sterilizes the water as it passes through killing the bacteria, parasites and algae. This makes the water free from disease and much clearer. The action of the UV system also causes the particulate matter to flocculate. This means that the suspended muck gathers together in clumps so that the filter becomes more efficient.

A biological filter is still needed even with a UV in operation because the UV does not remove the ammonia or nitrates from the water. If you didn't have a filter you would still get clear water but after a period of time it would become poisonous to the fish with a build up of chemicals unless you carried out regular partial water changes. UV systems are quite expensive to buy but prices are coming down. Because they use a fluorescent tube they do not cost much to run but the tube has to be replaced every season as it becomes less effective with time. Also every couple of years the quartz sleeve has to be replaced as it becomes scarred and pitted making it opaque. UV's are available in several different sizes suiting pools ranging from 100 gallons to mini lakes holding several thousand gallons.

LOOKING AFTER YOUR FILTER.

Some people are under the misapprehension that fish pond filters start working the moment they are turned on and that they only need a little attention. This is not the case at all as a biological filter will not become fully operational for about 8- to weeks after it is initially turned on.

Admittedly it will start to physically filter the pond. That is to say it will remove the larger particulate matter by way of the water passing through the foam or filter brushes. The biological action takes longer as the colony of bacteria build up. This process can be speeded up, by adding bacteria in solution to the new filter. If the filter is turned off for any length of time, such as for winter, this process should be repeated, as the filter will die just like any other living thing without its nutrient rich supply of water from the pond. If the good aerobic bacteria are allowed to die after a long period of in-operation then the filter should be washed out thoroughly to remove the anaerobic bacteria that will have built up in the sludge that will have accumulated in the filter. This is the only time the filter should be cleaned out thoroughly.

In normal maintenance only single sheets of foam or filter brushes should be cleaned and then only lightly as the cleaning will wash away some of the filters bacteria. It is easy to tell when the filter needs a little bit of a clean because the water level will start to rise towards the overflow pipe. Ideally when the filter is installed a facility should be made to allow the filter to be backwashed. This is by far the best way of flushing the Filter through because natural pool water is used instead of harsh chlorinated tap water. If the filter is small it may become totally overloaded with sediment and then it will be necessary to dismantle it and clean it but again it should be treated as a new filter and fed with a bacterial solution.

If white scum forms on the water at the outlet into the pond the filter is not doing its job properly and is not removing the ammonia and chemical waste from the water. In this case the capacity of the filter should be questioned and or the flow rate for the size of the pond.

TESTING THE WATER

There are many ways of testing water in which fish are to be kept so as to measure its suitability for them. Whilst temperature is not so important for pond fish it is crucial that it is maintained correctly for tropical fish. 75 to 80 F is quite suitable for most tropical fish although some such as Silver Sharks like it a little cooler. If a fish pond were to get that high the fish would start gasping for oxygen and some sort of aeration would be required. However it does not happen very often in this country except in freak summers.

Oxygen levels can be checked and there are now test kits available for it. However sensible stocking levels and good aeration should remove the need for testing in both the fish tank and pond.

Where temperature is more significant in the pond is when Autumn comes and it gets cooler. As the pond temperature starts to drop to around 55F the feeding of high protein fish meal based foods should be stopped. Wheatgerm based foods should then be given until the temperature drops further still so that the fish go into a semi dormant state and just lie on the bottom of the pond.

All fish keepers should be aware of the problems that high Ammonia, Nitrite and Nitrate levels can cause. They are all Nitrogen based compounds produced by feeding fish and the decay of vegetation. Ammonia is highly toxic to all fish and if its presence is detected a water change should be carried out immediately. If the water is agitated, ammonia will oxidise to produce white bubbles that are a simple warning of its presence.

Nitrite levels of even 1 part per million are too high and a partial water change should be carried out. Nitrate levels on the other hand can go much higher before they become harmful. If nitrate levels are high the addition of quick growing plants such as ELODEA will help matters as this is a natural plant food.

Another quite important thing to test is the P H level. This is a measure of the degree of acidity or alkalinity of the water. A P H reading of between 7 - 8 is suitable for most fish. Pond or Aquarium water may become acidic with age or become alkaline due to presence of lime from cement. If this happens P H buffers or adjusting chemicals are available to make the water safe for fish again.

You can also test the hardness of water but this should not concern the average fish keeper other than the fact that hard water may leave scale deposits on pipe-work to the pump.

