

EVERYTHING YOU EVER WANTED TO KNOW ABOUT PONDS AND GOLDFISH



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PLANNING YOUR POND

So, you've decided you want to build a pond.

Can I suggest that you spend some time in the planning stage, now, rather than rushing into the garden with a shovel! Pause for a while and think about the type of pond that you want ...

To give you an overview of pond and water garden construction I want to start with this article by Lee Goins. It explains the basics of pond construction in simple terms and will help to remove the mystery and build your confidence before you start construction.

Today's successful water garden usually is designed as an ecosystem that uses a balance between fish, plants and bacteria keeping the water clear. The type of pond I'm talking about is self-contained (not fed by a spring or stream) and between 100-900 sq ft; a backyard water garden that is easy to maintain and adds value to your lifestyle and property. 20 years ago the typical do-it-yourself water garden was a muck-filled cesspool waiting to happen, while the successful koi pond required deep water and unattractive out-of-the-pond filtering equipment. Thanks to a better understanding of the pond ecosystem and some equipment ideas borrowed from the pool equipment industry, anyone with the ability to dig, make things level, and move rocks and dirt around can create a beautiful living water garden if they use proven equipment and methods.

Now I will admit that there are other ways that can work; But none of the other pond construction methods have the successful track record I've seen with pond installs using this system.

The basic elements for this system are underlayment, liner, rocks and gravel, skimmer, fill valve, pump, plumbing, biological filtration, plants, fish, and bacteria.

Here's a simplified explanation of how this works as an ecosystem. Fish eat insects and plants and then the fish waste spreads through the system. The skimmer draws water off the top layer of the pond helping with circulation and aeration while trapping floating debris in a net. The pump is situated under the net in the skimmer and pumps up to a bio-filter. The bio-filter is often designed to be incorporated into a waterfall. The water enters the bio filter and rises up through filter media that is colonized by bacteria. The bacteria converts the waste into forms less harmful to the fish and less conducive to excessive algae growth. The waterfall or stream add more aeration that the bacteria and fish need. The plants uptake more of the nitrogen and some oxygenate the water. The rocks and gravel provide more area for bacteria and protect the liner from UV rays.

Sheesh! Every time I set out to give a simple explanation of a pond ecosystem it still takes 10 sentences. Suffice it to say that all the parts work together to make your pondkeeping easy!

I use the word easy as a relative term. Compared to the work and rebuilding you may experience with other methods this is the easiest way I know. But there is still a good deal of work in pond construction. Obviously you need to dig and shape a hole in the ground and move some heavy items around. A well trained crew with everything needed on-site can install a pond in a day. It may take a few weekends for a homeowner to do the job himself, depending on their ability, time, and conditions.

Some key points:

Size: It's best to have it at least 6 ft across. Bigger is better. 16 x 11 is a good medium size. Generally people regret not making the pond larger when they are done with their first one.

Location: There is a tendency to put ponds in a place where water already collects in the yard. This isn't always the best idea. Groundwater running into the pond can create problems. If possible bring it right up near the patio where you can enjoy the fish and flowing water everyday.

Electric and plumbing: Don't overlook the need for a GFI outlet near the pump and a water source to keep the pond topped off. Most kits for some reason don't include a fill valve, but it really is important since on a windy day a pond can easily lose an inch of water. Left unattended this can lead to the pump running dry in the skimmer for a long period causing possible damage. The ponds level of course won't drop below the skimmer opening.

Lets go over the basic steps for installing this type of pond system.

Decide the size of the pond and order a kit with all the necessary components. Layout the shape of the pond with something like a garden hose. Leave it out there for a while, move it, think about where the falls and different plants will be. If you are building a stream do the layout for it too. Level ground isn't a problem since you will be excavating enough soil to buildup around your waterfall filter. Paint an outline with orange marking spray paint.

Make arrangements for getting the variety of rock and gravel you will be using.

Position your skimmer and BioFilter. The skimmer should be on the opposite side from the falls or stream to create circulation. Then lay the flexible PVC, or kink-free pipe between the skimmer and waterfall filter. This is so it can be covered during excavation instead of trenching it in.

Establish a firm compacted and level base for the Waterfall filter, perhaps leaning slightly forward, depending on it's design. If you have help they can be working on digging the pond while you get this right, or vice versa.

Hook up the plumbing to the filter and backfill around it. It's a good idea to have someone stand in the filter while it is being backfilled to prevent it from shifting out of position on the base.

Examine any slope of the land and establish where the water level will be; usually a couple inches below grade. Finish digging the pond relative to the water level. A rotating laser level is the ultimate tool for this, though they are expensive to rent. Patiently checking string levels in all directions can get the job done also. Include shelves for marginal plants and keep the sides and shelves level. The deep part of the pond should be around 2 ft or a little less. Any deeper and most towns swimming pool codes kick in with fence requirements. Unless you intend to keep a great number of koi this will be plenty deep for your fish. Planting pockets for water lilies can also be dug now. These pockets create a plantable depression in you liner for later. You can either plant directly in these pockets or hide your planters in them covering with gravel creating a more natural looking pond.

Excavate the position for the skimmer so it will be on a firm level base that gets it into correct position relative to the water level. Recheck everything. All the measurements and levels. Make sure the pond is free of sharp objects and unfold the underlayment into it. Start in the deep area pushing the underlayment into all the shelves and pockets. The EPDM rubber liner is then installed in the same way, making sure that it extends far past the waterline (settling will occur) and above the openings on your skimmer, filter, stream etc.

Add rock and gravel. Pre-washing the stones can help with a clean install or you can hose them down in the pond while pumping out the dirty water. Use larger stones at the base of each wall that forms a shelf, building up with smaller ones. Cover flat areas with 1"-2" gravel...absolutely no more than that. If you have extra gravel don't be tempted to just use more in the bottom of your pond. This is for biological reasons I won't go into now. The rock should have your liner pretty well pulled into position now so you can make final adjustments on your skimmer and attach the liner to it according to the manufacturers instructions.

Start filling the pond. Now the fun of building the waterfall and stream. Make sure you have plenty of slack running up to the falls opening before you attach it and make any cuts. Also take care to avoid folds in the liner as you twist downstream. Folds in the stream liner are a common source of leaks and why a very wide liner for a stream is recommended. Dry stack stones as in a wall up the front of the waterfall filter. Using black waterfall foam or some other type of expanding foam to seal the space between the rocks. This makes the water flow over the rocks instead of disappearing into the cracks between. Black waterfall foam is nice for blending in with the rocks. The basic outline of the stream should have been established with excavated soil from the pond, but some digging of different catch pools may be necessary and you may need to build up more of a berm at the waterfall. Rock in the sides of the stream and cover the bottom with gravel as in the pond. Use the waterfall foam to seal in rocks wherever a cascading effect is wanted, using flat rock to form the lip of falls and sealing under them.

Install the pump, install the overflow plumbing and fill valve in the skimmer. When water level is high enough and all the waterfall foam is dry, (you can assume your hands will be covered with the stuff, but try to avoid it because it is very difficult to clean off!) try out the pump. You will then need to refill the pond as it will take a large volume of water to fill the plumbing, falls and stream. Once you are happy everything is as it should be, cut the excess liner away. Leave several inches of liner for settling and possible adjustments.

There are plenty more nuances to building a pond but this should give you a decent feel for what a water garden project entails. The kits that Lee Goins sell include a decent installation manual and he's happy to answer any questions as are many other pond enthusiasts.

A garden center manager, writer, builder of water gardens, musician and webmaster; Lee Goins is often called on as an expert in landscaping and gardening. Lee's site The Garden Aquatic offers products and advice to make water gardening easier. His garden and landscaping site is <http://www.shelbylandscaping.com>

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Now, let's get into the detail ...

BUILDING YOUR POND

1. The first step to consider is to decide what type of pond you want to build. You should consider what type of aquatic life you want in the pond. Is it going to be a home for goldfish or koi? Or is your main concern for the aquatic plants? Perhaps you only want the pond for the sound of a waterfall. Each type of pond will need to be planned for its specific features. Keep in mind that the most common mistake water gardeners say they made when building their first pond was making it too small. A small pond limits the number of fish and plants you can add.

KOI POND

A koi pond is different from a water garden because koi limit the amount of plant life available to be grown. Simply put: koi eat some plants. A koi pond should also be larger because koi get quite large despite the size of the pond, it is recommended that a koi pond be no less than 1000 gallons in volume, the bigger the better. It also needs to have an area of the pond at least 3 feet deep, 4 - 5 may be better.

The information in this section on building your pond has been supplied by The Water Garden in Chattanooga, Tennessee. The Water Garden stocks a vast range of pond accessories and ship worldwide. Visit [The Water Garden](#) online.

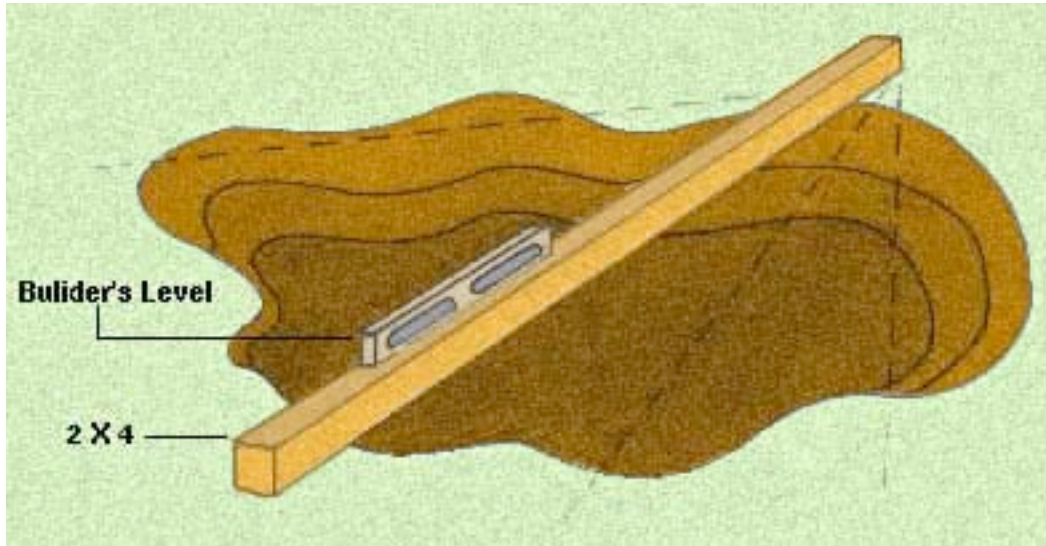
WATER GARDEN

A water garden typically contains both goldfish and a variety of aquatic plants. Water gardens in moderate climates usually need for an area of the pond to be at least 2 feet deep. Colder climates require a depth to provide at least 12" to 16" of water below the freeze zone.

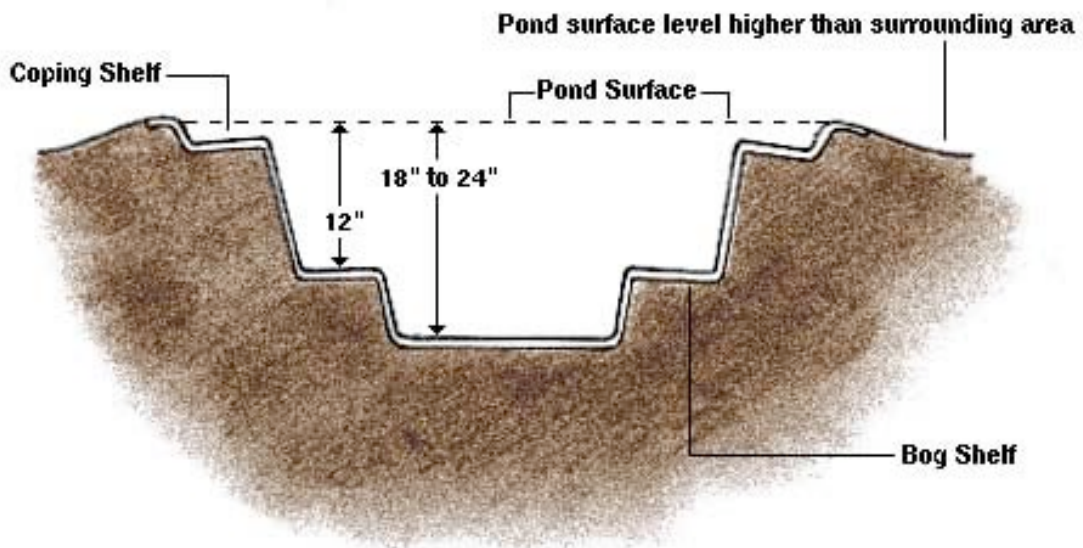
2. The second step in establishing a new pond is to select the proper location. Most ponds will be enjoyed more if they are installed close to the home. Select an area where you can see the pond year round. Ponds are great attracters of wildlife including birds and butterflies. Position the pond where runoff from rain will not flow into the pond. This may carry fertilizers, chemicals, and organic debris into the pond. It may be necessary to alter the terrain to accommodate this. Avoid placing a pond too close to trees. Falling leaves and other debris will need to be removed from the pond. You will want to place your pond where it will receive at least 4 to 6 hours of direct sun if you want grow water lilies. Shade is fine for fish-only ponds. Water circulation is not essential but the use of a pump will allow you to keep more fish, it will keep your plants healthier. A pump is required to run a filter, fountain, or waterfall. The sound of running water adds greatly to the enjoyment of the pond. Most ponds will benefit from the use of a biological filter. This is essential if you are keeping koi or more than a few goldfish. We have several types of biological filters to choose from.

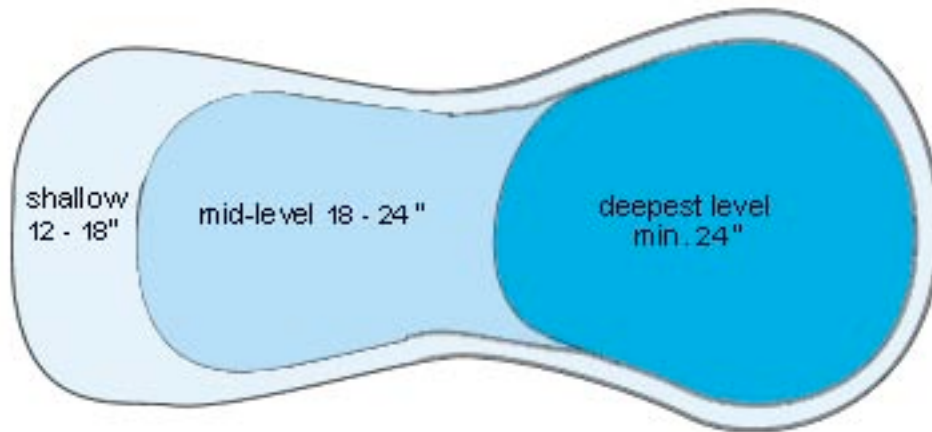
3. Now you need to determine the size of your pond or water garden.

The best way to do this is to use a rope or water hose and lay out the shape on the ground. A pond for goldfish or water lilies need be only about 2 feet deep for zones 5 or greater. Ponds built in colder areas may need more depth to keep the pond from freezing solid. Ponds built for koi should be close to three feet or deeper to allow these larger fish enough space. The biggest mistake that most people make is building the pond or water garden too small. A larger pond is more stable and easier to maintain. Keep in mind that a finished pond or water garden will be about 30% smaller than you visualize it. After you have laid out the shape, measure the maximum length and width. Add the depth twice to these measurements plus a foot or two for overlap and this will give you the pond liner size.

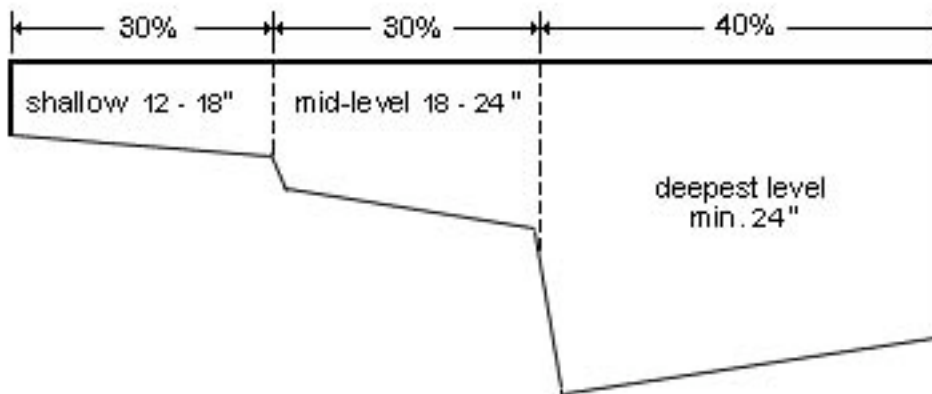


4. Dig the pond or water garden to the desired shape and dig a shelf around the perimeter of the pond about one foot deep and one or more feet wide. Dig the remainder of the pond with a slight slope to the end opposite the waterfall if one is included in the design.





