

- Avoid locations close to bedrooms or else frogs may keep you awake.
- “Plant shelves” are a desirable feature for most water gardens.



- Water Garden Society of Oklahoma, Will Rogers Park, Oklahoma City www.wgso.org
- Central Oklahoma Water Garden Society, Inc., Norman, OK and surrounding area www.COWGSI.com

- Pond Life: Revised and Updated (A Golden Guide from St. Martin's Press), ISBN 1582381305. Drawings and information on the amazing plants and animals that will find their way into your water garden.

Conclusion

The idea of not feeding water garden fish may be difficult for some people to accept. It is neither cruel nor impractical. Given proper stocking rates, an un-fed water garden managed as described above, mimics a natural aquatic ecosystem and offers all the delights of other water gardens with fewer problems. Most water gardeners seek relaxation – the low intensity, no-feed approach offers just that.

You will hear different opinions about how best to plan and manage a water garden. Keep in mind the amount of time and effort needed for each method. Take advantage of the sources of information mentioned above and you will be in a much better position to pick and choose between various strategies for managing what will become an important part of your landscape.



Learning More

The following publication contains additional essential information required to plan, construct, manage and enjoy a successful water garden:

- Water Gardens, SRAC publication no. 435. This fact sheet is available online at srac.tamu.edu

Two other sources of information are also recommended:

- Your nearest water garden society. Check with your county Extension office to see if there is one in your community. Here are a few in the larger metro areas:
 - Green Country Water Garden Society, Tulsa Garden Center, (918) 482-2327 www.gcwgs.com
 - Oklahoma Koi Society www.oklakoi.org/forum
 - Tulsa Koi Society (918) 834-KOI4 www.koitulsa.org



Water Gardens – A Low Management Approach

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When properly planned and managed, water gardens are restful, relaxing, and beautiful additions to any landscape. However, if you get started on the wrong foot, your water garden will be difficult or even stressful to manage. This publication promotes a low intensity approach to water gardening and attempts to dispel some common misconceptions that can lead to problems in managing a water garden.



Water Gardens Are Not Pet Fish Aquaria

Most of us have some experience in managing an aquarium. This can lead to problems if we assume that a water garden must be managed in the same way.

Feeding of water garden fish is not required when fish are stocked lightly. A stocking rate of one fish per 5 square feet of surface area should allow fish to do well foraging for natural food. In new water gardens, where natural food is not yet plentiful, stock fish that are less than 6 inches long.

Oklahoma Cooperative Extension Fact Sheets are also available on our website at: <http://osufacts.okstate.edu>

If you do choose to feed your fish, be careful not to overfeed. Excess fish waste and uneaten feed quickly degrade water quality. This problem is more likely when fish are overstocked, have grown large over time, or too much “recreational” feeding occurs. Dense green, turbid pond water; elevated ammonia levels; and even fish death due to poor water quality can result from overfeeding. Water exchanges and reduced feeding are generally recommended if dense green water or fish distress are observed as a result of over-feeding.

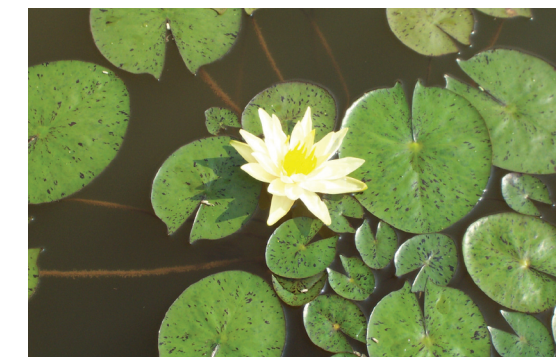
Water Gardens Are Not Swimming Pools

Some of us are familiar with the management of swimming pools. The use of chemicals and expensive filters to keep water crystal clear is incompatible with a water garden that functions according to the principles of nature.