Salinity can also be tested using a hydrometer but again this only concerns the specialist fish keeper who may keep marines, unless salt water is being used as a medicative treatment for freshwater fish,

OXYGENATION

Fish like all animals need oxygen to live even though they live in water. So it is necessary to maintain oxygen levels in the pool. In a densely stocked pond additional aeration will probably be needed. This can be achieved by the addition of a fountain or waterfall. The action of agitating the water will cause more oxygen to be absorbed by the water. Some people use an air pump as used on fish tanks to blow air into the water that will also increase the amount of oxygen in the water. One method very popular with Koi keepers is the use of a VENTURI. This is a simple device that is attached to an outlet pipe from the pump where it reenters the pond. Within the device is a restriction of the tubing with an air hole leading off it. This causes a change in pressure in the water flow that sucks in air, forcing it out in a stream of bubbles with the water.

The VENTURI works well with a fairly powerful pump and is available in various sizes. If no oxygenation devices are to be used in the pond stocking levels must be kept to a minimum. The maximum number of fish that a still pond will safely hold is 5 inches of fish per square foot. Only a fool would put in this many when stocking a fish pond as this doesn't allow for growth. One or two inches would be a better stocking level.

Temperature also affects the absorption of oxygen into the water. The higher the temperature the lower the oxygen levels. This often explains why golden orfe, which have a high oxygen requirement, die in a hot summer for no apparent reason. It is advisable during hot weather to apply some form of oxygenation to all ornamental ponds.

In the winter the temperature is low so the water holds more oxygen. This is very fortunate for nature because it means that when the pond is frozen over for a short time life can still go on underneath the ice. In prolonged cold spells it may be advisable to make an air hole to allow the gaseous exchange to occur. It is possible to buy test kits that check the oxygen levels but they are expensive and a little common sense will remove the need to make tests.

ARE YOU POISONING YOUR FISH?



After getting a pond established people often find that fish suddenly start dying for no apparent reason. Various medicines are added with no benefit and the fish continue dying. Another cause should be looked for other than disease and this could well be poisoning, There are many innocent ways to add harmful chemicals to your pond. Often a freshly installed concrete waterfall is to blame or a newly slabbed area adjacent to the pond. This is because the run off water running over the new

cement will leach the lime from it. In a large pool this isn't so much of a problem but in the average back garden pond it is often fatal. Lime will alter the PH value of the water making it deadly for the fish. It is also a problem that will not go away so the best way to cure it is to treat all new cement work with a neutralizing agent, carefully following the manufacturers instructions or paint it with a special pool paint.

Garden sprays used on nearby bushes can be just as deadly as the spray may drift onto the water. Lawn fertilizer must also be used carefully as the run off water from a lawn can be poisonous. If any nearby fences are to be creosoted then great care must be taken not to splash the creosote into the pond. Any foreign chemicals in the pond should be avoided at all costs because fish do not have the same ability to remove poisons from their bodies the way that most mammals do.

Even things that wouldn't harm us such as copper pipes should be avoided as the chemicals in such an enclosed system as a pond can build up in the fishes body until it becomes fatal.

Both copper and lead pipes are often used in stone fountains which shouldn't be a problem but no more such piping should be used and plastic or rubber should be used as an alternative. Even plastic can be harmful to fish as a lot of cheap plastics contain cyanide compounds that can leech out. This is why plastic filter materials and plastic hose-pipes should be of a good quality and specially made for the job. Some cheap butyl pool liners can even be harmful as they can contain too much butyl which in itself is poisonous in small pools.

Another very common problem is autumn leaves which fall on to the pond and sink to the bottom. There they will rot and if not removed before the winter will produce a high concentration of poisonous gases dissolved in the water. If ice forms the gases will not be able to escape and will build up to toxic levels. Conifer needles are especially harmful as they will change the PH value of the water making it acidic as well as rotting.

A relatively new problem that is starting to emerge is that caused by the incorrect use of UV sterilizers. If they are not used in conjunction with a biological or chemical filter the ammonia levels can build up in the pool to toxic levels. The pond may stay clear but be very poisonous to fish so don't think that a clear pond is automatically a healthy pond because the reverse is very often true. Indeed there is some evidence to suggest that a slightly green pond is healthier. The reason for this is that there is a vitamin in the algae that causes green water that is therapeutic for the fish.

One problem which can only be put down to carelessness is the incorrect use of medicines. Incorrect dosage is a big problem as people often think that if a little is good for the fish a lot must be better.

Mixing of chemicals can lead to problems with them interacting to produce a poisonous product. Whenever using chemicals in the pond the manufacturers instructions should always be followed carefully and to the letter. Always leave at least a couple of weeks between using different chemicals and a month would be better. Some chemicals remain in the water for even longer so do read the bottles.

The use of salt can be a problem, Table salt is poisonous and should never be used but sea salt, rock salt or a branded pond salt is a very good tonic in small doses. Always remember that until you change the pond water the salt will remain in it. Don't keep adding more and more every few weeks or months because it doesn't go away and eventually it will kill your fish.