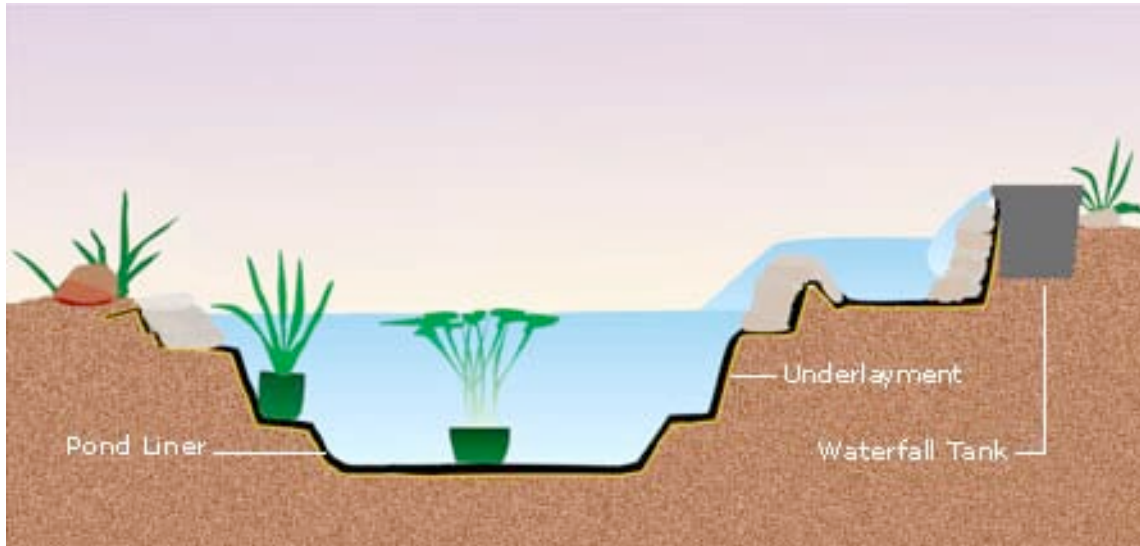
Shelf Depths



5. Position any external pond filters and/or pond skimmers and level these in their proper location. Pond skimmers should be buried to the proper level beside the pond. A ditch should be dug for the plumbing from the pond to the waterfall or external pond filter. If a pond skimmer is being used, dig a ditch to the external pond pump and from the pump to the external pond filter or waterfall. If you are using a submersible pump in the pond skimmer then the ditch will be from the skimmer to the external pond filter or waterfall.



6. Line the pond or water garden excavation with Pond Underlayment. This can be cut with scissors or a utility knife. You may want to tape any small pieces together to keep them from moving when the pond liner is placed.
7. Place the rubber pond liner into the excavation and unfold. Position the liner evenly in the pond. Try to minimize folds and wrinkles but some will be necessary. After the water is added the folds should flatten out.
8. Pond waterfalls and streams can be excavated now. An external pond filter or waterfall tank can be positioned to create the first waterfall. This can be placed to spill directly into the pond in which case the pond liner is held against the pond filter until you are able to stack stone from the pond shelf up against the pond filter to create a waterfall. If a small pool or stream is desired then excavate this several inches deep and to the desired size and shape. Position the underlayment and pond liner allowing extra material to overlap several inches into the pond. Plumbing from the pump can be brought over into the stream or pool or again if using an external pond filter this will be the start of the waterfall. Streams should be dug wider than the finished size to make room for stone that will be placed into the stream for the edging. Stone can be secured to the liner with mortar or expandable foam. This will hold back the water allowing it to spill over the stone creating the waterfall.

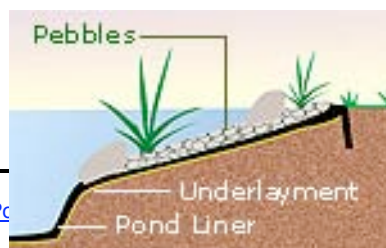


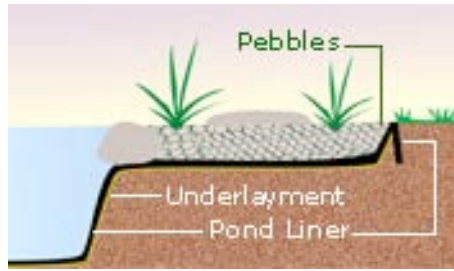
9. Connect the pond liner to the skimmer, if one is being used, following the manufacturers directions. Place the pipe or tubing in place leaving a few inches extra to make your connections later.

10. Place the stone or other coping around the edge of the pond or water garden. Arrange the copingstone around the edge of the pond and fold the pond liner up behind the stone to slightly above the water level. It is usually not necessary to mortar the stone into place if it is of sufficient size to be stable. If using small stone or if people will be walking around the edge then mortaring the stone for stability may be required. Back fill with soil to hold the pond liner against the stone. Fill the pond with water to within a few inches from the top and then make corrections if necessary to ensure that the pond is level. As the pond is filling remove wrinkles and make folds as necessary.

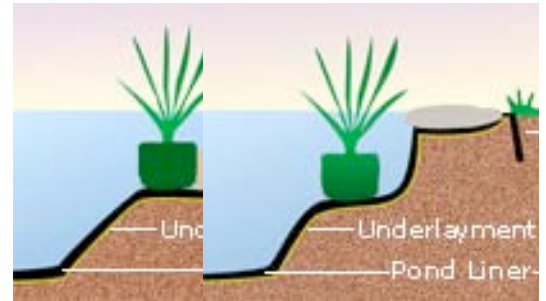
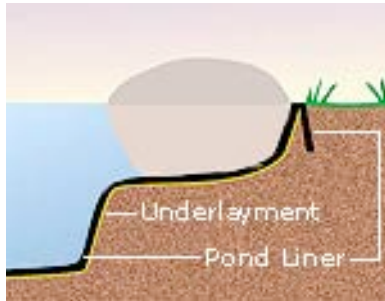
11. Other methods of edging the pond or water garden.

For most installations having a necklace of stone around the pond or water garden does not create a natural appearance. If your goal is to make your pond blend into the landscape in a natural setting then you will want to consider other methods of edging the pond. Besides the traditional method of edging with a thin stone on the edge overlapping the pond you can also use one or more layers of stone built up from the shelf. This provides a more natural appearance and will allow the water to fluctuate without seeing the liner. You can also create a cobblestone beach edging by placing a large stone at the inside of a large shallow shelf and filling the area with gravel and cobbles. You can naturalize this area by planting shallow water plants. This will create a more natural edge with plants partly in and partly out of the water. You can plant bare root plants directly into the gravel or place the plant with some soil still attached into the gravel. This will help the plant to establish quicker.





12. Add dechlorinator to the pond to remove any chlorine or chloramines.



13. Add aquatic plants as soon as possible after constructing the pond or water garden. Add a packaged bacteria to seed the pond filter and pond. Fish should be added a few at a time over several weeks to allow the bacteria to establish in your water garden.

14. The most important plant is Anacharis. This is an underwater plant that uses up the nutrients that would otherwise feed the algae. For ponds and water gardens under 25-sq. ft. use one bunch for every square foot of pond surface area. For ponds 25 to 100 sq. ft. use one bunch for every two square feet of surface area. For ponds 100 to 300 square feet use one bunch for every three-sq. ft. of surface area. Use one bunch for every four square feet for ponds over 400 square feet in size. If you are keeping koi then a smaller upper pool or plant protectors will be needed to keep them from eating the Anacharis.

The next step is to add water lilies and other plants with surface leaves to provide shade to approximately 66% of the surface area if in full sun. If less than full sun then less coverage is acceptable.

USEFUL CALCULATIONS

HOW TO CALCULATE YOUR POND LINER SIZE

The formula is simple. Pretend your liner is a rectangle and use the following formula:

Length = Length of rectangle + (2 x max. depth) + (2 x edge allowance)

Width = Width of rectangle + (2 x maximum depth) + (2 x edge allowance)

Example: A pond 6 ft wide x 8 ft long and 2 ft deep and with a 6 inch edging will need a liner 12 x 14

W: $6 + (2 \times 2.5) + (2 \times .5) = 12$

L: $8 + (2 \times 2.5) + (2 \times .5) = 14$

It is a good idea to add a foot to both of these measurements to allow for error. And you may want to have a wider edging.

How to calculate the surface area of your pond: Ponds can be constructed in unusual shapes but a general guideline for some basic geometric shapes is:

Rectangle or Square: Length x Width

Circular: $1/2$ diameter x $1/2$ diameter x 3.14

Oval: $1/2$ length x $1/2$ width x 3.14

How to calculate the volume of your pond: Note that there are 7.5 gallons in a cubic foot.

Rectangle or Square: Length x width x average depth x 7.5

Circular: $1/2$ diameter x $1/2$ diameter x 3.14 x average depth x 7.5

Oval: $1/2$ length x $1/2$ width x 3.14 x average depth x 7.5

FILTRATION

Filtration is not always necessary in a pond without fish but it is usually desirable.

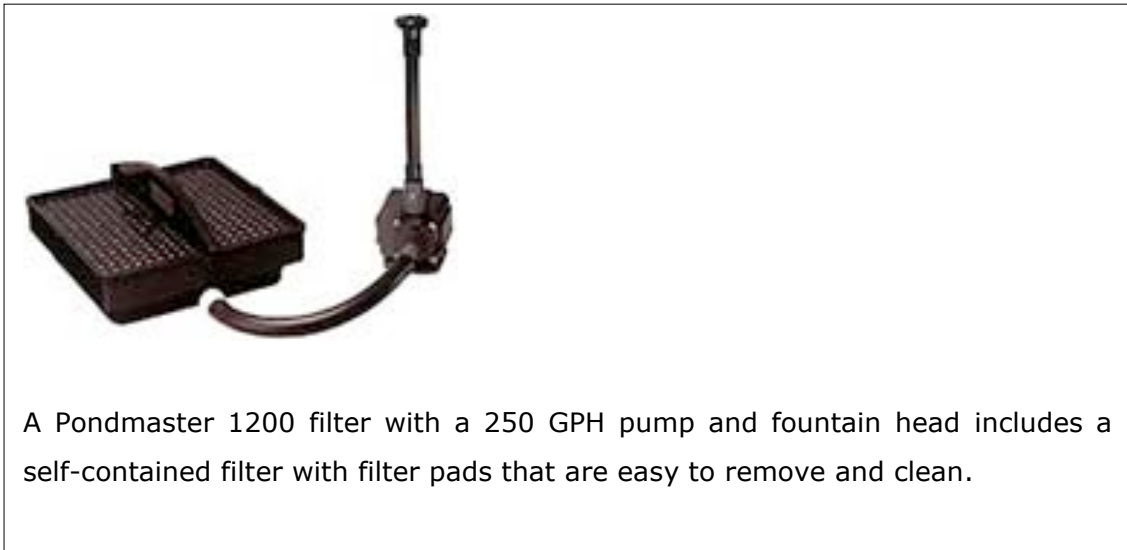
The first rule of filtration is that there is no such thing as a filter that is too big! If you only want a few fish and you don't mind green water then you'll get by with a smaller filter. If you want a pond that supports fish and plants and has clear water it will require filtration.

If your pond is in direct sunlight (and you'll need sunlight for your plants to flourish and flower) then your pond will almost certainly generate a lot of algae without adequate filtration.

The main types of filtration are mechanical which removes particles from the water and biological, which uses bacteria to breakdown matter.

MECHANICAL FILTRATION

This type of filter removes particles that are suspended in the water. The particles are trapped in the filter and then removed when the filter is cleaned. Mechanical filtration can be as complex as a series of separators and screens, or as simple as a strainer. It depends on how big the particles are that you want to remove and how much maintenance that you want to do.



A Pondmaster 1200 filter with a 250 GPH pump and fountain head includes a self-contained filter with filter pads that are easy to remove and clean.

Mechanical filtration generally involves some type of filter media wrapped around a screen on a pump. They are readily available from pond supply stores but ensure you

know the volume of your pond before you purchase a filter. Remember: there is no such thing as a filter that is too big. A mechanical filter can be used as a pre-filter to a biological filter

The filter pump can also be used in conjunction with a waterfall or fountain which will add oxygen to the pond.

Seek advice from your local pond supply outlet or do an online search for “pond filters” to find online retailers who can supply your needs. Many of the larger online retailers will provide advice, and will ship internationally.

With mechanical filtration you will be cleaning / replacing the filter media frequently.

For severe algae problems an ultraviolet sterilizer can be added.

UV sterilization is a proven and effective method of controlling algae spores, protozoa and bacteria present in the water, however it should be noted that this method will eliminate both wanted and unwanted organisms. I frankly think it is easier to try to gain a healthy balance in your pond through natural means rather than resorting to UV sterilization.

BUILDING YOUR OWN BIOLOGICAL POND FILTER (VEGI FILTER)

Concerned with maintaining the health of his very large pond, Erik Kilk wanted to install a filter and spent considerable time researching different types. The following information is the result of his research and describes how he has built – and how he maintains – a biological filter in his

stunning pond. Erik’s pond is very large – he converted an unwanted swimming pool – but the information and description is applicable for anyone wanting to build their own biological filter. The sizes could be changed to match the pond size.

The information in this section on constructing a biological filter has been reproduced with kind permission of Erik Kilk from <http://www.kilk.com/pond>

“Because I was very concerned about having such a huge amount of water go bad on me I planned on a pond filter. I didn't want a huge ugly algae mess. I spent considerable time researching filters. In my previous home's pond, a smaller typical yard pond, I built it like an aquarium – with an underground gravel filter with PVC pipe running through it. It worked fantastically and I had perfectly clear water for years. But someone warned me it would be hard to clean. So this time I used the same principle (since it worked so well the first time) but I built it externally to the pond. In addition, I had now learned about the vegi-filter concept which incorporated plants.

MY FILTER CONSTRUCTION

The basic idea for my filter is to pump water to the filter, have the water percolate up through the gravel and plants, and then let gravity bring the water back to the pond via a spillway. I used one foot of gravel and an additional foot of water above for the plants. Finally, the water returns to the pond with gravity through a robust spillway that is safe from raccoons and clogging from leaves. The pictures below give a closer view.







I used 8' landscape ties and 3/8" rebar. The whole thing is 16' x 2' x 2' which is approximately 500 gallons and 5% the volume of the pond. Concerned it would be hard

to insert the rebar, I cut and overlaid all the wood first without the rebar. Then I used a plumb bob and string to mark each piece where the rebar goes. I took the whole thing apart, drilled the holes for the rebar, and put it back together. (Make sure the holes are a little big - otherwise it's a royal pain to fit the landscape ties back over the rebar.) Next I added 1 foot of gravel, connected the pump and plumbing, and added a few 79 cent bunches of watercress to start growing in the water. In 2001 through 2002 I added six plants of mint and let them grow as they will. The mint is doing best had has overtaken the watercress. The last picture above shows the mint. (Today I have given up on the watercress and mint and just use water hyacinth in the summer.)

When I built my first gravel filter, I read somewhere that it should take 45 minutes for the water to flow through the filter to maximize the bacterial action. This is very slow. Nice because it means you can get by with a smaller, cheaper, and more efficient pump. Unfortunately I don't seem to be able to regulate my water to go that slow. I noticed my filter fills in about 20 minutes.

CLEANING THE FILTER

Everything kept my pond crystal clear for so long that I honestly didn't get around to cleaning my filter for 5 years - then I figured it was time. I was worried what I might find. To my surprise when I removed the gravel to rinse it, I found it only scummy along the top. Most of the gravel was rather clean. Honestly, I think I could have gone another five years without cleaning. Note that this is far better than the commercial filters you'll find for many times the cost. Ask them how often you should clean them? You'll find they need cleaning about every week.

I reworked my outflow plumbing recently to add a T-connector with a threaded plug on both the inflow and outflow pipes. I placed these at the lowest point in the plumbing (which is just under the filter). The next time I want to clean my filter I will unscrew these plugs, let the water spill onto the ground, and stir up the gravel. This will let me flush the gravel clear without having to remove the gravel. (By the way, I have done this now once and it was very easy.)

I don't quite understand why the filter doesn't need cleaning except for every 5+ years. My guess is I've properly sized the filter and the whole system is nicely balanced.