Aquatic plants are the best way to filter and treat the wastes produced by fish in a water garden. Plants include microscopic phytoplankton, which at times cause the water to take on a greenish color. This is normal. It is also normal for algae to grow on waterfalls. Chemical control of these two types of plants is impractical.

The “higher” aquatic plants, such as lilies, arrowheads, etc., help limit the growth of algae and phytoplankton by competing for light and nutrients. A common recommendation for preventing excessive growth of algae and phytoplankton is to add enough aquatic plants to shade 50 to 75 percent of the pond's surface.

Purchasing and using a water quality test kit is not required for a properly managed pond where feed is not used or is used very conservatively. It is not unusual for water gardeners



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to be overly concerned with water quality measures like pH. The pH in water gardens follows a daily cycle with the highest level occurring in the afternoon, especially when there is a “bloom” of microscopic algae. It is not necessary or desirable to chemically adjust the pH as long as it stays between 6.0 and 9.0 most of the time.

Expensive Is Not Always Better

The more expensive water garden is not always the better one. For instance, be aware that expensive filtration systems require regular maintenance and can be overloaded by too many fish and too much fish feed. The least expensive and most reliable method of avoiding water quality problems is to stock small numbers of fish and limit or totally skip the use of fish feed.

There are expensive and inexpensive options when choosing fish. Investigate the advantages and disadvantages of both goldfish and koi before choosing between the two. Goldfish are hardy and available in a variety of pleasing color patterns, similar to koi. Choose goldfish varieties that have a simple body form suited to quick swimming. Avoid those with extra large fins or bulging eyes etc. Koi require a larger pond but have a distinctive beauty. Koi with prized color patterns are quite costly but others can be very inexpensive. A beginning water gardener is probably better off with goldfish, especially if their pond will be less than 1000 gallons in size. Native fish species are an interesting but more challenging third option.

After you have selected the type of fish you will use, fish health is of greatest concern. Inspect fish closely and reject any that hang close to the water surface, have whitish dots on their surface, or display poor balance or other abnormalities.

Pond liners are one item on which spending more money is probably better. Be sure to use a liner material specifically designed for ponds.

Water Gardens Are Ecosystems

Almost everyone is familiar with the term “ecosystem” but few people truly understand how one works. Figure 1 illustrates the poor water garden management practices that occur when ecological principles are overlooked.

As a water gardener you have a unique opportunity to closely observe an aquatic ecosystem in action and to influence it through your management. Begin by learning the “parts” of your water garden ecosystem. These are the...

- Producers - the higher plants and algae
- Primary Consumers - the insects and tiny zooplankton

- Secondary Consumers - the fish
- Decomposers - the bacteria and fungi

Figure 2 illustrates the parts of a water garden ecosystem and how they interact to form a balanced system. The energy of the sun supports the growth of plants, which in turn are food for the tiny zooplankton and insects, which in turn are food for fish. The decomposers feed on wastes and dead material. This releases nutrients that are used by the plants. A pyramid is often used to picture the relationship of producers, primary consumers, and secondary consumers. A stable ecosystem requires a large amount of plants in the base of the pyramid to support a smaller amount of insects and zooplankton. At the peak of the pyramid and smallest in total weight are the fish.

The clarity of pond water changes rapidly with the growth and die-off of microscopic algae known as phytoplankton. The coming and going of phytoplankton “blooms” is natural and should not be a cause for undue alarm, especially in the first year when the higher plants have not yet reached full size. These microscopic plants and the other plants you add to the pond are the foundation of the pond ecosystem upon which everything else depends.

A step above the plants, are the zooplankton and insects. You may be able to see a few of the tiny zooplankton, by collecting a clear plastic baggie of pond water. Seal it and hold it at an angle so that one corner is down. The zooplankton will tend to collect in the bottom corner – look for tiny spots that jump.