When changing pond water remember that tap water has chlorine and often flourine in it. These chemicals are both harmful to fish as they burn the delicate gill membranes. To a healthy fish a partial water change once or twice a year or an annual clean out shouldn't hurt. If you are doing regular water changes then steps should be taken to neutralize the chlorine. There is a chemical that all aquatic retailers sell which does an admirable job of this and also removes the dissolved metals such as copper, lead and zinc.

The simple rule is to keep all foreign chemicals out of your pond and remember that most metals are poisonous. Above all use medicines very carefully and keep your pond clean. If you do these things you wont poison your fish.

THE POND AND MEDICINES.

Many people keep fish and some are fortunate enough to never have to resort to using medicines for treatment but for most of us there comes a time when the only recourse is some kind of treatment for an ailing fish. Salt has been used for decades if not centuries as a cure all treatment. Used carefully in the correct dosage it is a powerful treatment against most problems with fish and a lot of people only use this type of treatment spurning modern medicines. However there are many medicines, tonics and remedies that are possibly safer and easier to use and in some cases much more effective. Chemicals are available to specifically treat fungus, white spot and other parasites, ulcers, fin rot and other bacterial infections.



As with any medicine non are guaranteed to work in all cases and you may develop favourites which you have tried and tested to your satisfaction, but, there is a quite bewildering range to choose from and if in any doubt you should seek advice from your retailer who should have a reasonable working knowledge of the medicines that he sells. In some cases there is a need for a more powerful medicine to cure a valuable fish and in

this case you need to seek the help of a good vet who can administer more potent drugs than can be bought over the counter. Medicated foods can also be bought on prescription to treat fish.

A long with medicines there are many pond remedies such as algicides that are designed to clear the water in the pond by killing the algae. Also available is a dechlorinator for removing chlorine and flourine along with poisonous metals from fresh water.

As with all treatments you need to know how many gallons of water your pool holds. If it was a preformed one the shop where you bought it will be able to tell you but if it is made with a liner you will have to work it out. Measure the capacity in cubic feet by multiplying the length x width x depth and then convert this to gallons by multiplying by 6.25, Although now this should be done in meters and liters now we have gone metric. If you don't want to have to use medicines you can avoid a lot of problems by installing a UV system along with your filter. This will sterilize the pond water as it



is circulated killing most of the disease causing organisms, parasites and algae.

THE LEAKY POND.

All pools no matter what they are made of can spring a leak due to carelessness, accident or bad planning. Concrete pools can be troublesome when they leak. If they are coated with a sealant it may need re-coating every few years as some can peel off. If the pool is cracked it may be possible to repair it with a special repair compound but often the only recourse is to put in a liner after padding the crack with a soft material such as old carpet or curtains.

Even fibreglass pools can crack but they are very easy to repair with a fibreglass repair kit such as is used for cars. If it is done properly the pool will be as strong and watertight as it was when new. Rigid plastic pools can also be repaired with fibreglass as it will bond to the roughened plastic around the hole.

Whenever sealing any damage to a pool the area must be clean and dry. This is especially important if a liner is to be repaired successfully. Small patches can be bought for liners and for bigger tears special tubes of adhesive can be used to stick on large patches cut from any off cuts you had when installing the liner. Pre-formed semi rigid pools are best repaired with an adhesive patch as well.

All good aquatic retailers will have a range of repair kits for fixing leaking pools but if the damage is severe then it may be a case of starting again and installing a new pool.

Very often the pool isn't leaking at all and water loss can be explained by a badly aligned waterfall.

Great care must be taken to line up the waterfall correctly so that all the drips land in the pool as even a slow drip will eventually empty a pool if the pump is left running constantly. A simple trick to cure the problem is to make a tiny V shaped cut either side of the waterfalls edge so that drips

cannot run past the notches. Great care must be taken not to ruin the waterfall however.

Another source of water loss is evaporation and in the summer this can be 2 or 3 inches a week. Often the blame for water loss lies with a fountain turned up to high so that spray is blown out of the pool. On a windy day your pool can be emptied in a few hours.

So if you are losing water from your pool don't always assume that you have a leak and don't be too quick to go out and buy a new one as it may be repairable anyway even if you have.

VISITORS TO THE POND.

When a pond is freshly filled with sterile tap water it is a fairly inhospitable place for life but very quickly the water softens and becomes a more friendly place. Within a week or two insects suddenly appear as if by magic. Some are very beneficial to the pond acting as a good source of food and others can be a menace to small fish.

DAPHNIA or water flea is perhaps the single most beneficial insect to arrive in your pond. It is a tiny insect about 1 or 2 millimeters and looks just like a flea with its jerky movements through the water. It feeds off the algae and breeds prolifically.