PUMP AND PLUMBING

The plumbing system works as follows.

Although I started with a Cyprio 2206 (2200 gph) pump, I have since replaced it with a smaller, magnetic 1200 gph pump. I did this because I noticed I was always turning down the 2200 gph pump to try to get the water to take at least 20 minutes to run through the gravel. The magnetic style 1200 is also quite a bit more efficient. The pump is in a pump

cage at the bottom of the pond (at the 4 1/2' depth.) The cage is wonderful. I think it would keep the pump from clogging indefinitely. I pull it up about once a year to wipe off leaves and plants.

From the pump the water goes via flexible 1-1/2" tubing to hard 1-1/2" PVC near the pond edge just under the water's surface. From here the 1-1/2" PVC takes the water under the deck to under the filter. Before the PVC enters the filter, I have placed three very useful accessories. First, there is a T'd off hose valve as the PVC crosses over the pond edge at its highest point (hidden in the flower beds). Second, there is an inline ball valve to control the water pressure and speed. Third, there is a T'd off and plugged drain at the lowest point in the PVC run. These all allow me considerable flexibility in controlling the water, draining the pond, draining the filter, and draining the PVC pipe itself.

The pipe enters the underside of the filter with a 1-1/2" bulkhead. You can search for this on the web - they are hard to find in stores. This forms a watertight seal for the PVC to get through the EPDM liner of the filter. From here a little network of PVC pipe is embedded in the gravel with little holes. This allows the water to evenly disperse through the length and width of the filter. At this point the water fills up the filter from the bottom up.

I am using 3" black ABS drainpipe for the outflow from the filter. The water "overflows" into a 3" wide ABS pipe sitting vertically in the middle of the filter. Water then falls down this 3" pipe. You may have seen large dams using the same technique for their spillway. The water spills through this ABS pipe, through the pond liner with a 3" bulkhead (a rather spendy \$50 piece of plumbing), past a plugged T-fitting (for drainage), and then under the deck and up over the lip of the pond onto some rocks. Obviously, for gravity to work, the filter surface water must be at least a few feet above the surface level of the pond.

Filter Plants

Over the years I have experimented with several different plants for my filter. I tried water cress for a couple years - it would go crazy and spindly in the summer. I tried mint - it worked well but also would get out of control in the summer. Both of these had an advantage that they continued to grow in cold weather. But I have settled upon using water hyacinth during the spring, summer, and fall. I go ahead and purchase about \$40-\$100 worth of water hyacinth every spring. It grows like crazy and filters fantastic. Unfortunately it dies every fall when the frost returns. During the winter I have sometimes let the filter run without any plants (and in fact that is what I've done the last couple of winters.)

The above information on building a biological filter has been kindly supplied by Erik Kilk of <http://www.kilk.net/pond/filter.html> Erik's site contains a wealth of information on pond building and has a description of an amazing transformation of a swimming pool into a pond!

Links for information on filtration:

The [Bickal Koi Farm](#) site shows you how to build various filters including a large filter with a settling chamber, filters using pond liners, a filter using a 55-gallon barrel and a small “trickle-tower” filter.

The [Pond Builder](#) site contains useful information on D-I-Y filtration systems.

CHOOSING THE PROPER POND PUMP

Whether you have a preformed or a liner pond, a pond pump is a paramount component of any water feature. Stagnant bodies of water attract mosquito infestations, which are a nuisance, and also undesirable, due to the recent outbreaks of the West Nile virus. Therefore, it is paramount that you utilize a pond pump that circulates your body of water.

Pumps are available in both submersible and external (out-of-pond) models. For the smaller pond (up to 1000 gallons of water), a submersible pump is the more economical and practical option. Submersible pumps can be placed directly in the pond and require relatively little installation. They are free of distracting noise, and for smaller ponds, can easily be utilized to drain your pond (if you hook up a hose to the output flow).

In the old days, the main disadvantage of submersible pumps was that the pump seal could rupture and release oil coolant into the water. However, this is not the case nowadays, because newer pumps are magnetic-driven, and no longer require coolant. “Mag-driven” pumps are slightly more expensive, but they have the added advantage of consuming less electricity.

Pumps are sized by gallons per hour (GPH) output at one foot of lift or height. Manufacturers usually offer charts that break down the power of each size pump according to incremental heights of one foot. It is recommended that you circulate your body of water at least once every 2 hours. Therefore you will need to size your pump to ensure that it has half the GPH rating as the volume of your pond in gallons. For example, if you have a 1000 gallon water feature, you will require at least a 500 GPH pump.

Calculating the proper pump for waterfalls is a bit trickier, because you must estimate your waterfall's height. To do so, you must measure the vertical height from the top of your pump to the top of your waterfall. In addition, you must add another foot of height or lift for every 10 feet of hosing you will be using (this will allow for loss of volume from resistance within the hose). To calculate the required pump GPH, a general rule of thumb is that each inch of width of the channel will require an extra 100 GPH. For example, if your stream or waterfall spillway will be 10 inches wide, you will need a pump that produces an excess flow of 1000 GPH at your waterfall's height.

If you plan on having fish, your water circulation demands will be drastically increased. Fish rely on the oxygen in the water to survive, hence a proper pump for a fish pond must ensure that extra oxygen is both introduced into the pond, and distributed throughout the pond. The general rule of thumb is that you must double your pump GPH if you plan on raising fish. An example of a pump that would be appropriate for fish is GardenSuperMart's UltraFlo line of pumps. These pumps have oxygen intake valves and an unique air/water air mix system which effectively increases the oxygen concentration in your pond.

The advantage of GardenSuperMart's low-maintenance, magnetic-driven UltraFlo pump kits is that they contain a sealed unit with a large enclosure that prevents debris from clogging the water intake. The UltraFlo line of pumps starts at 200 GPH, and increase up to 660 GPH. All UltraFlo pump kits come complete with a telescopic riser and diverter and 3 fountain heads.

If you require a more powerful pump, GardenSuperMart also has a SuperFlo line of pump kits that can provide up to 1585 GPH. All SuperFlo kits come complete with a telescopic riser and diverter, 4 fountain heads, and a sponge pre-filter. An optional SuperFlo Mechanical and Biological filter can also be added to the pump to provide additional water filtration for your fish.

Both the SuperFlo and the UltraFlo pumps can be purchased online at GardenSuperMart's store.

This article is by Gerry Fung, Vice President of [GardenSuperMart](#).

More information about their pond pump lines can be obtained [here](#).

Article Source: <http://EzineArticles.com/>

WATERFALLS AND STREAMS

As you would guess, a pond waterfall will become the focal point of any pond and the benefits of building one continue to grow. Aside from the obvious pleasant sound of a waterfall welcoming you and your guests into your own tropical paradise, there are many other practical benefits you may not know about.

The information on constructing your waterfall has been supplied by [California Waterscapes](#). They specialize in creating natural ecosystem fish and koi ponds, waterfalls and streams.

Do you live near a busy street or freeway? Homeowners have reported to us that a major benefit of owning a pond waterfall is a significant reduction in traffic noise.

Pond waterfalls actually help to decrease the traffic sounds near your home, giving you the backyard oasis you thought wasn't possible due to the unwanted noise. This of course, increases your home's property value too!



Another benefit of having a pond waterfall is that mosquitoes cannot breed in moving water. This benefit is of particular interest to anyone concerned about the West Nile Virus and heartworm, which mosquitoes carry.

Moving water discourages mosquitoes, which love to breed in stagnant pools of water. Adding a pond waterfall or stream can help prevent your pond from becoming a neighborhood breeding ground and will make those evenings by the pond more enjoyable for everyone

HOW TO BUILD A WATERFALL

When you build a waterfall you have to get it the right size in proportion to the pond. After building hundreds of waterfalls California Waterscapes know that more often than not, bigger is NOT better.

Waterfalls can add a very nice touch to a pond or backyard or they can totally overwhelm a small area.



More often than not, people tend to build too big, too tall and with too much water. The design phase is very important. You must know what effect you want to create. Is the waterfall in a small, enclosed space or is it in a grand entrance?

FLOW OF WATER IN A WATERFALL

To help you further with the design you can follow these basis rules.

All waterfalls should have a minimum of 100 gallons per hour of water flow over each inch of width of your waterfall. If your fall has a width of 20 inches you should have a flow of 2000 gallons per hour for it to look good.

SOUND OF WATERFALLS

When building a waterfall the sound is a combination of three basic factors:

1. The volume of water
2. What the water is falling onto, and
3. The distance the water falls

We discussed the volume of water above. As that volume increases, say to 200 gallons per inch, the sound of course will increase. If the volume is cut to 50 gallons, again, the sound will decrease.

BASIC WATERFALL DESIGN

There are several types of sounds created by what the water is falling onto. The most pronounced is water falling directly into a pool of water. Next is a shallow pool, followed by water falling onto a rock or boulder and then water sliding over rocks or boulders.

The distance the water falls is a key factor. A 3 inch to a 4 inch drop can be quite subtle, but as it's increased to 18 to 20 inches, the sound increases significantly. Of all the factors, this is the most distinct.



You can experiment with a garden hose running into a bucket or a pool and note the difference.



From all this you should be able to work out the basic design of your waterfall.

DETERMINE THE SIZE OF POOL OR BASIN

The next thing to determine is the basin or the pool the water will flow into.

If the water is going into a pond, the size of the pond in square feet of surface area needs to be 1 1/2 times the square footage of your waterfall and stream.

If your waterfall and stream is 20 feet long and 3 feet wide, then the pond should be 90 sq. feet. This is to allow the pond to capture all the water from the stream and waterfall when the waterfall is turned off without the water overflowing the pond.

BUILDING A WATERFALL WITHOUT A POND

If there is not room to accommodate the size of the pond, then a different technology can be used called a Pondless Waterfall.

Now that you have the basic design done, it's time to start building it.

See section on How to Build a Pond



MORE ON WATERFALLS

Hugh Harris-Evans, the owner of The Garden Supplies Advisor where you will find further articles, gardening tips and product reviews, has the following advice on building a waterfall.

Building a waterfall is easier than you think and will add a new dimension to your pool.

When building a waterfall, as with any garden project, you must first consider the design and make a plan. The biggest mistake that people make when planning a pond waterfall is to err on the large side. For a pond measuring 12 ft x 14 ft you should think in terms of a fall of 18-24 inches. The width of the waterfall should be in proportion to the size of your pond. The important point is to make sure that the scale of your construction fits in with the surrounding features and does not spoil the balance of your overall garden design.

The next question that has to be answered is the type of construction you wish to use. There are two basic choices. You can either use a liner and place rocks to form the fall or you can save yourself the trouble and buy a fiberglass unit. Either way you will still have to use your shovel to form the site of the waterfall.

The other requirement is a pump which will be sited in the pool to transport the water to the top of your waterfall. The size of pump that you will need depends on the height and width of the waterfall and also the length of pipe from the pump to the top of the fall. Once you have finalized your plans, consult your dealer and he will be able to supply you with the correct pump.

To maintain a healthy pond environment with crystal clear water usually involves installing a biological filter. Again your dealer will be able to advise you as to the correct type and size. The filter should be placed at the top of the waterfall so that the water is cleaned before issuing out on to the fall.

Once you have assembled all the equipment it is time to get out your shovel. If your site is level and the soil from excavation of your pond is nearby this can be used as the mound on which to place the waterfall. If you are using a liner you first dig out the channel and then fit the liner. Next place the rocks so that the water can flow over them. It is helpful if you observe a natural waterfall to give you some ideas as to how the rocks can be placed for the greatest effect. Once you are satisfied with the arrangement, use black waterfall foam to seal the rocks to ensure that the water flows over and around them and not underneath. If you have chosen to use a fiberglass preformed model, you will avoid the problem of placing the rocks and will just have to dig out sufficient soil to allow you to fit the unit.

To complete the installation fit the pump, filter and hose and connect to the electricity supply. Providing all is working to your satisfaction, now is the time to relax and enjoy your handiwork.

If you have read this far and are wondering whether it would be just too much like hard work, then consider this. Water soothes and relaxes, inspires reflection, and is a source of beauty. A cascading, bubbling stream adds interest and serenity to the garden, while a waterfall can create a dramatic centerpiece. Building a pond waterfall really is worth the effort.

Hugh Harris-Evans is the owner of The Garden Supplies Advisor where you will find further articles, gardening tips and product reviews.

Article Source: <http://EzineArticles.com/>

SEASONAL POND CARE

SPRING

As spring approaches the following list of pond care suggestions will help get your pond off to a healthy start for the spring and summer growing season.

- Increase water circulation.
- Start feeding your fish again when the water temperature reaches a constant 50 degrees.
- If there has been an accumulation of leaves and other debris over the winter you should remove this now. Leaves can be removed with a skimmer type net that has a square end that allows you to push this across the bottom of the pond scooping up the leaves.

You can also use the Leaf Eater Vacuum or Mini Vac for smaller ponds and small leaves to vacuum the leaves from the bottom of the pond. These devices use fresh water from your garden hose to create the suction. You could also try to use a shop vac but this removes a lot of water in the process and may not be the best choice. If there are lots of leaves and sludge accumulated in the pond to the point that you cannot remove this easily a complete pond cleaning may be necessary. A complete cleaning will upset the balance of the pond and actually interfere with algae control but should you decide to go this route you can use the following method.

- Pump water from the pond into a large tub or other container. The exact size will depend on the number and size of fish that you have but should be as large as possible.

It may be necessary to cover the container with leaf netting or something similar to keep the fish from jumping out especially if you have koi. This container should be in the shade if it is hot out.

Continue pumping the water out of the pond until it just covers the fish. Use a fish net to catch the fish and place them in the container with the water just pumped from the pond. Also the plants can be removed if repotting is necessary or left in the pond. If removed they should be kept in the shade and covered with damp newspaper. Underwater plants should be kept in a container of water.

After you pump as much water out of the pond with your pump as you can, you will want to use a shop vac to finish up or you can use a large dust pan and broom with a bucket to

The information in this section on seasonal pond care has been supplied by The Water Garden in Chattanooga, Tennessee. The Water Garden stocks a vast range of pond accessories and ship worldwide.

Visit [The Water Garden](#) online.

finish removing the sludge. Do not try to scrub the velvet type algae that may coat the liner as this is beneficial. Do not use any chemicals.

After the pond is clean you can pump the water with the fish into the pond and then put the fish back into the pond. Add a dechlorinator to remove the chlorine and slowly add water from the hose to finish filling the pond. The plants can be placed back into the pond during the filling process. After the pump and filter are turned back on it is a good idea to add bacteria such as Biological Clarifier, Bio-Filter Booster, Microbe-Lift PL, or Microbe-Lift Spring/Summer Cleaner, to help in establishing the balance of the pond. Acclimate fish.

- Fertilize each plant and place at appropriate depth. Lilies and Lotus should be fertilized every 3-4 weeks, marginals every 5-7 weeks.
- *
- Add Anacharis to prevent algae growth. Use one bunch per one sq. ft. of surface area for ponds under 50 sq. ft. and one bunch per two or three sq. ft. for ponds over 51 to 200 sq. ft. For ponds over 200 sq. ft. use one bunch for every three to four sq. ft.
- *
- Turn on Ultraviolet sterilizer after the biological filter is working properly and the water starts to turn slightly green.
- *
- Add Pond-Zyme or Microbe-Lift PL (these products contain bacteria to help jump-start biological filters and break down sludge).
- *
- Divide and re-pot plants as needed.
- *
- Add floaters such as water hyacinth and water lettuce (late spring after danger of frost has passed).
- *
- A few things you may need: Fish net, Dechlorinator, Biological Clarifier, Anacharis, no-hole aquatic plant containers, Aquatic Plant Soil, gravel, fish food, and a thermometer.

SUMMER

- Remember to continue fertilizing your plants.
- Remove dead foliage from the pond.
- Feed your fish well.
- Maximize your aeration.

AUTUMN/WINTER

One of the most significant events of Fall is, of course, when leaves begin to fall from the trees above. If these leaves get in the pond and decay it will throw off the ecological balance of a water garden. One option is to use a net to skim leaves off the surface of the pond as they fall, but this can be a daily chore. Also, don't expect a skimmer type filter to get the leaves. Skimmers are designed to get the occasional leaf or other floating debris. Heavy leaf fall can clog a skimmer several times a day. Installing leaf netting over the pond will be easier to maintain.

It is best to try to minimize the amount of accumulated sludge, decaying plant debris, etc. from the water. This can be done with a net, by siphon, or by use of a pond vacuum, like the Mini-Vac or the Leaf-Eater.