Some of the most noticeable insects in and around water gardens are the dragonflies and damselflies. As they buzz

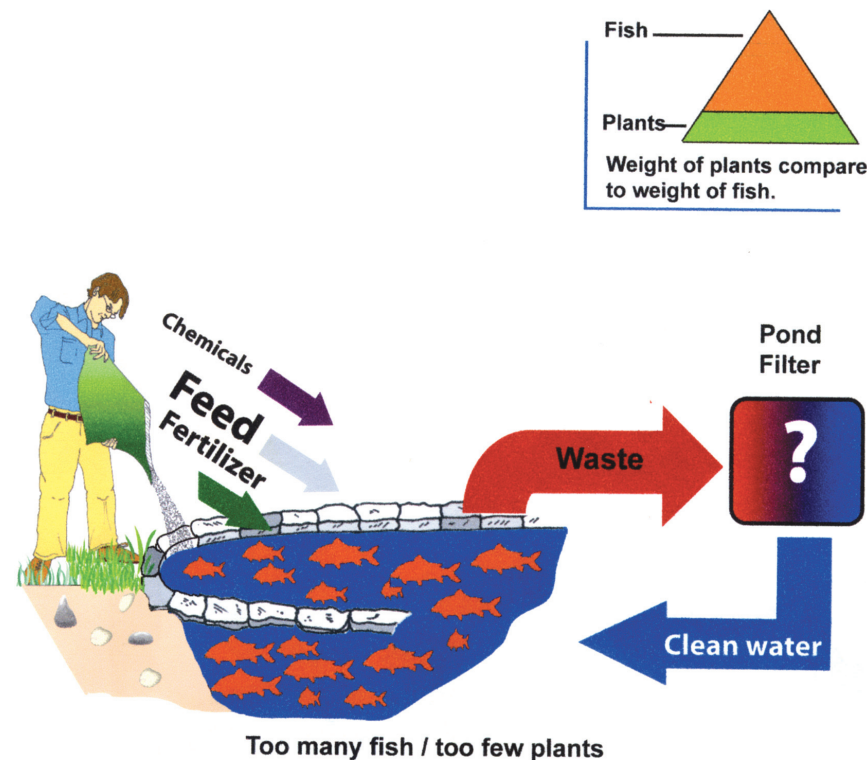


Figure 1. The common, but incorrect, view of how water gardens should be managed. Problems are sure to occur due to overstocking of fish; too little plant cover; and overuse of feed, fertilizer, and chemicals.

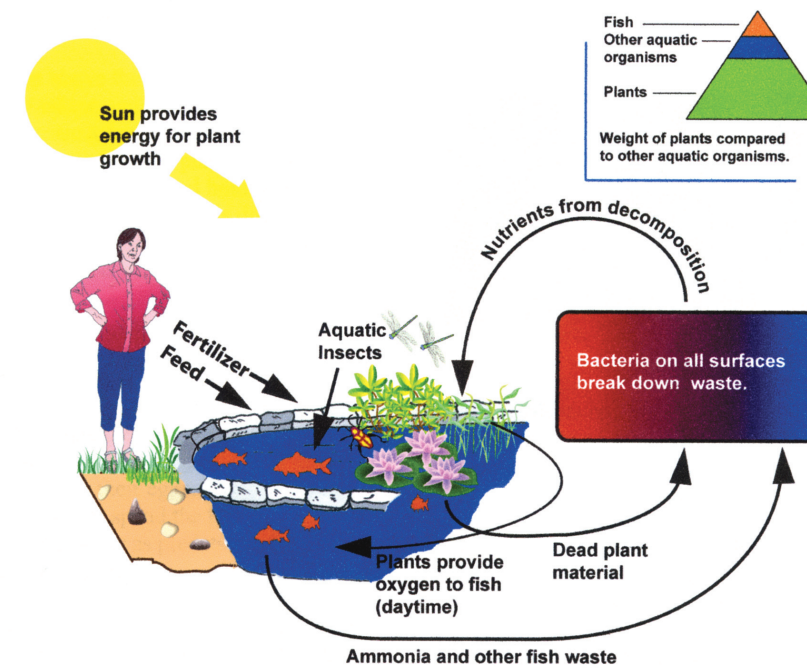
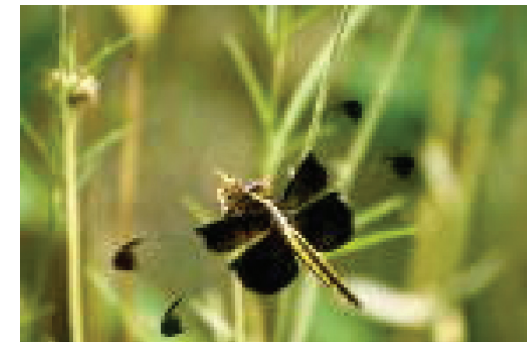