Daphnia are an excellent source of food and can be bought by the bag full at most aquatic retailers. Fish love them and go frantic to catch them when any are introduced.

MIDGE LARVA are another good source of food for fish and will arrive unannounced in the season. They wriggle about in the water and are often to be found hanging upside down from the surface as they breathe.

BLOOD WORMS will arrive and breed in any rotting vegetation such as leaves in the Autumn or an infected lily. They are also often sold at aquatic retailers as food for tropical fish. Blood worms are like tiny red worms that continuously wriggle in the water and provide fish with a good source of natural protein.

WATER BOATMEN These insects grow quite large and with their legs moving in a rowing action make them look like a little rowing boat moving through the water. They are silver underneath so that the fish can't see them because although they are quite large and tough the bigger fish love to eat them. Water boatmen prey on other pond life and even small fish so it is a good idea to remove any that are found.

POND SKATERS as their name suggests skate on the surface of the water held up by the water tension. Again they will be eaten by the bigger fish and they are fairly harmless.

GREAT DIVING BEETLE is an aggressive predator which grows very large for an English beetle. It will dive and catch fish killing them so it should always be removed. LILY BEETLE is a tiny beetle that eats lilies making holes in the leaves. If any leaves are infected the best way to cure the problem is to simply remove the leaves.

DRAGON FLIES are an enormous insect with shimmering wings that will visit most ponds to lay its eggs. The eggs develop into a larva that is quite vicious but as fish will eat them they don't generally get the chance to develop and prey on the smaller pond life.



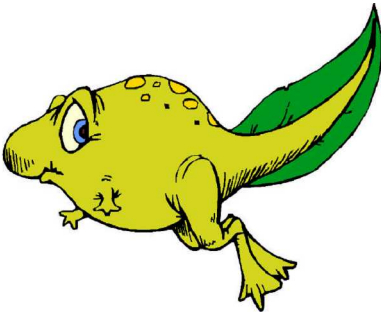
SNAILS are not of course insects but they will be found in most ponds just the same. There are two types of snail to be found in British ponds, the Stagnallis and the Ramshorn. The latter can be bought at aquatic shops and is said to be a good scavenger not eating healthy leaves. The Ramshorn snail is black and its shell looks like a coiled up hose pipe

or curly rams horn hence its name.

The Stagnallis is conical and will eat lily leaves or any other sort of vegetation so should not be encouraged. However in a well stocked pond it is unlikely that either will grow and multiply because the fish love to eat them. If you have snails in your pond you will see a string of jelly on the underside of the lily leaves. These are the eggs that will eventually develop into 100s of snails. It is a simple job to remove them or treatments can be bought to kill the snails if they are a nuisance.

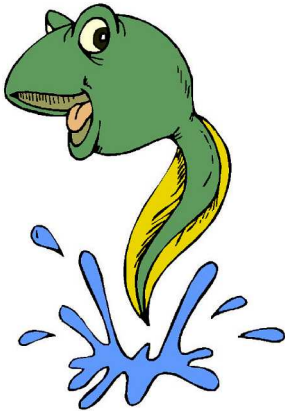
FROGS AND YOUR POND

In the spring is you will probably start finding that your pond is home to an ever increasing number of frogs. As the mating time approaches all the frogs in your garden and beyond will converge on your fish pond and start a noisy mating ritual filling the pond with their eggs in the familiar frog spawn jelly that we all played with as children.



Fish will start to become more active with the warmer weather and some of the eggs will be eaten, but many will survive to quickly hatch into tadpoles. Again the larger fish will not miss the opportunity for some live food but their vast numbers ensure the survival of a large number of tadpoles. Some of the tadpoles become carnivorous and start eating their brothers

and sisters. These develop particularly fast into small frogs. The normal tadpoles will clean up the pond eating all the decaying rubbish on the bottom of the pond and any uneaten fish food, but they will also eat some of the plant life stripping the leaves off the emerging foliage.



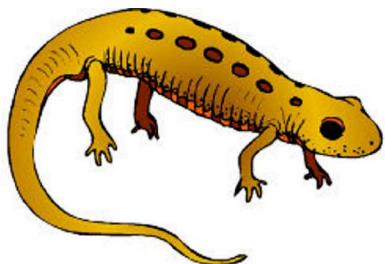
The plants won't really suffer as the tadpoles only remain for a few weeks until they develop into small frogs and leave the pond in a search for slugs and insects. A large number of small frogs will survive the developmental process of metamorphosis from eggs to tadpoles to frogs and return to the pond in future years to mate and continue the generations.

Frogs are very good for the pond and garden in many ways but the adult frogs are sometimes

considered a nuisance for those who don't like them and some fish keepers mistakenly believe that they kill fish. It is true that during mating time a male frog will grab anything it can in the hopes that it is a female frog. But a healthy fish is far faster and more agile than a frog.