Fish

The water temperature is dropping now and we should be feeding our fish less as their metabolism slows down. Hopefully you have been feeding your fish well with a high protein food this summer to allow them to build up a reserve of fat to help them through the winter. After the water temperature drops to the sixties you should decrease the amount of food given and feed only once a day. Provide food with a protein content of 25 to 32 percent. A wheat germ based food is good at this time as it is easily digested. Pond Care's Spring & Autumn Food is an excellent food at this time of year. It is Formulated with a unique blend of amino acids and minerals to help supplement the dietary requirements of koi and goldfish in cool water.

As the water temperatures continue to drop to below 60 degrees you should feed only two or three times a week. It can take your fish two or three days to digest food at this temperature.

Once the temperature drops below 50 degrees you should stop feeding altogether until spring when the water temperature remains above 50.

As organics decompose in the pond they can produce toxic gases that could be trapped in the pond if it is covered by ice for more than a few days. It is important to keep at least a small area free of ice so that these gases can escape. Do not break the ice as the shock waves created can damage or kill your fish. One of the easiest ways to do this is with a floating pond de-icer. This device floats in the pond and has a built in thermostat to turn the heating element on when the water temperature drops below 40 degrees. They can also be used to keep a small pond from freezing solid allowing you to keep your fish alive.



Floating pond de-icer

With their slower metabolism and the absence of plants our fish are more susceptible to predation by raccoons, birds and other animals. If you took our advice and added leaf netting to keep the leaves out of your pond this should protect your fish as well. A Koi Kastle will help your fish be more comfortable by providing a place for them to hide. One of the most effective methods of keeping predators away from the pond at any time of the year is the ScareCrow. This device senses movement with a motion detector and sprays any intruder with a burst of water frightening them off.



Above: koi kastle; right: scare crow

Plants

You should have stopped feeding your plants by now. As the foliage on your hardy plants begins to die back you should remove any dead and dying leaves and place the plant deep enough in the pond to keep the roots from freezing. While it is true that some marginal plants will survive even if their roots freeze solid it is best to lower all of your plants below the ice zone.

If your pond is too small or shallow to offer protection from freezing temperatures then you still have other options. You can add a floating deicer, which will keep the pond above freezing. If your pond is not too large and does not contain any fish you can place

a cover such as plywood over the pond and cover this with bags of leaves or bales of straw to provide insulation. A tarp should also be placed over the straw to keep it dry to provide better insulation. A basement can provide protection if you remove the plants and store them either in their original containers or in peat moss. A method that I like is to build a temporary shelter over the pond. Lumber or PVC pipe can be used to construct a framework over the pond. Place clear plastic over this and weight the plastic down with soil or stone. This frame should hold the plastic a few feet above the water. Greenhouse type plastic is best but construction grade plastic should last the winter. This method works very well and is basically like moving the pond to one USDA hardiness zone higher. On clear days the sun warms the water and even if covered with snow there is good insulation over the pond. Some tropicals can be wintered over this way in mild winters even if you live in zone 6 or 7.

Some plants do not like being submerged in the pond through the winter. *Iris ensata* formerly known as *Iris kaempferi* a Japanese Iris should be removed from the pond and planted in the yard until spring when new growth starts and it can be placed back in the pond for the summer. *Lobelia cardinalis* (Cardinal Flower) should be removed from the pond and planted in the yard for the winter. This plant should have a few inches of mulch over it as well. You will have more success wintering over Cannas if you remove the rhizomes from the pot and store in slightly damp peat in a basement or other cool area. Some tropical water lilies will bloom all winter if kept in a tub container inside and given at least six hours of bright light. You can also winter them over by removing the tuber from the pot after the foliage has died back from a freeze. Place the tuber in a container of slightly damp sand or peat moss at 50 degrees. In the spring you will need to heat the tuber in an aquarium to about 75 degrees to trigger its growth before moving outside.

One choice with tropical plants is simply to dispose of them after freezing weather and replace them in the spring. This way you get to try new plants and colors next season. If you want to try wintering over your tropical plants there are a few methods worth trying.

Many tropical plants can be brought inside and treated as a houseplant for the winter. Umbrella Palm, Taros, and Calla Lilies will do very well with medium light levels. If these are in no-hole containers then no special care is needed otherwise keeping the pots in a tray full of water is needed to keep the plants wet. Water hyacinths and water lettuce require more care than they are worth; it is much easier and less expensive to replace them each spring. If you still want to make the effort they require 10 hours of intense light and temperatures above 70 degrees.

Pumps and Filters

Depending on your climate and other factors you may or may not want to run your pump and filter system through the winter. If you live in a climate with temperatures mostly well above freezing then it will be to your advantage to keep your pump and filter running through the winter. The bacteria in your biological filter will not be active at low temperatures but it will remain alive as long as you keep it supplied with oxygen-laden

water. When spring arrives and the water temperature is rising the bacteria can start to work immediately keeping the water quality good for your fish and helping to control the algae. Should you choose to run your filter through the winter it is a good idea to minimize the water circulation in order to take advantage of the layering effect of the water. (Water temperature is densest at 39 degrees and the water on the bottom of the pond will remain at this temperature even with freezing temperatures on the surface.) Some ways to minimize circulation is to turn off bottom drains if possible, place intakes to pumps/filters at mid-water, turn off surface skimmers, (you do not want to circulate top or bottom water in the winter), place your intakes closer to the outlets in the pond (waterfall or fountain), and or turn the pump down. These actions will allow the biological filters to stay alive without interfering with the layering of the water. Massive circulation of water in the winter can super chill the water by exposing warmer pond water to below freezing temperatures leading to the death of the fish. One problem with running a pump and filter in the winter is the potential of major damage to your filter and plumbing system if the power goes off for extended periods and you are not at home to make sure that no water is present in the filter and plumbing. If water is allowed to freeze in plumbing, UV's and filters this can lead to breakage requiring replacement of these units. If your system is designed to allow the water to flow back into the pond in the event of a power outage then these problems can be averted. If you have a check valve installed in your system you can use a long piece of small tubing or wire to hold the valve open to allow the water to drain out.

You can turn off the pumps and filters for the winter. Cold water holds much more oxygen than warm water and the fish's respiration is slow therefore you should not need the circulation and aeration. The bacteria in your biological filter does not work in cold temperatures so the only reason to run the filter is to keep the bacteria alive. If you turn off the pump and filter for the winter be sure to drain all plumbing. External filters, UV's, and external pumps will need to be drained. Submersible pumps should be left in the pond or in a bucket of water in a warm place to keep the seals from drying out. If you choose this method be sure to clean the filter before starting up in the spring. With the absence of biological filtration you may want to add a product containing bacteria that will work in near freezing temperatures that also contains enzymes that consume cellulose in the form of leaves.

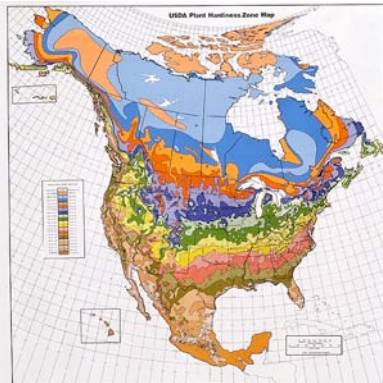
A check-list for Autumn/Winter pond care

- Before the leaves begin to fall, cover your pond with one of several sizes of leaf netting. (It is much easier to keep the leaves out than to remove them after they fall into the pond)
- This is a good time to divide some types of aquatic plants (waterlilies and iris)
- Remove tropicals from the pond as they will decay and pollute the water.
- After your hardy plants have stopped growing, cut back the foliage and lower the pot to the bottom of the pond.
- Stop feeding your fish after the water temperature has dropped to the mid to upper forties.

- Also when the water temperature has dropped into the forties, reduce the circulation of the pond water by either turning off the pump for the winter and draining of all the plumbing or preferably by placing the pump or the intake to the pump closer to the water outlet (waterfall etc.) and pick up water from mid-level of the pond. Also turn down the water flow. Keeping the water flowing through your biological filter allows the bacteria to live therefore giving good water quality early in the spring.
- **If you keep your filter running through the winter, you must take precautions against the freezing of water in your plumbing should there be a power outage.**
- You can add a floating de-icer to keep an area free of ice. This opening is necessary during periods of ice cover to allow an exchange of gases.
- Water Hawthorns are a nice addition to the pond and sometimes bloom through the ice. They grow and bloom fall through spring and go dormant in the summer.



USDA HARDINESS ZONES



USDA Hardiness Zone Map (courtesy US National Arboretum). [Click here](#) to go directly to the hyperlinked online version of the map.

WILL YOU NEED A DE-ICER?

[Greg Bickal from [Bickal Koi Farms](#) has provided this information on pond de-icers.]

In Northern Climates (Zone 1 through 5), our ponds can be covered with ice from December to mid-march. This ice can be as thick as 8 inches. The ice traps toxic gases and doesn't allow the exchange of oxygen to occur. If a hole is not left open in the ice, your fish could suffocate and die.

HOW DOES THE DE-ICER WORK?

The Deicer uses the heat from two standard 25 watt light bulbs to warm the air inside the unit. The warm air keeps a hole open in the ice. The black color absorbs sunlight during the day, thus an additional thermal gain. Air takes less BTU to heat than water, so the unit is more efficient than a stock tank heater (which typically draws between 1000 and 1500 watts). This efficiency can add up to significant savings over the winter months. Here's the cost comparison:

Bickal Deicer 50 watts X 24 hours a day x 30 days = \$3.46

Stock tank heater 1000 watts X 1000kwh x .0962 (cost per kwh) = \$69.26

So you can see that's a savings of \$65.80. That's enough to pay for the unit in its first month. In central Iowa, we usually have 3 months of ice on our ponds.

DESIGN FEATURES

The unit is designed with 2 bulbs to provide redundancy and will still work if one bulb burns out. Proven effective up to 15 degrees below zero with a 45 below zero wind chill factor at the recommended wattage. Higher wattage bulbs may be used, but are not recommended. The floatation ring is filled with styrofoam to prevent sinking in case the base were to get ruptured. Bulbs may burst if they come in contact with cold water. Deicer should be plugged into a Ground Fault Protection Outlet (GFI). Snow, Debris, and small animals should be removed from the top of the de-icer to prevent sinking. The unit is designed to support only its own weight!

NEW PONDS AND ALGAE CONTROL

by: PondGuy at [Ponds Plus](#)

Probably the thing we hear most frequently from brand new ponders is: "My pond was beautiful for a week and now it's so green I can't even see my fish!"

Around here, we call it "New Pond Syndrome". A pond which is well designed, properly aerated and filtered, has "good" amounts of live plants, and which is not "overstocked" with fish, must go through a maturing (or curing) process that usually lasts between 4 and 8 weeks.

The first week the pond will stay crystal clear and you'll feel great joy and accomplishment.

The second week begins with the pond looking cloudy or hazy, with the fish still visible. But by the end of the week, the pond is turning greener and greener each day.

During the third week, it gets so bad that you can't even tell which fish are eating the food, you just barely see little lips on top of the water during feeding time. The filter is getting clogged up so quickly that you find yourself cleaning it almost every day! You begin to despair and wonder if this is what "ponding" is all about?

Don't panic. And whatever you do, DON'T drain the pond and clean it out.

If you do absolutely nothing except frequent filter cleanings, the pond will clear up on it's own! One day, between weeks four and eight, you'll walk out to feed the fish and your pond will overnight have become absolutely crystal clear! It is ok at that point to dance around the yard singing gleefully as you are overwhelmed with the beauty of your landscape creation! (Just make sure the neighbors aren't watching you dance and sing around the yard!)

"What's happening in my pond during those first two months?" you ask? Well, it takes a while for all of the beneficial carpet algae to become established. This is the green/black/brown algae that covers everything in the pond. This is good algae! Once established, it will begin to out-compete the floating green algae (bad stuff) for the nutrients in the water. Eventually, the bigger plants plus submerged grasses, plus the carpet algae will starve all that bad floating green algae to death.

The other thing that's "maturing" in your pond is your biological filtration. This is the colonies of invisible bacteria which inhabit your filter system (and pump, pond walls, tubing, and everything else in the pond). This beneficial bacteria converts fish waste into plant food and gases. It takes about 3–6 weeks for the beneficial bacteria colonies to become numerous enough to handle all the waste produced by the fish. Once established, the biofilter also aids in keeping the water clear.

Remember, this hobby IS enjoyable! Keep telling yourself that, frequently! Your water will clear up! Give it time!

Or, there are a couple of things you can do to make the water clear(er) during the maturation process! We recommend using a liquid preparation of concentrated live bacteria. These products do several things, all of which are good for your pond and for you. They will deprive the floating evil green algae monster of food and will change your pond from pea-soup green to crystal-clear in about three to eight days (depending on several factors). These products also provide bacteria which function the same as those beneficial guys who'll someday inhabit your biofilter. They will, in other words, perform the same job as your biofilter until your biofilter is established enough to take over. Of the eleven or so products containing beneficial bacteria that we have (informally) tested, we choose to recommend Microbe-Lift PL. There may be others out there that work well, but there are some we have tried that severely disappointed us.

Avoid algae control products that say things like "pond clarifier". Most of those products will kill the existing algae and cause it to flocculate together and sink to the bottom of the pond. They work quickly, usually in a few hours. BUT, (there's always a "but") you must do something to vacuum up all the clumped dead algae at the bottom of the pond or when it decays, it will release all of it's nutrients back into the water at once and feed the next bigger, badder algae bloom.

Avoid products that contain copper compounds of any sort (copper, Cu, cupric). They usually warn you that they will kill your water lilies, but what they don't tell you is that copper can be retained forever in the bodies of your fishies (Cyprinidae family, koi and goldfish) and that there is a very narrow window of pH and alkalinity where it's use is safe. You may use a product like this successfully once or twice or even thrice, only to find the next time kills all of your lovely fish. The safe use of copper compounds is greatly affected by water temperature, alkalinity, and pH. Better to stay away from it entirely, there're better ways.

AVOIDING ALGAE PROBLEMS

Excessive organic matter in the pond provides nutrients for algae, contributing to its growth. Algae can obscure the view of colorful fish, and more dangerously, it robs the water of valuable oxygen and releases harmful pollutants.

UV clarifiers are effective tools that use ultraviolet light to destroy the reproductive ability of suspended algae. Dead, microscopic algae will clump together into particles large enough to be removed by filtration. (It should be noted that this method will eliminate both wanted and unwanted organisms. I frankly think it is easier to try to gain a healthy balance in your pond through natural means rather than resorting to UV sterilization.)

Increasing the amount of floating and oxygenating plants in your pond is a better solution to keeping the water clean, and clear. Floating plants such as water lilies, water lettuce, lotus and water hyacinth provide shade, reducing sunlight in the pond, which helps control algae growth.

Submerged plants, also known as oxygenators, affect the carbon dioxide and oxygen levels of the pond by competing directly with algae for light and food. Oxygenators absorb nutrients from fish waste and minerals through their leaves, helping to starve algae, keeping the water clear. Some examples of oxygenators are Hornwort, Anacharis and Parrot's Feather.

Brett Fogle is the owner of [MacArthur Water Gardens](#) and several other pond-related websites. He also publishes a free monthly newsletter called PondStuff! with a reader circulation of over 9,000. To sign up for the free newsletter and receive a complimentary 'New Pond Owners Guide' visit MacArthur Water Gardens.

Article Source: <http://EzineArticles.com/>

AMMONIA

by: PondGuy at [Ponds Plus](#)

Ammonia, chemically known as NH_3 , is the first chemical of concern in a water garden containing fish. The major component of fish "waste" is ammonia, excreted primarily through the gills. Ammonia is also added to the water as organic materials decay on the bottom of the pond (the reason for routine pruning of your water plants), or when uneaten food decomposes in the pond (the reason you shouldn't overfeed the pond). The problem with ammonia is that, under certain circumstances, it can be VERY toxic to your fish. Under "normal" conditions in a well-established pond, all of the ammonia is almost immediately converted to something else (Nitrite) by the colonies of beneficial bacteria living in your biofilter system. Ammonia in an established pond should remain undetectable, i.e., tests for ammonia should always be "zero".

Ammonia can become a significant problem in the first months of a "new" pond where the biofilter has not yet become established. Occasional small trace readings of ammonia are common in the spring months as the newly re-awakened bacteria begin to multiply in the warmer water, or, in the south, during extremely hot conditions as the bacteria suffer from the heat. Biofilters that are in need of cleaning often become radically less effective and can result in spikes of ammonia. Certain chemicals and medications added to the pond can damage or inhibit the biofilter's bacteria resulting in an ammonia spike. Adding too many fish at once to a pond, even one with a fully established biofilter, can also result in an ammonia spike.

