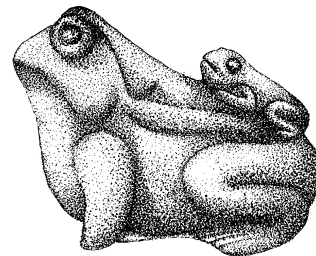


Ng Kok Hong

# GARDEN POND MANAGEMENT

FROM SCIENCE TO DESIGN



**T**he garden, a symbol of paradise is never complete without shade and water. The architecture of the past and the present appears incomplete without the presence of living water in the design. Water has inspired Islamic garden for centuries and it is still a prominent feature in today's architecture and landscapes.

The pond in a garden brings about a kind of comfort that mysteriously stimulates both the mind and senses. The garden pond needs to be designed with respect and understanding as a bad design can be disastrous not only to functioning of the pond itself but ultimately the surrounding environment as well.

Water, the element of life, in a garden pond contributes to peace and freshness that manifests itself in relaxation and pleasure. But such a sense of peace and freshness can only be achieved with the success of the water garden with water playing its primary role as the element of relaxation and pleasure. History has recorded the beauty and success of water in the garden but there are also as many failures of water gardens that stem from a poor understanding of its application.

Water itself is a complex element though it reflects its simple form through its purity. It has long been taken to symbolise many forms of rituals and expressions in many cultures and civilisations. Historical records have glorified the use of water in the garden but the limitations on its use is more profound today in a modern society. Environment stress and consciousness affect today's modern architectural and landscape design. The use of water in gardens and in architecture no longer substantiates the old practices of symbolism and rituals but is merely a form of creative or artistic expression. Water in that sense has become an art form and we have lost an understanding of its purity and its life-giving properties.

Water in the garden has always commanded our inspiration to be part of the architectural design that reflects what we have sought after as a form of artificial paradise by design for relaxation and pleasure. Water in gardens is a key and vital element in today's landscape design. Far from being a ritual or symbol, it has become more of an environment that reflects care and responsibility besides being featured for pleasure. To succeed

in ways that has been achieved in past designs for pleasure, we must understand the nature of water itself through both an artistic and scientific approach.

Art in a water garden can be expressed in its creative aspects from shape, volume, colour and form. The expression of water by design has no limits and its physical quality and liquidity are adaptable to all forms of shape and design. The science of water is entirely another aspect altogether. Water in this sense is no longer a mode of expression but is a medium with quantifiable properties, that will have an impact on the surrounding environment. The nature of water itself has to be understood in regards to its physical, chemical and biological qualities besides being able to establish its form in terms of art.

## Nature as inspiration

The best approach to create an artificial aquatic environment or water garden is to look to nature itself. Ponds, lakes, rivers and other aquatic systems thrive symbiotically with other natural components from micro-organisms such as bacteria, micro plankton to large organisms

*Private Villa Bali – Living with water bodies all round the compound can be attractive provided the quality of water is well taken care of with proper understanding and management, otherwise, it might not be as attractive as it seems to be.*

nature as inspiration...



# the best approach to design and management of the pond is to understand the way it exists in nature itself



like fishes and macrophytes (plants). These water bodies display their beauty day and night, and across all seasons. In these ecologically balanced systems, all living and non-living beings remain healthy from the constant changes of the water quality.

Such adaptations and constant changes in different aspects of water quality maintain the health of a natural water body and all the flora and fauna that depend on it. The living backbone that holds an aquatic environment in place can break down and render a pond lifeless with the use of chlorine. Chlorine is applied in swimming pools and reflecting ponds as a disinfectant to achieve a clean pool for

swimmers and clear water for reflection. Most microorganisms in chlorinated water have either been deactivated or killed leaving the water body with no ecological function.

A garden pond, therefore, functions without the application of chlorine but due to poor design and understanding of pond and water management, it can still become an unwelcome body of water when it becomes eutrophicated or polluted naturally. Eutrophication defined as "...having waters rich in mineral and organic nutrients that promote a proliferation of plant life, especially algae, which reduces the dissolved oxygen content and often causes the extinction of other organisms." The best approach to design and management of the pond is to understand the way it exists in nature itself.

## Components of a healthy pond

In nature, undisturbed ponds thrive beautifully with fishes, aquatic plants and other micro and macro components that allow the cycle of nature to fulfil its role and remain a healthy living body. Such cycle of nature can be adapted and applied into artificial ponds in garden. Beneficial nitrifying bacteria in natural ponds also

occur naturally in designed ponds. These bacteria breakdown compounds into forms that can be assimilated and released back to nature through the nitrogen-cycle. These bacteria that work in nature can be adapted and brought to function in a designed pond with the installation of a biological filtration system. A bio-filtration system can be made or improvised with gravel, sand, nettings, pipes and other cheap available materials by a good, effective and creative design. Overtime, a well designed bio-filtration system will eventually replicate the natural processes by itself.