So it seems likely that if a frog is found clutching a dead fish that the fish was either already dead or was sluggish and ill so would probably have died anyway. If you want to encourage frogs into your pond, plant lots of leaf cover around it and provide a shallow access point to the water so that they can easily climb out.

NEWTS AND YOUR POND



The word Newt is derived from the Angle Saxon word EVETE which became altered to EWT and then to NEWT. Newts will be encouraged to visit your pond if you have good leaf cover around it. They will be a great benefit to your garden as they will eat all manner of creepy crawlies and help

the birds to keep the numbers of worms in your lawn down. It is possible to collect them from the wild and introduce them to your own pond but it is illegal to remove some species such as the great crested newt. The common newt is much more plentiful and may well arrive on its own. Common newts only grow to about 3 1/2 inches but the Great Crested Newt will reach 6 inches.



If you have Crested Newts in your pond don't tell anybody because the wildlife people may restrict you from putting fish in which may eat them or from cleaning it out which may disturb them during the breeding season.

You may want to encourage the newts to breed and help the eggs survive. The eggs are laid on the underside of leaves in the water and will be readily eaten by fish. They hatch like tadpoles and spend the early part of their lives

in water until they develop into small adults when they will leave the water a lot of the time to hibernate and search for food. If you remove some eggs, from the pond place them into a cool vivarium in water and wait a few days. The tank needn't be a particularly large one as newts grow a few

inches in length. The young are easy to care for as they will readily eat fish food and as they develop you can start feeding them on worms which may appeal to your sadistic side.

Very often 2 newts will grab the same worm from opposite ends and start swallowing. When they meet in the middle there is a tug of war sometimes tearing the worm in half. Sometimes one will emerge victor and pull the worm out of the mouth of the other and then it will struggle to swallow its wriggling prey.

Newts will need a dry part in the vivarium if they are to be kept for a long time where they can climb out of the water and have a rest. If they are forced to spend their whole time in the water they can do but their breeding will be affected and with each generation numbers will decrease. If you are successful with your breeding program and want to release some newts into the wild. you can do this as they are a native species. You might also like to contact one of the wildlife organizations that will be very keen to assist you and advise you on the best locations to release the young newts.

The Pond Through The Year

SPRING CLEANING YOUR POND

After going to the expense of buying a pool some people are inclined to throw in one or two plants, a couple of goldfish and then leave them to fend for themselves. After a year or two the fish may be dead and the plants a tangled unsightly mess, whereas with just a little attention for a few days in the spring and the autumn the pool can be turned into the focal point of interest for the whole garden.

Whether your pool is neglected or not Spring is the time to give it a clean. Carefully catch any fish and place them in clean buckets or bowls (NOT GALVANISED) remembering that the water absorbs oxygen through the surface of the water, so a deep receptacle will not hold any more fish than a shallow one.

You may also like to save a little frogspawn if any visiting frogs have obliged, as it can be a useful addition to the pool. The frogs spawn itself is good fish food and any tadpoles that hatch will provide valuable nutrition for the larger fish as they start feeding in the warmer waters of the spring. The tadpoles also clean the pool eating any dead vegetation and decaying fish food. Next remove all the pots of plants and keep them out of the sun while the water is siphoned, bucketed or pumped out.

There is no point in scrubbing the pool spotlessly clean because in a few weeks it will be green again anyway, but do remove all the foul smelling sludge before refilling with tapwater. The tap water will contain chlorine and may contain flourine that can harm the delicate membranes in the fish's gills.

This problem can be removed by adding a chemical that is designed to neutralize all halogens and is widely available from aquatic retailers. Alternatively the pool can be filled and the water left to stand for a few weeks before adding the fish. However, in practice if plants are added to the pool, the fish can be introduced straight away with no real harm, as the chemicals and organisms in the pots of plants will naturalise the water.

CARING FOR POND PLANTS IN SPRING.

In spring after cleaning your pond your attention may turn to the plants that should now be starting to shoot. Clean off all the dead vegetation and trim back any untidy foliage. Some of the larger clump forming plants may be divided and potted to increase the number of plants or simply put into a larger planting crate. The easiest way to divide lilies is to use a large sharp knife or even a spade.

Special planting crates are available from most garden centres. They are perforated to allow the roots to leave the pot and obtain the necessary nutrients from the water and the sludge that accumulates at the bottom of all pools. Planting crates come in a wide range of sizes from small round marginal baskets to monster lily baskets and contoured ones that will hold 2 or 3 plants. The newer designs of baskets have a very fine mesh that is said to stop soil seepage but lining them with Hessian or cloth of some sort is always advisable as is a top dressing of pebbles.