Just how toxic the ammonia is depends on several factors: ammonia level, pH, and temperature. At a pH less than 7.2, almost 95% of the ammonia is in its least toxic form. At lower pH levels, fish can tolerate as much as 1ppm for a day or two. The bad news is that very few water gardens are kept at 7.2 or lower pH. Above a pH of 7.4 most of the

ammonia present is in the form of ammonium, NH₄, which is extremely toxic to fish. At a pH higher than 7.4, an ammonia test reading of 0.1ppm may be quickly lethal to your fish.

Every pond-keeper should own an ammonia test kit. With a new pond start-up, or in the spring with an established pond, the ammonia levels should be tested daily for the first month, then every two to four weeks routinely. There are several different test kits available.

EMERGENCY MANAGEMENT OF AMMONIA

Assuming that your pH is like most of ours, somewhere between 7.5 and 8.5, when ammonia is detected you should:

1. Make sure that the water is well aerated. If in doubt, add supplemental aeration.
2. Reduce feeding amounts, or halt feeding entirely for several days.
3. Do a water change. If the amount of ammonia detected is very low (trace or 0.1ppm), change out 10-15% of the water. If the level exceeds 0.1ppm, perform a 25-50% water change. If the level gets to 2ppm or higher, do a 100% water change. Note that if your tap water pH is a lot higher than the pond's, doing a water change could cause a lot of the ammonia to become more toxic ammonium. Use caution.
4. Consider chemically treating the ammonia. Many pond water preparations are available which will bind ammonia into a non-toxic form. Most ammonia test kits (Nessler type) will be fooled into thinking the ammonia is still there after these chemical binders are used. Read the directions of your test kit. Consider using one of the live bacteria products which consumes ammonia (Microbe-Lift PL for instance).
5. Retest 12 or 24 hours later and repeat as necessary.
6. Figure out "why" the ammonia is there and correct the underlying problem.

Chlorine and Chloramine

by: PondGuy at [Ponds Plus](#)

Chlorine (Cl) is a gas which is added to municipal water systems to control harmful bacteria. In the United States, if you don't have a water well on your property, you probably pay for chlorinated water. Test kits are rarely owned by the pond hobbyist because it's an "all or nothing" sort of thing. If you use well water, you don't have chlorine. If you don't use well water, you do have chlorine and need to take care of it before (or while) adding water to your pond. Most city systems run a chlorine content of 0.5 to 3.0 ppm, but will sometimes "flush" the systems with higher concentrations. Check with your local water authority to find out if chlorine is present in your water.

Chlorine is very deadly to fish in even very small concentrations, less than 0.5ppm. It affects the fish's gills causing severe tissue damage. Larger fish usually die more quickly than smaller ones and at a lower ppm. Even minute quantities of chlorine can also severely damage the bacteria in your biofilter system. Often times, the disruption of the biofilter (and the resulting ammonia/nitrite spike) following the initial damage to the fish is what causes them to die 3 or 5 days after the chlorine event.

Because chlorine is a gas in solution in the water, it dissipates into the air with relative ease. Simply spraying the water from your hose through the air on it's way to the pond will allow about half of the chlorine present to dissipate into the air. Never stick the end of the hose into the water when adding chlorinated water to the pond.

Dechlorinator chemicals are used to bind the chlorine still in the water until it dissipates naturally. We recommend using a dechlorinator added to the pond anytime you need to replenish more than 10% of the pond volume (in small ponds, 2-5% in large ones). Small additions of water to the pond need not be treated in most situations.

In a brand new pond just filled with chlorinated water, about 1/4 of the chlorine will dissipate each day. If left to sit for 5-7 days, there is no need to treat the water for chlorine.

Chloramine is a compound which contains chlorine and ammonia that is also used in some parts of the country to control bacteria in water systems. This compound also results when sodium hypochlorite powder is added by the water department instead of chlorine gas as a water treatment method. Water companies like this compound because it remains in the solution for a LOT longer than plain chlorine.

To test for the presence of chloramine take a 5 gallon bucket of tap water and use a dechlorinator as directed. Next, test the water for ammonia. If ammonia is present, you've got chloramine. There are several dechlorinators on the market which will take care of both the chlorine and the ammonia. Alternatively, if you have an established biofilter, it will manage the left behind ammonia after using the less expensive plain dechlorinator to treat the water.

Nitrites

by: PondGuy at [Ponds Plus](#)

Nitrite, or NO₂, is probably second in importance in pond water chemistry only to ammonia. The first group of bacteria to develop in the pond convert ammonia into Nitrite. As soon as Nitrite is present in the pond, the second group of important beneficial bacteria begin to colonize whose function is to convert the very toxic Nitrites into the pretty much non-toxic Nitrates. The problem with this is that Nitrites are much more toxic to fish than the ammonium was, and it takes 2-6 weeks for enough of the right bacteria to grow to be able to deal with the pond's Nitrite load. Once the biofilter is fully established, the nitrites are almost immediately converted to non-toxic nitrates.

Nitrite reading should be zero in any well established pond. In a newly established pond, nitrite levels must be detected and dealt with. Problems with biofilter (clogging, undersizing, medications) can result in the presence of nitrites even in an established pond. Adding too many fish at one time can also cause sudden increases of nitrites. Very low levels of nitrite are sometimes found in ponds in the deep south when the summer sun warms the water temperature into the 90's thereby inhibiting the bacteria.

Nitrite toxicity can be particularly deadly, usually resulting in the smaller fish dying before the larger ones. Severe damage is done to the gills, liver, spleen, kidneys, and even the nervous system of the fish. Concentrations as low as 0.25 ppm can kill small fish and levels of 0.5 ppm are considered an emergency and treatment indicated. Levels of 1ppm or higher is an extreme emergency which requires immediate action.

Every pond-keeper should own a nitrite test kit. With a new pond start-up, or in the spring with an established pond, the nitrite levels should be tested daily for the first six weeks or until a zero reading, then every two to four weeks routinely. There are several different test kits available. We recommend test kits with a range of 0 to 4 ppm.

EMERGENCY MANAGEMENT OF NITRITE LEVELS

1. Increase aeration to the maximum amounts possible. Use supplemental airstones if nitrite higher than 1ppm.
2. In an established pond, quit feeding the fish entirely until you figure out and correct the problems.
3. If levels are 0.5ppm or lower, do a 10% water change and add non-iodized salt at the rate of 1 pound per 100 gallons of water.
If levels are between 1ppm and 2ppm, do a 25% water change and (after removing submerged grasses) add non-iodized salt at the rate of 2 pounds per 100 gallons.
If the levels are higher than 2ppm, do a 50% water change and (after removing submerged grasses and other more tender aquatic plants) add non-iodized salt at the rate 2.8 pounds per 100 gallons.
If levels are higher than 4ppm, consider doing a 100% water change.
4. Retest after 24 hours and perform indicated water changes as above.

NITRATE

by: PondGuy at [Ponds Plus](http://PondsPlus.com)

The beneficial bacteria in your pond's biofilter convert ammonia to nitrite and then finally into Nitrates. Nitrates were once considered not to be harmful even with very high levels (> 250ppm). Recent research and experience has shown that NOT to be true. Ponds or holding systems with continuously high levels of Nitrates (even up to 40–50ppm) can develop major problems. It seems that prolonged exposure to high Nitrate can severely

depress the immune response of the fish leaving it wide open for any opportunistic infection or parasitic.

Nitrate levels very rarely result in a problem in a moderately well kept pond. Most pond-keepers don't even own a test kit for it. Nitrates are either suitably diluted by rainfall, consumed by plants, or converted to nitrogen gas in small pockets of anaerobic activity in the pond. The pond management method of performing routine water changes can prevent the problem from ever forming.

Nitrate can be a very severe problem, however, in indoor ponds, overcrowded systems, and ponds that do not receive routine water changes especially during periods of low rainfall. You may, or may not, even begin to see a yellowish stain or tinge to the water.

High levels of Nitrates (greater than 40–50 ppm) should be managed by partial water changes and/or increasing the number or size of plants in the pond.

DISSOLVED OXYGEN

by: PondGuy at [Ponds Plus](#)

The oxygen used by fish in your pond is dissolved within the pond water. Gas exchange between the atmosphere occurs at the surface level of the water continuously. Anything that splashes or creates turbulence on the water surface will increase the dissolved oxygen in the water. Most smaller water gardens are fully aerated by a simple fountain or waterfall and require no other method of increasing dissolved oxygen. Oxygen is also produced by the plants in the water in the presence of sunlight, BUT they release CO₂ and absorb oxygen when no sunlight is present.

The limiting factor to how much oxygen can be dissolved in the water is temperature. The warmer the water, the less dissolved oxygen it can hold. The most that 50°F water can hold is 11.5 mg/L. At 70°F the water only holds a maximum of 9mg/L, and at 90°F the water only holds 7.5mg/L.

Fish are most comfortable when dissolved oxygen levels are at least 5.5 mg/L or higher. Levels from 3-5 mg/L can be tolerated for short periods by otherwise healthy fish. At levels of 3-4 mg/L the fish are usually seen gasping near the surface where the highest concentration of oxygen remains. Levels less than 3 mg/L will generally support koi and goldfish.

Most pond hobbyist do not own a dissolved oxygen test kit. Dissolved oxygen levels are rarely below necessary levels in common water gardening situations. Heavily populated ponds with pump failure probably cause most of the problems you'll hear about dissolved oxygen. Treatment is simply to get air into the water by increasing water movement and contact with the air. Simply running the water across a rock to form a thin sheet of water in contact with the air does better than even aquarium style airstones.

It is worth mentioning here that well water usually comes out of the ground very low in oxygen, and very high in carbon dioxide. If using well water, spray is through the air or forcefully into the water to inject as much air as possible and the deficits will correct quickly.

ADDING PLANTS TO YOUR POND

By: Brett Fogle of MacArthurWatergardens.com and Pond-Filters-Online.com

So. The water garden bug has bitten. You've dug and levelled and sweated and said words you hope that no one else has heard. Now it's time for the fun part – picking out your water garden plants!

Plant varieties within these four categories are what you need to eyeball: deep-water, marginals, oxygenators, and floaters. (If you think these words are big and weird, just thank your stars we're not talking medicine.)

After you've diligently planted your babies in plastic tubs, pans, or clay pots, packing the fertilizer- and chemical-free soil down tightly, load the container down with pea gravel to keep the soil from floating away. (Don't ask why this works, but it does.) Plunk your prize into the water at the appropriate depth (You'll read about that in just a minute, so hang on to your hat.) and you're on your way!

Plant-dunking should be done during the growing season. Wait four or five weeks for the water plants to do their thing before you add your fish. If you just can't hold your horses, er, your fish, for that long, you can jump the gun a couple of weeks, but the idea is to let the plants first get established.

When picking your plants, you'll no doubt be wowed by water lilies of the tropical persuasion. These aquatic wonders lord it over their hardier cousins with knock-out fragrance, big blooms day or night – depending on the variety – and a habit of blooming their little hearts out nearly every day during the growing season. They love their warmth, though, so unless you live in a year-round, warm-weather climate be prepared to hasten them into a greenhouse or at least muster up enough moolah to buy them some “grow” lights to tough it out through the winter. They will definitely bite the dust at freezing temperatures, but give them night-time temps of at least 65F and daytime temps of 75F or warmer, and your love affair with tropicals will only grow that much more torrid.

Hardy water lilies, while not the showboaters that tropicals are, are ... well, hardier. Their big advantage is that they can stay in the water year 'round unless it freezes so deeply the rootstock is affected. And being the tough guys they are, you can plant these puppies deeper than the tropicals, some living it up in depths of 8 to 10 feet.

Both hardy and tropical water lilies are real sun worshippers. At least 5 to 10 hours a day is what it takes, along with regular fertilization, to keep these plant pals happy.

Everybody and their brother with a water garden wants a lotus plant. (Sisters, too, no doubt.) These water-lily relatives come in hardy and not-so-hardy strains, so make sure you know what you're buying. Much bigger than water lilies, lotus have huge, famously splendid blooms that not only will knock your socks off, but make you forget you have feet altogether. Their leaves and seed pods are so breathtaking, they're a favorite in costly cut-flower arrangements. Big, bold, and beautiful, with water-depth needs of 2-3 feet, these shouters are really better off in big ponds that get plenty of sun.

Marginals (sometimes called "bog" plants by those less high-falutin') are grass-like plants that strut their stuff in shallow areas no deeper than 6" that border the water garden. They also do well in mud. Cattail, bamboo, rush, papyrus, and many other plants fall into the family of marginals and grow best with a minimum of at least three hours of jolly old Sol.

Some plants are there but not seen, working stoically under water and without fanfare to fight algae, oxygenate the water, and provide food for fish. (In lieu of these plants, if your pond is small, you can fake it fairly adequately with an aquarium pump.) Easy on the wallet, varieties of these plants can be bought in bunches and like their soil sandy and/or gravelly. Like hardy water lilies, they, too, will warrior it through the winter.

Water hyacinths have become a recent rage, especially for the lazy among us. No soil is required for these beauties. Toss them in the water and they're "planted." A water hyacinth* ain't just another pretty face, though; these plants do their part in the war against algae and blanket weeds by keeping sunlight scarce on the water's surface. But one note of caution: This plant may take over the world if allowed. It's invasive as all get out, so keep it under control or you (and your neighbors) may wish you'd never laid eyes on it.

A water garden isn't a garden without plants. Take your time, know your climate, and choose wisely. Your rewards will be great in return.

Article Source: <http://EzineArticles.com/>

* A note about water hyacinths. These plants have been declared noxious weeds in some states of the US and Australia and have been declared by the CSIRO in Australia to be the world's most serious aquatic weed. There are better choices for your pond!

THE FOUR TYPES OF PLANTS FOR YOUR POND

Oxygenators are very important for keeping the water clear. Their roots and stems remain submerged and usually the leaves are submerged as well. They are often bought in bunches and most oxygenators do not flower, but two exceptions are the water violet and the water buttercup.

Right: anarchis





Floaters – Simply drop them into the pond. Their roots are submerged and their leaves and stems float either on or just below the surface. They provide surface cover. Water hyacinth is a flowering 'floater'. Other floaters include frog-bit, water lettuce and water soldier.

Left: frog bit

Marginals cover a vast variety of plants. Marginals (often called bog plants) usually live in either the shallow part of the pond or on a marginal shelf. They do not play a role in conserving the balance of the pond but are ornamental and provide some protection for frogs and other pond creatures from predators. Marginals are generally planted in special baskets using aquatic compost. *Right: variegated sweetflag*



Deep Water Aquatics need to be planted a foot or more deep. Their leaves help to keep your pond life cool, provide shelter and assist in keeping the water clear by limiting the sun's rays.

Left: water hawthorn

STORM WARNINGS FOR PONDS

[Another brilliant article from Brett Fogle at MacArthur Water Gardens in Boca Raton, FL]

California has earthquakes; we in the south and east coast [and northern Australia] have hurricanes. One thing we all share is power outages. Ours are usually caused by storms. Most power outages last only a few hours and only happen a few times a year. A hurricane is always a threat that hopefully will never happen or have only a minimal consequence. Flooding may be more common than a power interruption and both can happen at the same time.

A well built well thought out well designed pond will survive a big storm with a long power outage, lots of rain and flooding. This pond also will be less worrisome during the numerous smaller but strong storms. The most obvious and the most popular is the garden pond. It has few fish so it does not need extra filter or aeration. There is enough surface area for oxygen levels to be sufficient. The surfaces of the pond and plants handle the filtration. A koi pond should be able to stand-alone for hours without danger of quick suffocation or toxic waste build up. The key is in the number of fish. Conditions in an

over stocked over fed pond will quickly deteriorate. A lesser or under stocked pond will always be healthier, have less maintenance, and survive periods of no power.

Heavy rain can make a pond quickly overflow or be flooded out. Heavy rains can cause a rapid change in the pH and the temperature of your pond water. Check your inventory of chemicals such as pH adjustors, Amquel or Ammo Lock. Heavy rains can cause a change in the pH and the temperature of your pond water. Water with higher alkalinity will have a stable pH. Buffers can be used like baking soda will help keep ph stable. If it is possible use a tarpaulin a few feet above the surface to permit airflow yet keep rains out.