Naturally healthy ponds are filled with many life-forms including fish that feed on other organisms that keep the natural cycle going and maintain the food chain in the pond. Fish can be kept and adapted into garden pond for the same purpose. Gouramies are best for garden pond to control mosquito larvae. Barbs are best to seek and clean off leftover supplement food. Some, like the Indian Rohu (*Labeo rohita*) graze for algae as food on the pond bottom or the wall, cleaning up what would require to be removed for aesthetic reasons anyway.



*FACING PAGE | Garden ponds should be enticing rather than a burden in a home garden. Right conceptual approach and application will create a harmony and balance in aquatic body.*

*THIS PAGE | ABOVE Natural stones are used as bottom substrate covering the bio-filtration circulatory pipes as shown here. This pond in the inner court of a spa is maintained clear and crisp through out without much maintenance.*

*THIS PAGE | RIGHT Fishes thrive and spawn in pond like this which is intended to be as natural as possible without any application of chemicals. The pond is to be self-sustainable.*



# adapting natural processes in artificial ponds requires an understanding of the application of art and sciences

Introducing the right and 'functional' type of fishes into a garden pond is important as the fishes play critical roles in pond management and at the same time provide visual pleasure to viewers.

Macrophytes, or plants that grow in water, are natural water filters. These aquatic plants extract nutrients from water as fertilizers for growth. Such processes maintain the level of nutrients to keep the water quality in good state and at the same time allow the plants to thrive as submergents, emergents or floaters. Understanding the ways in which aquatic plants absorb nutrients from water, planting in garden ponds is always beneficial to pond management. Low maintenance plants such as *Pandanus amaryllifolius* grow very well in water. This plant extract nutrients efficiently from water and no artificial fertilising is required at all. The leaves are used in part for cooking and its natural fragrance heightens the aromatic effect of the garden pond. This plant can be planted in pots and designed to be partly submerged or above the water level based on the desired planting plan.

A designed garden pond is still an artificial eco-system unlike a natural pond. In nature, bacteria, planktons, fishes, macrophytes and many more organisms survive and thrive because the water contains a mixture of certain properties that support all these life forms. One of them is dissolved oxygen in water. Without dissolved oxygen in water, living organisms cannot survive. The ecological balance of

nature in water is vital in order for the natural life cycle to continue and for aquatic organisms to survive. There should be a balance of dissolved oxygen enough for bacteria and other organisms such as fish to survive from air-water contact exchange as well as from the process of photosynthesis in phytoplankton and plants. There should also be enough organic nutrients from living matter to allow plants to thrive in order for the phytoplankton or plants to produce dissolved oxygen. Such a cycle of ecological support is balanced naturally in a natural pond.

In a designed pond, dissolved oxygen which is vital for all aquatic organisms can be introduced and controlled. A good circulatory pumping system can be installed to support biological life in an artificial pond by allowing the cycle of nature to run through all components, which will allow them to adapt for long term survival in the pond.

## Summary

With the absence of chlorine, designed ponds for gardens can be made to mimic nature displaying a quality of water that is clear and crisp rather than an eutrophicated collection of dark green masses. In a well designed garden pond, fish swim, breed and feed naturally and as a result supplementary food might not be necessary. Plants may be used to soften and green the hard edges of the pond and these plants will serve to ex-

tract excessive nutrients in the water besides releasing oxygen through photosynthesis. The artificial fertilizing of the plants is not necessary to maintain healthy level of nutrients in the water. Nitrifying bacteria are made to work through an effective biological filtration system design installed in the artificial pond. The installation of a pumping system allows the water to flow and achieve a running water system with ample dissolved oxygen for all organisms in this designed aquatic environment.

As described earlier, adapting natural processes in an artificial pond requires an understanding of both the application of art and sciences with respect to pond design and management. The outward appearance of a garden pond can be made aesthetically pleasing through creative design and the inner functioning of the pond can be made to work correctly through science, and as a result a successful pond intended for relaxation and pleasure can be achieved.



**Ng Kok Hong** is a Malaysia based artist specialising in water garden design and management – by art and science. His firm Ayer Matahari Sdn Bhd is involved in design and management of pond, lake and other water related project like aquaculture. He can be contacted at [kokhong@ayermatahari.com](mailto:kokhong@ayermatahari.com)

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