Figure 2. The correct view of a water garden ecosystem in which the knowledgeable water gardener promotes a balanced and healthy system. Excessive use of fish feed, fertilizers, and chemicals is avoided.

around the pond they are not only looking for something to eat but also a place to lay their eggs. These amazing aerial insects spend the first part of their life underwater as predators of insects and other small forms of pond life.



If you wish to prevent fish reproduction, stock a solitary sunfish to eat any eggs that are laid. Sunfish such as bluegill, green sunfish, or redear sunfish will eliminate the problem.

Learning about the lifecycles and functions of the different forms of life in your water garden and how they form an inter-related, balanced system will greatly enhance your enjoyment of it. There are many forms of plant and animal life that will find their way into your water garden. Just as bird watchers enjoy finding and observing birds, you can enjoy the many interesting forms of aquatic life in your pond. A magnifying glass is recommended.

Aquatic plants require nitrogen, phosphorous, and other nutrients, just like all other plants. The most reliable way to supply nutrients to containerized plants is to insert aquatic fertilizer tablets into the soil. Nutrients are also released into the water in the form of fish waste but may be taken up by phytoplankton before they come in contact with the roots of

containerized plants. Too much fertilizer can cause water quality problems leading to fish health problems and excess algae.

Quarantine to Prevent Problems

Serious fish parasites, including the dreaded “Ich” (*Ichthyophthirius multifiliis*), can easily find their way into your water garden when you introduce new fish, plants, or move anything from another water garden or pond.

- Hold new fish and plants in an isolated tank for at least two weeks.
- The quarantining of plants also gives you an opportunity to attempt to remove duckweed or watermeal that may be “hitchhiking” on larger plants.

If no problems become apparent after two weeks in quarantine, the fish are probably safe to transfer to the water garden. One exception is the koi herpes virus which requires at least 30 days in quarantine to detect. Use of harsh chemical dips to remove parasites is not recommended in most cases. Fish can be harmed by overuse of such chemicals.

Nets, pumps, and other equipment should be thoroughly dried and exposed to the sun or sterilized with chemicals before being transferred from another water garden into yours. Such items may carry parasites if they have been in contact with fish elsewhere.

Safety Concerns

To minimize the chances of someone being injured in or around a water garden, the following advice applies:

- Take care that toddlers do not have access to water gardens.
- Use ground fault interrupter outlets for pond pumps and lights. Unplug them before entering the pond.
- Pond liners can be extremely slippery - take steps to ensure that you do not slip. When you must enter your pond, having a buddy present is an excellent idea.

Design and Site Considerations

The advice of an experienced landscaper can be invaluable in assuring that you will be pleased with the appearance and functionality of your pond. Here are some recommendations to consider:

- Consider sites close to a patio or other seating area where the pond can be better enjoyed. The distant corner of the backyard may be a poor location.
- Access to an electrical outlet should be considered.
- Avoid sites under trees where leaf accumulation will be a problem.
- Do not build a water garden that receives runoff water from surrounding areas. This puts the pond at risk of chemicals in the runoff.