A pond should be built with the top above grade. Six inches is minimum and twelve inches is better. This can be a raised wall or lip. It also can be graded out and still have an in ground look. This will make rainwater drain away from the pond instead of into it. Choosing a spot that is not the low spot that always floods should be avoided or built higher. ? If at ground level consider surrounding the perimeter with a wall of sand bags 1 or 2 bags high. Drastic, but it has been done. This may protect your fish from being washed away and never to be seen again. Is it possible to set up a portable show tank, maybe in a garage or other protected area? We know that with changes to their environment, Koi will often jump. Murphy says that they will land in the worst possible location. A net surrounding the edge or covering the pond is therefore advisable.

An overflow drain is easy to build and may be the most used and important design of a pond. Without an overflow the water level will never be constant, be hard to maintain and get too high during a storm flowing over the top. An overflow drain should be large enough to handle large amounts of water I like four inch pipe. It can be above the waterline or stubbed up from below. It needs to drain to an area that can handle a lot of water. A storm drain, a dry well or a drain field, which is a large hole with gravel in it, then covered work well. Making a bog area where the overflow water goes also works. Just take care that it does not flood someone else. Having the waterline above grade makes any overflow drain simple.

Lower stocking and overflow drains are simple ways of making a pond storm proof but there is more we can do. Most of us like to be heavily stocked with more fish then we should have. We may not want our fish not to have periods of low oxygen or risk an ammonia build up. One solution is to have an emergency generator that can be started automatically when the power goes out. They may not be too expensive for the piece of mind and convenience they provide. A portable generator can be used for some or all your equipment but will have to be started and switched usually during a storm. Both of these solutions work but will need fuel on hand and tested regularly for events that may only happen once or twice a year or a big event that may never happen.

Lets say we are in a hurricane watch or a tropical storm warning and we have five days to get ready. There are a few simple things you can do and a few simple items you should have on hand that could save your fish until power comes back on in a few days.

1: STOP FEEDING!

Koi will be fine for a week with no food. With no food the amount of ammonia produced will be dramatically reduced. This is a common practice when taking koi to a show to prevent ammonia build up in holding tanks. Koi excrete the most ammonia right after they eat so if bad weather is approaching you may want to skip a meal. The longer the better. 3–5 days of no food will make a huge difference.

2: WATER TREATMENTS.

Products like Amquel or Ammo Lock are products that bind ammonia and prevent it from harming fish. These products should be on hand normally. You can test your water for ammonia and use these products to control it. Make sure your test is a salicylate type as opposed to a Nessler reagent base kit that will give false readings with ammonia control chemicals. Mydor is one brand of test kit that will work.

3: SHADE

Storms happen during the summer when it is sunny and hot. A tarp on PVC legs or rope over the pond will help keep the temperature down. This will help keep the dissolved oxygen up and make the fish more comfortable. With no power or air conditioning it may also be a nice place to be. I have seen some inexpensive quick garden shade canopies that could be used.

4: EMERGENCY POWER.

A car battery and a power inverter can run an air pump and air stone for hours. The battery can be kept charged with a charger on low and a timer so it is not charging all the time. When the power goes out you plug your air pump into the inverter. Aeration using this method is very efficient, low in cost and easy to do. You may have these items already. For longer periods of time you can recharge the battery with a car, self start lawnmower, motorcycle or small emergency generator. You also can find complete units like the XP600 for \$279.95 from Aquatic eco- systems. Small emergency generators are good on fuel and can provide many hours of aeration.

5: HYDROGEN PEROXIDE.

This is another item that should be on hand. It can be added to the pond and add huge amounts of dissolved oxygen to a system. Simply use 1/2 to 1 cup per 100 gallons. Apply with a squirt bottle forcefully under the surface of the water. 60 squirts is good for 100 gallons

6: FILTERS

Bacteria in a filter will go anaerobic without oxygen. It will start going bad and producing toxic wastes like hydrogen sulfide. A few hours may be ok but if the power is out for more than a few hours you should not pump right back into the pond. You should back wash your filter first. If it is an open filter you can have air stones on your emergency power to help keep the filter aerobic and living.

7: GROUNDING

Make sure that all equipment is grounded with heavy wire and GFI protected. This will lessen them being damaged by lightning, storm surges and shorts from wet weather.

This is only intended to be a brief guide and in no way details all steps that can or should be taken in an event.

In summary plan for flooding and power outages. Do not to over stock unless you have the equipment to support a liveable condition. Plan for ammonia build up with no filtration by chemical treatments and halting of food. Emergency power works most efficiently with aeration. Most storms are short or do little real damage. Having a plan to handle them will make life less stressful for you and your fish.

Article Source: <http://EzineArticles.com/>

INTRODUCING FISH TO YOUR POND

by: PondGuy at [Ponds Plus](#)

HOW MANY FISH CAN I PUT IN MY NEW POND?

Fish stocking density is affected by many different variables. Larger fish require a LOT more water than smaller fish. The number of plants in your pond, the type of filtration system, and the dissolved oxygen levels in your pond affect it. The waste handling capacity of your filter system together with the quality and amount of food that is fed play a big role.

In other words, that's a tough question to give a definitive answer to. Suffice it to say that it's likely to be a whole lot fewer fish than you initially planned on getting. Most small water gardens (under 500 gallon) should stick to goldfish and avoid the much larger koi. Remember that the little fish you buy will grow FAST in a pond environment, and if too numerous, they can outpace the capacity of the filter system and result in dead fish. Besides that, within a season or two you'll start seeing baby goldfish that will ALSO grow to full size.

In general, each adult goldfish needs at least 15–25 gallons of water and each adult koi needs 100–300 gallons or even more. Unless you plan on substantially increasing pond size and/or filtration systems, you should plan for the eventual growth of the fish and keep the numbers down. Work closely with your local pond dealer to make sure you don't overpopulate your pond. Having a few very healthy fish that grow to attain their full color and size potential should be desirable over a whole herd of stunted sickly fish.

Tropical fish are often sold on the rule of thumb of one gallon of water per inch of fish. This DOES NOT apply to goldfish and koi that get a LOT bigger and produce exponentially more waste. Take note that a well-filtered small water garden of only 125 gallons may support 10 koi that are 1.5 inches long (15 inches of fish), but cannot support 1 koi that is 15 inches long.

ADDING NEW FISH TO AN EXISTING POND POPULATION

Great care should be taken when purchasing a new addition to the pond. While koi and goldfish are rugged and hardy creatures, they suffer tremendously from the stress of transport to a retail facility. They usually arrive at your dealer with their immune system suppressed from the strain of transport and can be harboring deadly disease and/or parasite problems. These are things that you DON'T want to have to deal with in your pond. In particular, avoid the big super-chain stores that occasionally get large batches of fish in for cheap prices. Take note of the above info on overcrowding and picture the poor transport-stressed fish crammed 30 to a 20 gallon tank just like the tropicals ... then look closely for the ones that float or lay quite still on the gravel, they're dead, ya know!



Either buy fish from a reputable dealer who quarantines his newly arrived fish OR, build yourself a quarantine facility and keep the new guys isolated for at least 3–4 weeks BEFORE adding them to your pond.

Some folks like to add fish of other species to their goldfish and koi ponds. Pleocostumus, or algae eater or sucker fish, are usually one of the first choices. This is usually not a good idea for several reasons. All of those other fish are tropical, and have different water temperature requirements than cold water koi and goldfish. A Pleco may do fine all summer, but it'll die if left in the pond over winter. Besides, the only "algae" they eat is the beneficial carpet algae that grows on the bottoms and sides of the pond.

ADD ONLY A FEW FISH AT A TIME

Don't add more than 1 to 3 fish to your pond at a time. Adding too many fish at once will produce more waste than the filter can convert. Allow about 10 days for the biofilter to

increase its capacity and absorb the increased waste in the pond before adding another 1 to 3 fish.

WHICH FISH TO CHOOSE FOR YOUR POND

Many people have asked us over the years "Should I add goldfish or Koi (or both) to my pond? The answer from Brett Fogle at [MacArthur Watergardens](#) is, "it depends."

Goldfish are better suited to smaller water gardens and ponds, in the 50 – 500 gallon range. Goldfish are extremely hardy and easy to care for, which makes them the perfect choice for the new pond owner or water gardener.

Koi, on the other hand, require a little more knowledge and better water quality in most cases, than goldfish and are better suited to the more experienced pond keeper. Koi generally thrive best in ponds over 500 gallons (the bigger, the better).

This is because Koi can grow quite large and therefore require more water in the pond for proper biological breakdown of waste. Koi are also more expensive (and harder to replace) than goldfish, so this should also be taken into account before filling your new pond full of Koi. More considerations ...

Goldfish are an excellent choice for the average water garden that is usually also full of a variety of potted plants. Lilies, lotus, iris, and submerged annuals – these all do well in a water garden pond with goldfish. Goldfish will not disturb the plants, and will enjoy playing around under the lily pads without disturbing the plants.

Koi on the other hand, and especially the larger ones, will often create a huge mess out of submerged potted plants. They seem to enjoy 'digging' in the soil of the plants and sometimes even knocking them over. This all leads to added mess in the pond, and can create a real problem for the pond owner.

Generally, it's best to not have submerged plants in large pots, when also keeping Koi. The ideal Koi pond is much deeper than the average water garden, so the necessity for plants to help with water quality and shade is reduced.

However, if you still do want to keep potted plants in your Koi pond, we recommend wrapping netting over the tops of the pots, to keep the fish from digging in the pots. Another thing you can do is to top the pots with 1" of pea gravel, and then larger river stones or similar over that. The Koi will not be able to get past the larger rocks.

As far as mixing Goldfish with Koi, this is fine and very common. We've just tried to highlight the most important differences between the two and between the average water garden and Koi pond. Feel free to experiment with both, and then decide which fish is more to your liking.

Article Source: <http://EzineArticles.com/>

KOI HISTORY

Although the word “koi” was first used in China about 2500 years ago, Japan is recognized as the home of Nishikigoi. Japanese farmers developed koi from early color mutations found in their common food carp (*Cyprinus carpio*).



The Japanese took the naturally occurring mutations and developed them further and around the 1820s began to breed them for their aesthetic appeal.

As farmers developed different color types interest began to spread and when the Emperor Hirohito was presented with koi for the imperial palace in 1914, the popularity of koi increased further.

Nishikigoi “living jewel” first appeared in the region of Niigata, Japan. These colored carp were interbred to produce the koi we know today. Nishikigoi is the formal name used in written text. Today, colored carp are simply called koi, a term that is now commonly used throughout the world.



A major fascination with koi is the variety of color and pattern combinations. There are metallic-skinned varieties, scaled and non-scaled varieties, although certain features are common to all good koi. *Left: a fine example of a Showa Sanke.*

Over the years, 13 classes of koi have been established. Each class contains a number of varieties. Metallic-skinned koi have classes of their own. There are many specialist publications available that deal with koi so we'll turn them to the specialists and move on to goldfish!

GOLDFISH HISTORY

Goldfish are probably the most common pet found in households today and they have been kept as pets longer than any other species of fish. Although there are many varieties they all belong to the species *Carassius auratus* – a sub-species of the crucian carp, *Carassius carassius*.

Goldfish originated in China and are described in manuscripts from the Sung era in the eleventh century. It is believed that they originated from mutant common carp and during the Sung dynasty the emperors began building pools to keep them.

During the Ming dynasty when ceramics were becoming popular, goldfish were bred in clay aquariums and kept as household pets in decorative ceramic jars.

It required the passage of about 500 years for the goldfish to reach beyond China and during the sixteenth century the goldfish was introduced to Japan where they were popular at first with the aristocracy and samurai. The Japanese set up breeding programs and by the eighteenth century had developed the Bubble Eyes, Celestial, Pearlscales, Blue and Lionhead goldfish.

During the eighteenth century goldfish found their way to the west and were soon being bred in Europe and were classified zoologically.

INDOORS OR OUTDOORS

The goldfish is a versatile creature and, although it can grow quite large, it will usually acclimatize itself quite well to either a pond or an aquarium.

That said, **DON'T EVEN THINK ABOUT KEEPING A GOLDFISH IN A SMALL GOLDFISH BOWL!** It is a life of stress with high fluctuations in water temperature and chemistry.

There are advantages and disadvantages to keeping goldfish indoors. One of the main advantages is that you'll be able to see your fish at any time, regardless of the weather and you'll spot signs of trouble earlier.

Aquarium fish will not usually grow as large as pond fish – their growth is limited by the size of the aquarium – and they may not achieve the same vibrancy of color as pond fish.

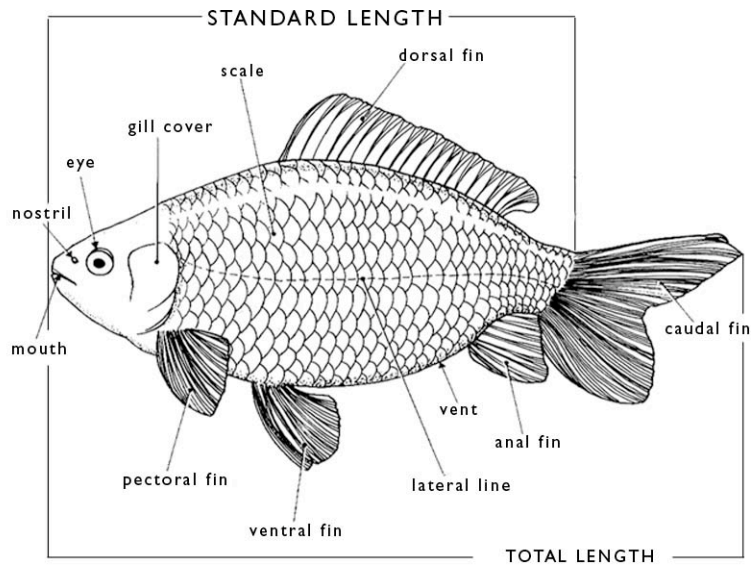
Water conditions in an indoor aquarium should be more stable and controllable than those of the pond.

Goldfish will be at home in either environment although the faster-swimming, common goldfish will prefer a garden pond with plants whilst the fancy varieties will prefer an aquarium with well filtered water.

Although the common goldfish and the fancy varieties belong to the same species, the fancy variety will be unable to compete for food against their faster-swimming cousins and not all fancy varieties will be able to withstand cold winter outdoor temperatures.

GOLDFISH ANATOMY

Apart from some exaggerated physical characteristics bred into the more fancy varieties, the anatomy of a goldfish conforms to the structure found in other fish.



When you see a reference to the standard length of the fish it refers to the true body length. The total length will include long flowing fins.

Goldfish can be divided into two distinct groups – singletails and twintails. As their name suggests, single tails are the ordinary-looking fish with fins and tails similar to those found on any other fishes. Twintails have tails and anal fins that are divided or double-sided when viewed from the rear. Singletails are the more hardy of the two groups and can usually spend winter in an outside pond. Twintails have been developed over many years by selective breeding and are more delicate, requiring special care and attention and you may need to bring them indoors before winter sets in.

COLOUR

Coloration in fish, as with other animals, comes from the distribution of chromatophores. These pigment-rich cells under the scales are either red, yellow or black in color. The variation in intensity and distribution of these cells makes up the color and pattern that occur in the different varieties of goldfish. For example, orange and red varieties occur when there is a lack of black pigmentation in the chromatophores. A fish with a complete absence of pigmented chromatophores is an albino.

Goldfish can be divided into three groups – metallic, nacreous (pearly) and matt – depending on their “shininess”. This effect of “shininess” is caused by guanine (a reflective material) under the skin. Metallic fishes, like red or orange goldfish, contain a large amount of guanine. Nacreous fish contain a smaller amount of guanine, which gives them a lustrous mother-of-pearl effect under their scales. Matt fish have a dull finish due to a total lack of guanine.

White or silver fish occur when there is plenty of guanine in the skin but a lack of pigmentation. Black, brown and green goldfish colors found in the wild varieties are caused by different combinations of black and yellow pigmentation. Blue goldfish occur through a large amount of guanine in combination with black pigmentation, or when there is very little guanine and the black pigmentation is further down in the skin.

VARIETIES

There are many beautiful varieties of goldfish. We'll show you some of the popular varieties and include pictures where possible.

Common – These are normally shaped fish, usually orange-red in color and metallic. They can grow to be 12 inches and live 20+ years if cared for properly. They are often sold in pet stores as "feeder fish".



Fantail – A shorter, egg-shaped fish with a double tail. If they have long caudal fins growing in decorative folds they are called veiltails.

Comet – These are more like the common goldfish but with longer fins and narrower bodies.

Lionhead / Buffalo Head (Ranchu) – Originally from Korea these are perhaps the most rare of goldfish. They have a symmetrical body shape, no dorsal fin, a rounded back and a head growth over the head and gill covers.