Specially formulated fertilizer packets are also available for pond plants along with liquid and granular feeds. Aquatic compost is available but any compost such as well rotted turfs is suitable as long as it hasn't had any chemicals such as weedkiller or fertilizer added to it because these will harm the fish and ordinary garden fertilizer will turn the pond green.

After the plants have been repotted they should quickly be returned to the pool so that they don't dry out. This is easiest done when the pool is empty but can be done afterwards if great care is taken. After you have cleaned and repotted your plants you may decide to add a few more so why not pay a visit to your local garden centre and see what the aquatic department has to offer. They should be well stocked and have a good choice of plants costing from a little over a pound to the more expensive lilies costing anything up to 15 or 20 pounds.

In the Spring all the plants should have some growth on them including the lilies which will make it easier to pick out a good plant.

THE POND IN SUMMER

In summer the pond is at its peak of attraction and interest with everything growing vigorously and the pond is full of life. The tadpoles are busy cleaning up the pond by eating all the rubbish and developing into small frogs. After they leave the pond they will feed on insects and slugs in the garden returning in a year or two to mate and produce a new generation.

When the small frogs have left it is a good time to clean out the pond if you haven't already done it. This job can be done at almost any time except mid winter but if it is done when the fish are at their most active they will recover quicker from any scales broken off or other accidental damage and so will the plants. In the Summer you can feed the fish on almost anything as they will be very hungry and eager to fill their stomachs. Pellets are quite cheap and there are some good ones on the market but sticks are more popular these days. Flakes can be used for smaller fish and are very good for them but are a bit expensive for large fish. In the middle of summer the food is normally high protein fish meal based.

If you are going on holiday it is better not to leave the neighbor with food as it is likely that they will over feed the fish and pollute the pond. Fish can manage on their body reserves for a couple of weeks and there will be some natural food such as algae and insects for them to eat. However if you are worried about them you can buy automatic feeders and feeding blocks that are quite cheap and will give you peace of mind.

Don't forget that growing plants need food especially lilies which sometimes don't flower if lacking in nutrients. You can feed your plants by re potting them in special aquatic compost or by giving them food in one of several forms now available. There are tablets, granules and there is also a liquid feed.

In Winter the pond is usually clear due to low light intensity, cooler weather and general dormancy. However as Spring comes it usually goes green and then clears a little by Summer until it reaches a natural balance. The more oxygenators you have in your pond the clearer it will be. A filter or U V System is another answer but is not cheap.

All plants will help to keep the pond clear especially lilies which will shade out the sunlight. They also provide shade from the fierce summer sun for the fish that prevents them from getting sunburn. Fish can often be bound hiding under the lily pads. As the water gets warmer it holds less absorbed oxygen, so when it is hot it is a good idea to have the pump running whether it operates a fountain or a waterfall. Don't forget that oxygenating plants take oxygen out of the water at night so if you have a lot in your pond it is important to leave the pump running through the hot nights as well.

As Spring turns into Summer the fish will be seen chasing each other around in their efforts to spawn. This often results in minor damage as they push up against pots so it is important to keep an eye on them and at the first sign of trouble pour in some general medication which will be readily available from your local aquatic retailer. If the females look as though they are outnumbered try to introduce more to balance up the numbers so

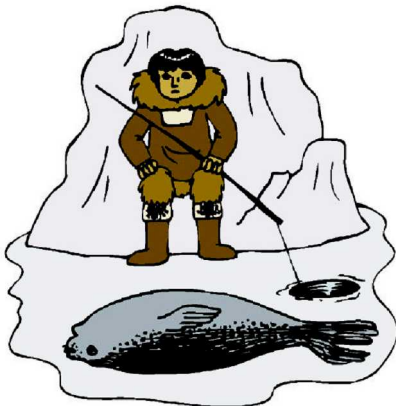
they don't get so exhausted. After the eggs are laid they will slowly get eaten by the fish as will the fry when they hatch so if you want to be save some it is a good idea to remove them and place them in a specially prepared aquarium or isolation pond. The fry can be fed on Infusoria and brine shrimps.

In Winter the pond will be kept topped up by rainwater, indeed it will probably overflow but in the hot dry weeks of the summer you will need to top it up from the tap. When adding a quantity of water you can add a de-chlorinator to neutralize the chlorine in the tap water. Don't add very large quantities of water on a hot day because you may chill the fish and then they may get white spot.

THE POND IN AUTUMN AND WINTER.

As Autumn approaches most aquatic retailers sell off their fish stocks cheaply and this is the time to make the most of their last minute bargains. you may lose a few of the smaller fish over winter but their low price will more than compensate for this. Fish should not be bought for the pond in the winter. The reason for this is that they are not feeding outside so they

have no way of regaining their strength lost in the holding tanks and no way of recovering from any minor damage or the shock of being moved.