Black Moor – These fish are veiltails, have telescope eyes and are a deep velvety black although sometimes a little gold creeps in to the body.



Oranda – The largest of the goldfish varieties, it is almost identical to the Veiltail except for the hooded growth over its head.



Shubunkin – These fish are more long bodied and best known for their white bodies and spots of color in shades of yellow, orange, blue and black.

Pompoms – Small growths like pompoms grow near their nostrils. These fish come in a variety of colors but are no longer very popular.

Telescope eye (Demekin) – These fish come in a variety of shapes; however, they have large eyes that stick out similar to a telescope.



Pearlscale – They have a fatter shape with a bulging middle and the center of each scale is light-colored and domed. The fins are similar to the fantail.

Bubble eye – A striking-looking fish, they have huge, fluid-filled sacs under each eye. They are susceptible to bacterial attack. They come in a variety of colors and have no dorsal fin.

Ryukin – a popular aquarium fish with a round body and a triple or quadruple tail (often referred to as a fringetail). The red and white variety are very popular.



Sabao – a similar shape to the Ryukin but with a single caudal fin. Very hardy.

Celestial – This variety is closely related to the bubble eye although it doesn't have the huge sacs. Its eyes are permanently upturned towards the heavens.

AQUARIUM MAINTENANCE

The most important task in aquarium maintenance is the regular partial water change. This is a routine part of maintaining a healthy environment for your fish. Approximately 20 per cent of the water should be replaced every three or so weeks. This keeps the ammonia levels from surging and helps control the waste and debris that accumulates in the tank bottom. Try to ensure that the temperature of the replacement water is close to the temperature of the aquarium water.

Use a wide bore tube to siphon off the old water. A vacuum system can be attached to the siphon to assist in removing detritus from under the gravel.

Algae growing on the glass of the aquarium can be removed with a magnetic algae scraper or a nylon scouring pad.

Clean the filter regularly and replace the filter medium if necessary. Clean the aerator's air filter.

FEEDING

Goldfish are omnivores feeding on both animal and plant matter. They require a well-balanced diet consisting of proteins, carbohydrates, fats, vitamins and minerals. Some of these can be stored by the fish to be used when required but many need to be consumed regularly.

In a well-planted garden pond the fish will often be able to feed on the available vegetable matter and live food, although, depending on the size of the fish population, they may require a supplementary food source. In an aquarium your goldfish will rely on you for all their dietary needs.

Live food – earthworms, tubifex worms, daphnia, brine shrimp etc – is by far the best diet for your goldfish but maintaining a reliable and constant supply can be difficult. Prepared foods can also provide most of the fishes' dietary needs but do provide a variety of prepared foods.

Prepared foods range from flakes to floating or sinking pellets and freeze-dried preparations. You'll find a wide variety available at your pet store or aquatic retailer. Your goldfish will also benefit from the occasional meal of chopped spinach, lettuce or boiled peas and may also enjoy a small amount of lean raw meat. Remove any excess food that hasn't been eaten in a few minutes.

Fish that are fed a diet of mainly prepared food will benefit from the addition of live food to their diet. This will often relieve the symptoms of constipation in a fish that is usually fed prepared food.

By the way, never collect live food from the wild. The potential to introduce unwanted organisms into your pond or aquarium is too great!

HOW MUCH DO I FEED MY FISH?

The golden rule in feeding your fish is to give them an amount of food that they can completely consume in a few minutes. Goldfish will not overeat, however, if you overfeed them, the excess food will decay in the pond or tank and will pollute the water. It is usual to feed fish once or twice a day.

Because goldfish are coldwater fish their metabolic rate is governed by the water temperature. During winter, if the water temperature in an outdoor pond stays below 10°C (50°F) the fish will not require feeding. Begin gradually feeding the fish again in the spring when they start swimming around.

Fish can survive for long periods without food, however, if you are going away for more than a few days always arrange for someone to feed your fish and perform any necessary maintenance before you leave.

BREEDING

Goldfish mature at about 1 year, however, they are in their prime about their third year. A male that is ready to spawn will usually have tubercles about the size of a pinhead appear on the pectoral fins and gill covers. However, this does not always occur and has been seen in some females.

The information in this section on breeding goldfish has been supplied by Lyn Duedall from <http://www.goldfishinfo.com> an excellent online resource for the goldfish owner or anyone interested in becoming a goldfish owner

Temperatures should be about 70°F (20°C) during the day and 50°F (10°C) at night. You will notice the spawning chase occur. The male will begin chasing the female for two to three hours, bumping into her abdomen. If she is ready eggs will spurt out and stick to the first thing they come in contact with. They are usually released in batches with the first batch being the best. The male fertilizes the eggs immediately by spraying milt over them. Good sized females can lay anywhere from 500–1000 eggs a spawn.

Goldfish usually spawn in warm waters in the morning sun

You should remove the eggs immediately and rinse them in a bucket of aged water that is the same temperature as the tank they were removed from. Your goldfish eggs should be kept in water that is not deeper than 6 inches. In deeper water the pressure can damage the fry and make it hard for them to reach the surface. After rinsing the eggs place them in a 20-gallon tank. You should raise the temperature to about 70°F. The fish will hatch in 3–4 days. By the end of the first day you will notice that some eggs are a clear tan to yellow color while some are white. The ones that appear almost clear are the fertile eggs. The others are more than likely infertile and will be subject to fungus. These unfertilized eggs should be removed if possible, taking care not to throw away any good eggs.

Some breeders add a few drops of methylene blue to the water to reduce the fungus occurrence.

The fish will hatch out along the region of his back, pulling its tail out first, then releasing its head. At birth the fish is about 1/16th inch to 1/8th inch (1mm) long with two black eyes, a long notochord, and a full yolk sac. These translucent fry should not be disturbed. Do not be alarmed if they fall to the bottom. Within 48 hrs of hatching they will have absorbed their yolk sacs and an air bladder and rudimentary pectoral fin will become noticeable. After about 48 hours their air bladders will fill and they will start swimming normally seeking food. They will eat anything they can fit into their mouths.

See chart below for feeding instructions.

Feeding the babies can be somewhat difficult since they are so small. Ensure you place enough food in the water that they can find it, but no too much to pollute the water.

Maintain a continuous supply of food. Remove any uneaten food within a few hours and add more. Doing this helps maintain the water conditions. These little guys will grow rapidly and will soon be requiring a lot of food.

As the fish grow you will need to place them in larger tanks or divide them amongst several tanks.

If you have an outdoor pond you may be lucky enough to spot baby goldfish each year. Although many babies will be born during the breeding season, few will survive, as they are often eaten by other fish (including their parents). The fish that survive are the strongest; the ones that find plenty to eat, stay alert and remain hidden until they are large enough to join the rest of the group.

In a pond a female will spray her eggs near the surface and border plants and floating plants will collect the eggs. If you wish to raise the baby goldfish yourself, you can remove the eggs to a separate pool or tank and follow the instructions above

FEEDING SCHEDULE FOR FRY

- The following schedule is recommended by Lyn Duedall:
- After 48 hours – infusoria culture*
- After 2 weeks – newly-hatched brine shrimp and infusoria
- After 3 weeks ground up pellets or flakes can be used
- First 4 weeks feed 3 times each day
- Up to 4 months feed twice each day
- After 4 months feed once daily
- (Feedings should be as much as they can eat in 20 minutes)

Infusoria is a group of single celled organisms found in water containing decomposing vegetable matter. Infusoria culture is available commercially, or you can make your own as follows:

Place some torn lettuce leaves in a glass jar, carefully fill the jar with water that has been boiled. When cool, cover the jar and place on a sunny windowsill for 2–3 days. To feed the infusoria to the fry, simply pour some of the water into the tank from time to time. The culture will die after 2–3 days and may be replaced by harmful bacteria so it is a good idea to start a second culture two or three days after the first. It can be useful to develop three cultures with each becoming mature at intervals of two to three days. This will maintain a ready supply of infusoria.

Always siphon off any uneaten food, but be careful not to siphon off your fish. Once a month a tablespoon of salt should be added to the tank. Artificial aeration can be provided after 1 month.

A QUICK GUIDE TO DISEASES & SYMPTOMS

This is a brief description of symptoms and their possible causes. For more details on each disease go to the next section.

Many thanks to Lyn Duedall from <http://www.goldfishinfo.com> for providing information on goldfish diseases and their symptoms.

ABNORMAL BEHAVIOR

- **Breathing difficulties** – flukes, velvet disease
- **Distress/off colored** – cloudy eye, chilodonella
- **Fins closed** – ick
- **Clamped fins** – poor water conditions
- **Scratching/Flashing** – flukes, pH
- **Increased respiration rate** – chilodonella
- **Gasping at the water's surface** – not enough oxygen in the water, increase aeration, check water for ammonia, pH level, and nitrates
- **Appetite loss** – tuberculosis, constipation
- **Yawning** – toxic water, parasites, rock stuck in the mouth
- **Loss of balance**, unable to rise from bottom of tank – swimbladder problems
- **Sitting on the bottom** – swimbladder disease, flukes
- **Eating bubbles** – could be the fish is trying to clear its gills. Could also be caused from air bladder problems. (See swimbladder disease.)
- **Spitting** – flukes
- **Rapid gill movement** – flukes
- **Restlessness** – fish leech (lice)
- **Jumping** – parasites, low pH, poor water conditions
- **Tired fish** – Check the water conditions, do routine water change, smell the fish food and check its freshness, check for any other signs or symptoms.
- **Swimming awkwardly** – costia, swimbladder problems
- **Swimming with mouth open** – could be a foreign object stuck in the fish's mouth
- **Swimming upside down** – swimbladder disease
- **Rubbing body along gravel** or tank objects – ick, chilodonella, costia, fish leech, skin flukes, velvet disease
- **Swimming wildly** – check ammonia level

- **Standing on head** – intestinal worms, kidney damage, toxic water (do immediate water change) female fish may do this when they become exhausted from the male's breeding attempts
- **Standing on tail** – exhaustion from spawning, toxic water
- **Laying or leaning to the side** – where is the fish's light source coming from? Also toxic water, infections, parasites, lack of oxygen. The fish could be blind and cannot see the light to balance itself.
- [Worms, Spots, and Lumps](#)
- **Black spots** – black spot
- **Lumps** (various shapes) – Tumors
- **Small worms** – skin flukes
- **Worm-like protuberances** – anchor worms
- **Disc-like parasites attached to body and fins** – fish lice
- **Reddish or white spots making patches** – fish pox
- **Small white spots on body** – ick
- **White spots only on pectoral fins and gill plates** – male fish of breeding age will sometimes have these spots
- **Open sores located on fish** – ulcers
- [Abnormal Appearance \(except spots, worms and lumps\)](#)
- **Cotton-wool like growths** – fish fungus
- **Color changes** – water quality, pigment loss, melanophore migration
- **Bulging eyes** – dropsy
- **Curvature of the spine** – internal parasitic worms
- **Emaciated** – internal parasitic worms, velvet disease, fish tuberculosis
- **Emaciated/bulging eyes & skin defects** – fish tuberculosis
- **Emaciated/sunken eyes & pale gills** – blood flagellates, copepods
- **Eyes appear cloudy** – possibly velvet disease, ick, fish tuberculosis
- **Fine white threads** – columnaris
- **Edges of fins frayed** – finrot / tailrot
- **Split fin** – skin flukes
- **Excess mucous being produced** – check ammonia level
- **Fin edges slightly opaque** – finrot / tailrot
- **Fin membrane breaking up** – finrot / tailrot

- **Fin rays disintegrate** – finrot / tailrot
- **Fish appears to be wasting away** – flukes
- **Milky skin** – pH plunges, parasites
- **Pinecone appearance due to scales sticking out** – dropsy
- **Redness of fins** – check ammonia level, parasites, bacterial infection
- **Sunken eyes** – dropsy
- **Swollen abdomen** – dropsy, internal parasitic worms
- **Inflamed patches** – costia, skin flukes
- **Reddish color in patches over the body** – inflammation
- **Skin falling away** – chilodonella
- **Ulcerated body** – columnaris, dropsy
- **Bubbles in the fins** – this usually occurs when the water is full of supersaturated gases (nitrogen) and this creates bubbles that the fish will swim into.
- **Yellow brown to greyish color** – velvet disease
- **Feces trailing behind fish** – constipation
- **White eye** – a flexobacterial infection
- **White spots on head growth** – this is seen in species that develop head growth. It may be some debris, etc. that has become stuck in the crevices. So long as the fish appears to be healthy no treatment is required. You can try to dislodge it using a water-soaked Q-tip.
-

DISEASES AND TREATMENTS

The best way to keep your fish healthy is to follow the basic rules of good aquarium or pond management. Feed your fish correctly, keep their environment clean, avoid rapid temperature changes, ensure there is an adequate oxygen supply and make partial water changes as necessary.

Unfortunately, illness sometimes still occurs and the first sign to be aware of is stress. Just as a stressed human is prone to infection by bio-aggressors, so are fish, and stress is the principle cause of disease in fish.

There are three basic types of diseases in fish: parasitic, bacterial and fungal. These organisms are always present in the aquatic environment and a healthy fish can generally ward off, however, if a fish is weakened by stress or damage the risk of infection is high.

When fish become ill they show signs in their behavior such as:

- clamped fins
- shaking bodies
- constant scratching against objects in the tank
- hiding in the corners
- gasping at the surface
- swimming abnormally

The good news is that most fish diseases can be treated if caught in time.



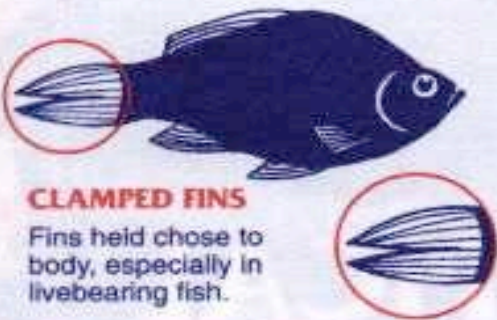
ANCHOR WORM AND EXTERNAL PARASITES

Threadlike worm hanging from fish. Base of anchor worm may be red. Nodules or reddish pimples on skin. Frayed fins.



GILL FLUKES

Gills hang partly open and may pump fast. Gills may appear red.



CLAMPED FINS

Fins held close to body, especially in livebearing fish.

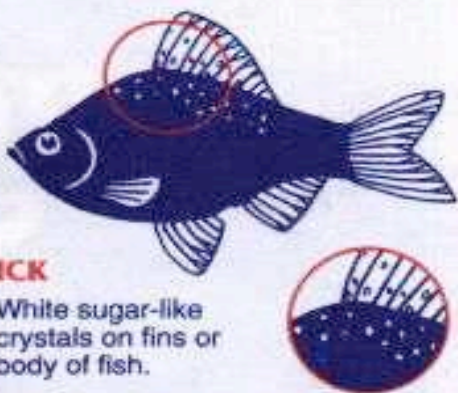


HEMORRHAGIC SEPTICEMIA

Red streaks on fins or body with no sign of skin damage.

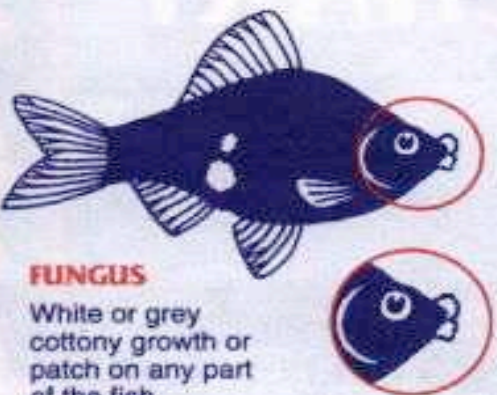
DROPSY

Fish bloated with scales standing out. Fish resembles a pine cone.



ICK

White sugar-like crystals on fins or body of fish.



FUNGUS

White or grey cottony growth or patch on any part of the fish.



TAIL, FIN OR MOUTH ROT

Flesh eaten away around mouth, tail or fin. Possible redness at base of area.

COMMON GOLDFISH DISEASES AND TREATMENTS

Anchor Worm – worms appear as 1/4 to 3/8 inch piece of string with a forked tail. Anchor worms that grow large are easily detectable and cause considerable distress to the fish. In most cases, the parasite is introduced into the aquarium from live food or aquarium plants. An anchor worm will install itself under the scale of a fish where it will grow to an adult. It will then attach itself by burying its anchor-shaped head under the skin of the fish (Don't confuse this ulceration with that caused by bacterial diseases). Treat for this immediately it is contagious! **Symptoms:** Clear to white, green or brown-red string-like worms, with forked tails are visible on the skin, head or mouth of the fish. Open sores may also appear on the fish's skin with the worms (parasites) protruding from the sore. **Treatments:** If you can see the parasites you can kill them with a gyrase inhibitor added directly into the water. It is non-toxic to the fish and it will clear the parasites within 3 to 4 days. Visit your local pet store and purchase medication that states it treats anchor worms and follow directions accurately! Another method is to take a pair of tweezers and carefully remove the worm.

Bacterial Infection – Bacterial diseases are usually the result of unsanitary tanks, cold water, over-crowding, corn-based diets, or parasite infestation. There are several forms of bacterial infections that can infect your fish. Many times the symptoms of bacterial disease can be visible on the fish. Such common diseases are Fin Rot, Ulcers, and Dropsy. Other bacterial infections are impossible to distinguish without running laboratory tests. It is not necessary to identify the specifics before you treat the fish. To help prevent infection maintain proper water conditions. **Symptoms:** Cloudy eyes, open sores on the body, abscesses, inflammation (reddening) of the skin, fins or internal organs. Bulging eyes may be present or possibly rapid breathing. **Treatment:** A fish infected with a bacterial disease should be treated in a separate tank if possible. The best medicine is a broad spectrum gram negative antibiotic. There are other possible treatments. See your local pet store.

Dropsy – Dropsy is not a specific disease, but rather a condition where the fish's abdomen becomes swollen. It causes concentration of the fluids in the body tissues or cavities. This results in swelling of the fish's abdomen, thus creating a pinecone effect where the scales protrude from the body. A sudden swelling of the abdomen (scales may stick out) is known as acute dropsy while a slow swelling of the abdomen is known as chronic dropsy. The actual cause of this swelling could be one of several conditions including internal bacterial infection, cancer, internal parasites. Many treatments have been tried for dropsy but with little success. The disease is usually terminal.

Fin or Tail Rot – Fins that are badly torn or frayed for reasons other than fighting will usually indicate fin or tail rot. Fin or tail rot is a bacterial infection that usually attacks fish weakened from another cause. Symptoms: It first appears as a whitish edge on the fins, then the fins start to rot away and may appear ragged, frayed and torn Treatment: It is easily treated with an antibiotic available from your local pet store. Ensure the medication states that it treats fin or tail rot. In some cases a secondary infection or

fungus will appear. If this is the case, treat the fin rot and then deal with the fungus problem.

Fungus – In most cases, fungus is a secondary infection. If a fish has an open sore caused from injuries or even a recent disease which may have penetrated the skin, the lack of mucus covering can leave the sore unprotected. During this period the wound is open to a secondary infection from fungus. **Symptoms:** The fish has patches of white or gray fuzzy puffs (resembles cotton) attached to its skin. There may be excessive mucus on the fish's gills or surrounding the wounds. **Treatment:** If treated quickly, fungus is easy to cure. There are several medications available. Check your local pet store. Fungal medications are sometimes applied directly to the patch of fungus present on the fish. This is generally done with a cotton swab.

Ick (Ichtyophthirius, fresh water white spot) – A common parasitic disease among fish. It is often present in freshwater aquariums and infects fish that are in poor health or have had a recent infection that has temporarily left them with a lower immune system **Symptoms:** Body and/or fins will be covered with small white dots resembling the look of being sprinkled with salt. The fish may scratch itself on tank walls or ornaments, show signs of rapid breathing, cloudy eyes, cloudy fins or some fin deterioration. Rapid gill movement is sometimes seen in the later stages. **Treatment:** See your pet store or vet for medication. You may want to remove a badly affected fish to a quarantine tank but it is important to treat the main tank to ensure you have removed all traces of the parasite. The treatment is only effective when the parasite is in its free swimming stage and seeking another fish host.

Note: Male goldfish that have reached breeding age will sometimes display white spots on their gill plates and pectoral fins. Do not confuse this with ick.

Constipation – this is a common problem in many varieties of goldfish and is usually caused by a poor diet. **Symptoms:** Trouble passing feces, or feces constantly trailing behind a fish. **Treatment:** Feed your fish some live food such as chopped earthworms, wax worms, brine shrimp, etc. If you can get your fish to eat one grain of Epsom salts in a small piece of meat it can help aid with the constipation. Soaking some dry fish flakes in a little castor oil will also sometimes help.

Costia, Cyclochaeta and Chilodonella (Slime Diseases) – There are various types of parasites that can cause similar symptoms and they are treated in similar ways. Note that if the disease spreads to the gills it is often fatal. **Symptoms:** frayed fins, sluggishness, dulled coloration, damaged gills. **Treatment:** There are many medications available from your vet or aquatic retailer. Treat the main tank and remove the affected fish to a hospital tank for treatment if required. If the disease persists after using the medication then the fish has probably been infected with the more resistant Chilodonella strain. A 1% salt water bath or a formalin and water bath can sometimes help, however seek professional advice before attempting this remedy.

Swim Bladder – The swim bladder allows the fish to stabilize its depth in the water. Swim or air bladder problems sometimes occur in freshwater fish. When the bladder is affected, the fish will experience equilibrium problems. Diseased or inflamed internal organs, poor water conditions or nutrition, and wounds received from fighting can also affect the equilibrium of a fish. Constipation is a common cause of swimming difficulty. **Symptoms:** The fish has problems swimming correctly. They may appear to be standing on their head, or floating to the surface and struggling to get to the bottom, or possibly even have problems removing themselves from the bottom. At the later stages of the disease, the fish could lose its balance and swim upside down. **Treatment:** There is no specific treatment for this dilemma, however, you can try isolating the fish to a quarantine tank where the water is shallow – this will provide some relief for the fish – and add one teaspoon of salt per gallon of water. If you suspect constipation is the cause of the problem follow the treatment for constipation. After 1–2 weeks try returning the fish to the main tank.

Skin Flukes – Flukes are trematode worms up to 0.8 mm or .03 inches in length. They attach themselves to the fish, sometimes near the gills, by using a sucker with two clasping hooks, and they then proceed to feed on the fish skin cells. These worms are forever producing. (The adult produces young, and even the young is producing a younger worm within it) Serious infections can result, and minor ones are less likely to be noticed. You should assume that if you are treating for a bacterial infection that you treat for flukes as well. They are easily seen with a microscope. Most species of fish can become infected with this problem. **Symptoms:** The fish may rub against hard objects in an attempt to get the flukes off, and the skin may appear opaque or inflamed. **Treatment:** Easily treatable with Potassium permanganate, or fluke tabs. Another known remedy is using a 3% salt dip to rid fish of the parasites.

Black Spot – Often these spots are seen as the fish is healing from ammonia surges. The area that was burned will turn black and this is the healing sign. The spots should fade within about 2 weeks. Orange Goldfish will sometimes turn black on their back and sides. After about 7 days the patches disappear and the fish appears orange. This is known as “Melanophore Migration” and is usually caused by any type of chemical irritant or traumatic injury. Some very common causes: high level of ammonia, low pH, flukes, or ick. The black color will not show up until the irritant is removed and the skin begins to heal. However if there are snails in the tank or the fish are living in ponds you should read below.

These spots could be from the pigmented cysts that contain the larval stage of a trematode intestinal fluke. **Symptoms:** Small black or brown spots up to 2 mm (0.08 inches) across. These spots appear on the body and fins of the fish and sometimes on their mouth and eyes. **Treatment:** Modern anti-parasite treatments should kill the parasites. The spots once formed may remain on the fish.

Chilodonella – A parasite that can attack a weakened fish but can spread to healthy fish in crowded conditions. The disease is very debilitating and in severe cases can cause long-term damage to the gills. **Symptoms:** The fish may have clamped fins, they may be

gasping at the surface or displaying labored breathing. They may be lethargic and spend more time hiding. Affected fish might rub against hard objects and hold in their fins. A whitish blue opaqueness might cover the skin, particularly between the head and the dorsal fin. If the gills are affected, the respiration rate increases noticeably. In the later stages of the infection the skin may have a swollen appearance. **Treatment:** If the fish is fairly strong, try a 3% salt dip. Keep the fish in the salt solution until it rolls over, then put it back in the tank. For an alternative treatment, and one that is less stressful for your fish, try a salt solution of 1% and let the fish swim in it for 10–15 minutes, then place the fish back in the tank. There are also medications available at pet stores. Follow the directions accordingly. Treat the entire tank to ensure removal of all parasites.

Pop-Eye – Pop eye can affect both pond and aquarium fishes. The progress of the disease depends on what has caused it. Bulging eyes can result from a number of causes, including fish tuberculosis, septicemia, ick, dropsy, and bacterial infections. Symptoms: One or both eyes protrude abnormally. (Remember that some fish are bred to have protruding eyes ex: fancy goldfish) Treatment: Use anti-parasite and anti-bacterial treatments. Seek advice early. Septicemia must be treated immediately and tuberculosis is extremely serious.

Blood Flagellates – Normally aquarium fish are not affected by this. This disease consists of single-celled organisms with hair-like flagellae. They live as parasites in the blood of the fish. They live in a leech's intestine and are passed on to the fish when the leech bites the fish. **Symptoms:** Fish will appear listless and swim abnormally. They become emaciated, with sunken eyes and pale gills (this indicates low red blood cells). Severely infected fish will die. **Treatment:** No chemical treatment has been found to be effective against blood flagellates in fish. Since only fish that have been attacked by leeches become infected, it is most effective to remove the infected fish and eliminate the leeches. It is an easier task to accomplish in an aquarium than a pond.

Costia –Costia (Ichthyobodo) is a microscopic protozoan flagellate. A microscope is needed to see it clearly. The organism attaches itself to the fish and destroys skin cells. It usually preys on fish that are already ill, or weakened. In ponds it is seen in the spring. While the parasite is attached to the fish it will thrive. If the parasite falls from the fish it will die within an hour. When the infestation begins fish can die within a few days if treatment is not administered. **Symptoms:** Red hemorrhaging will appear usually under the chin and along the fish's back. If the red dots are under the scales it is more than likely a bacterial infection. Affected fish will swim awkwardly, with their fins folded. They may seem to be scratching themselves against objects in the tank. An off-white film over the body with reddening of the most affected areas may be seen upon closer inspection. **Treatment:** The best treatment is to raise the water temperature to 77⁰F where the parasite will be unhappy and to 86⁰F where they will die. This may be a dangerous task if the fish are suffering from a severe infestation. Putting your fish in a 3% salt dip until they roll over (then quickly put them back in the tank) or a 1% salt bath for 20 minutes may work. There are anti-parasite medications available at the local pet stores. Follow directions on the packages.

Fish Leeches – There are about 300 different species of leeches. They are worm-like creatures that suck on the fish. Besides having an adverse effect on fish they are carriers of blood flagellates. They cause wounds that may lead to secondary infections such as fungus, and bacterial infections. **Symptoms:** Fish become restless and will try to remove the leech by rubbing against objects in the tank. If you look closely you will see the leech clinging to the body of the fish. **Treatment:** A 3 % salt dip is usually effective. Pull off any leeches that do not fall off during the dip. Do not remove the leeches before the salt dip or you could cause further injury to your fish. There are medications available at the local pet stores if you are more comfortable using that form of treatment.

Fish Lice – Fish lice can infect many species of fish. These parasitic crustaceans have eight feathery legs they use to swim with. They grab on to the fish and draw blood and body tissues from beneath the skin. There are about 200 species of fish lice (argulus). **Symptoms:** Fish lice are disc-shaped parasites between 8 and 12 mm (0.3-0.5in) in diameter and vary in color from light green to brown. They can be seen attached to the fish's body and fins. **Treatment:** Fish lice are relatively large so they can be removed individually from the fish using tweezers. Some information states using a strong salt solution applied with a paintbrush to help dislodge them. There are medications at pet stores available to help with this situation also.

Fish Tuberculosis – The bacteria Mycobacterium is responsible for this problem. This infection can infect humans, so take precautions when siphoning water from the tank and wash your hands thoroughly when finished. **Symptoms:** Affected fish may show loss of appetite, become lazy or listless, and lose color. When the disease has progressed the fish may become emaciated and develop bulbous eyes and skin defects. They may also suffer a deformed spine. A lot of the time no outward signs will be seen before several fish die suddenly. **Treatment:** In the early stages a human anti-TB drug could be used (seek a veterinarian for this). However, once the disease has advanced the medication does not seem to help. Always remove the sick and dying fish.

Internal Parasitic Worms – Intestinal worms are usually found in outdoor fish. Indoor fish can become infected through wild-caught fish, or by feeding certain live foods that carry the parasites.

Thorny headed worms – These parasites attach themselves to the intestine, damaging lining and making the fish susceptible to infections and other parasites. These particular parasites hang on the gut lining by a cluster of tiny hooks and absorb food over their entire body surface.

Tapeworms – Usually flattened and ribbon-shaped. They use sucking discs or hooks to attach themselves to the belly or intestine of the fish.

Threadworms or roundworms – Usually found in the intestine of the fish. There are only a few select species that will be found in fish tanks.

Camallanus – A worm that infects the rectum of aquarium fish. It is usually seen in live-bearing fish. Clusters of the worm can sometimes be seen protruding from the anus of a resting fish.

Intestinal flukes – Gill and skin flukes are exterior parasites.

Treatment: Severe infestations of internal parasitic worms are difficult to treat. Check with a veterinarian for more help on this issue. Prevention is the best medicine.

Tumors – Tumors can be benign or cancerous. Most tumors are incurable. Abnormal growth in the thyroid gland is sometimes curable. **Symptoms:** Internal tumors can only be detected when they distend the body. External tumors can be visually noticed. Any fish can be affected. **Treatment:** Thyroid tumors need a vet's identification. They may be cured with prolonged baths in 5mg/litre of potassium iodide solution. However, it is usually recommended to dispose of the fish in a humane way.

Warning: when using medication always follow the directions and keep all medications out of reach of children.

QUARANTINE / HOSPITAL TANK

With the exception of wounds and some visible fish parasites the treatment of fish takes place in water either in their own tank or, if possible, in a separate hospital or quarantine tank. A separate treatment tank will allow you to administer the correct dose of medication as you should be able to easily calculate the volume of water. If you use a hospital tank it should be aerated but activated carbon should be removed from any filter as it will absorb the medication.

Before returning your fish to the main tank or pond remove the medication from the hospital tank by doing partial regular water changes. This will assist to acclimatize the fish to the clean water conditions of the main tank.

Your hospital tank won't need plants or ornaments although you might like to add a couple of plastic plants to give the fish a feeling of security.

EUTHANASIA

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There are times when it is more humane to destroy sick and injured fish than to let them slowly die by themselves. If measures to help sick fish are ineffective, it is often better to end the fish's suffering by humane means.

WHAT ARE THE BEST WAYS TO EUTHANASE FISH?

An overdose of anaesthetic administered by your veterinarian is a recommended method of euthanasia. The Australian Veterinary Association also states that “severance of the spinal cord, either with a scalpel or by pithing, is recommended. Pithing is recommended for fish up to 10 cm in length.”

However, taking your fish to the veterinarian is not always practical, so there are some humane methods of euthanasia that fish owners can use:

- Stunning fish with a sharp blow to the head, followed by decapitation is a rapid, effective, humane way to euthanase a fish, as long as it is carried out competently.
- Clove oil is used to anaesthetize fish and is fatal to fish at doses greater than 1/4 ml per litre of water. Clove oil is used in beer brewing and can be purchased through home-brewing outlets. It is also an aromatherapy oil, so try specialty outlets where oils are sold. Keep in mind that clove oil is classified as hazardous and can be irritating to the skin and eyes, and can be harmful if swallowed.

Since fish are cold-blooded, the brain can continue to function for a long time even after the heart and lungs have ceased functioning. Therefore it is possible for fish to recover from deep anaesthesia even if they are apparently dead because they are not breathing and have no heart beat. It can be very difficult to determine if a fish is dead, therefore, once the fish is deeply anaesthetized by leaving it in the solution for a couple of hours, it is recommended to freeze the fish, decapitate it or administer a sharp blow to the head to ensure it does not recover from anaesthesia.

WHAT ARE NOT ACCEPTABLE METHODS OF KILLING FISH?

Flushing fish down the toilet into the sewerage system causes slow death by exposure to toxic chemicals and water conditions.

Freezing fish is also a slow way to die and is not considered humane since the fish is not rendered rapidly insensible to pain and distress.

Taking the fish out of the water to suffocate is also not an acceptable method of killing fish.

HOW DO I DISPOSE OF THE BODY?

How you dispose of the body is up to the individual owner. Some prefer to bury their pets, but the body can be disposed of as normal household waste after wrapping it securely in plastic. Burning is also recommended.