When the temperature starts to drop in the Autumn, with colder nights, fish like Black Moors and Fantails should be brought indoors and put in a coldwater aquarium. They are not the hardiest of fish and can develop problems with their long fins in very cold water. Also they

are susceptible to stomach disorders in icy conditions. Where people have got very small Koi they often like to over-winter them indoors or even in temporary pools in their garages. Others have fishponds in their conservatory and real enthusiasts have been known to heat their fish pool like a swimming pool.

As the temperature drops the fish outside will noticeably feed less and less. When the temperature falls below 55F you should stop feeding ordinary high protein fish food and switch to one of the many brands of wheatgerm. Both sticks and pellets are available. The important difference between this food and the ordinary fish meal derivative food is that it is digestible at low temperatures, so it can safely be fed all through the Autumn and Spring and even in Winter on warmer days.



Before the first frost arrives water Hyacinths should be removed from the pond and placed somewhere warm and light in damp peat for the winter. Also Lobelia Cardinallis pots should be taken out of the pool and put in a shed or greenhouse. If you have any of the exotic tropical lilies in your pool these should also be cut back and removed. As Autumn sets in the leaves on the trees will start falling

and landing in the pool. This is the time to net the pond to keep them off. Either that or simply get into the habit of scooping the leaves off the water on a daily basis to prevent them sinking to the bottom and polluting the pond.

When the first frosts come the filter and pump should be turned off. There are 2 reasons for this, firstly, it prevents the filter from freezing and the possibility of split pipes and loss of water. Secondly it allows a warmer layer of water to form at the bottom of the pond while the top layer ices

over. This warmer layer that is most important because it enables the fish to survive in water a couple of degrees higher than freezing.

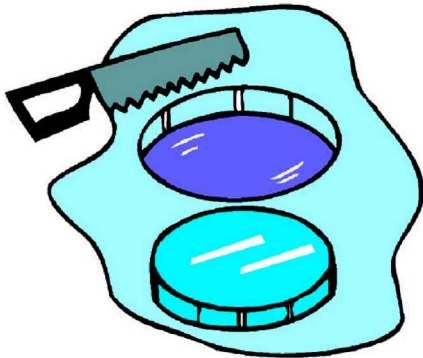
If the pump is left on to prevent icing over then the water will be universally chilled and will come very close to freezing throughout which may result in fish losses. When the filter has been turned off it should be cleaned thoroughly before turning back on again in the Spring. This is because the aerobic bacteria in the filter die when the water is turned off and are replaced with anaerobic bacteria. These are poisonous and so should be washed away before restarting otherwise it may result in fish losses.

If the pump has been removed from the pond it should be cleaned and dried before storing away, but if it's below the ice level in the pond it can be left in but disconnected.

BREAKING THE ICE.

When Winter comes there is little to do to the fish pond as all life has slowed down with the cold and the fish just lie on the bottom of the pool. Even with global warming and the milder winters we have had the last few years we still get one or two nights of hard frost which can freeze the pond over with a thick layer of ice. If the ice lasts for a day or so it will not cause any problems because the water will hold enough dissolved oxygen for the fish to live on but if it lasts for any longer then steps should be taken to make an air hole. This should not be done using a hammer to break the ice as the shock waves may harm the fish. Nor should a fork be used as this may puncture the pool. The best way to keep a hole free is with a pool heater. These are very low power and only need to be turned on, on the coldest of nights. Typically they use the same power as a light bulb. They do not heat the whole pool but just raise the temperature in a small patch of water a degree or two so that it does not freeze.

You can buy low voltage pool heaters that run off a transformer for added safety but these are less popular. One of the newer ideas for preventing the whole pond from freezing over is to use a large air pump to blow bubbles into the water. The constant agitation of the water keeps a patch free of ice. If you have a pond pump you could leave it running with just a pipe feeding the water back into the pool. The problem with this is that if it freezes solid it will ruin your pump.



If you have not got an electricity supply close to your pond then you can buy a polystyrene dome which will keep a hole free of ice or you can resort to the old tried and trusted kettle method. This involves boiling some water and then pouring it onto one spot on the ice to melt it. It may need to be done several times a day in very cold weather as the water will chill and

quickly refreeze.

Some people place a large ball on the water before it freezes and then remove the ball the next morning leaving a hole in the ice but if it is very cold this soon freezes over. In the Winter the pool should be left alone and not cleaned out or disturbed until the Spring comes around when the fish will once more become active and start to feed.

10 PROBLEMS WITH PONDS

1 Concrete ponds often leak after a few years. If the pool has cracked you can buy a repair compound which has a waterproof additive mixed with the cement compound. Sometimes this will cure it but if there is subsidence on the pond then the only answer may be to install a liner of some sort. Sometimes the concrete becomes porous or the old coat of sealant peels off. In this case brush it down with a wire brush and coat with a fresh coat of pool sealant.

2 Green ponds are a perennial problem. This is basically due to too many minerals in the water that acts as food for the green single celled plant called algae that turns the water green. It is a myth that a pump will clear it but installing a pump does enable you to add a biological filter and U V system. The filter must run 24 hours a day throughout the season and takes about 8- 10 weeks before it becomes fully functional although this can be speeded up by the addition of special bacteria in solution. The natural way to clear green water is with the addition of more plants, especially oxygenators. Chemicals are another solution as many algicides are now available. The addition of a little pack of Barley Straw is also supposed to work.

3 Overfeeding can result in pollution of the pond and ultimately in fin rot. If the pond is cleared the fish can be treated with any proprietary fin rot remedy and in most cases the fins will re-grow. To cure the overfeeding problem use floating foods so that you can see what is being eaten and you can easily fish out any uneaten food. The addition of a scavenger fish such as a Tench will help to remove unwanted rubbish and so cut down on pollution.

4 Large Golden Orfe often die in the hot summer months. This is due usually to oxygen shortage. Orfe are a river fish rather than lake or pond so they have a high oxygen requirement and when it is hot the water holds less dissolved oxygen so they suffer. The answer to this is quite simply have a pump running, especially on hot stormy summer nights.

5 Small fish often disappear without trace. This is usually because a bigger fish has eaten them. The simple rule is never mix big fish with little ones. Also a large catfish in a pond with other fish can well lead to problems as they are well known for their aggressive tendencies.

6 Oxygenators often get eaten when put into a fish pond. All the carp species, goldfish, Sarasas, comets, Shubunkins and Koi love to eat green plants leaving you with just bare stalks or even less after a few days. The only consolation is that it is good for them acting as a valuable source of nutrition. The way to stop them being eaten is to make a cage out of plastic coated wire mesh (not galvanized) and let the plants grow through it. Koi can be a real problem with any plants and generally the only plant that can be successfully kept in a Koi pond is a lily and even this will be dug out of its pot until it is well established.

7 Fish sometimes die a few days after cleaning out the pond in summer. The reason for this is that the pond water was quite warm before the fish were placed into the cold tap water and they received a chill. This usually causes white spot that is highly contagious and can lead to fish dying.

There are several proprietary medicines which will effectively cure white spot in a few days but the best solution is when transferring the fish into the newly filled pond float them in a bag of the old water for 1/2 hour to acclimatize them.

8 Sometimes a waterfall is added to a pond and the water level goes down as if it has a leak. This is usually caused by incorrect alignment of the waterfall, so that drips are running around the edge and not going into the pond. A very tiny V cut into the waterfall either side of the drop edge will also help to cure the problem.

9 Fish suddenly dying in a new concrete pond or after a concrete waterfall has been added to a pond is usually caused by the presence of lime in the water. It is most important to treat all new cement work in and around a pond with a neutralizing compound or cover it with a plastic paint. The

addition of P H buffer can also be used if it is only a small amount of cement involved.

10 Blanketweed is a perennial problem with most ponds at some time or other. This is a long filamentous algae best described as looking like green candy floss. It chokes the pump and all plant life. It is beneficial to some extent as when you have blanketweed your water in the pond is very often crystal clear. It is best removed manually with a stick and then poisoned with a selective weedkiller. This is not as dangerous to other pond life as it sounds if the instructions are followed carefully. Various other chemicals are available which restrict its growth by altering the chemical structure of the water.

USEFUL FACTS AND FIGURES.

1 Cubic Foot	= 6.25 Gallons = 62.5 Ibs
1 Cubic Foot	= 25 kilos
1 Cubic Metre	=35 Cubic Feet
1 cubic Metre	= 220 Gallons =2200 Ibs Or 1 Ton = 1000 Litres
1 cubic Metre	= 1000 Kilos
10 Litres	= 2.2 Gallons
1 Gallon	= 4.5 Litres
1 Gallon	= 10 Ibs
1 Gallon	= 4.5 Kilos

Pump running costs, 100 watts = 16.8 KWH per week
ie, 17 KWH units of elec cost £2.55
ie, 1 watt costs 2 ½ P per week
continuous pumping,

Measuring Liner Size,

(Length of hole +Double depth +1 foot) By (Width of
hole + double depth + 1foot)

eg, Hole 6x4 Depth 2 feet

= (6 + 4 + 1) By (4 + 4 + 1)

= 11 feet By 9 feet

To calculate cost at cost per square foot, eg, 60P

Multiply cost by total length of liner by total width,

is, 11x9 = 99 by cost per square foot

= 99 x60P

= £59.40