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A photograph of a pond with pink lotus flowers and lily pads on a dark background. The water is dark, and the lily pads are various shades of green and yellow. Two pink lotus flowers are in bloom, one in the upper left and one in the lower left. The word "Water" is written in a white, elegant serif font across the top right of the image.

# *Water*



# in the Garden

## *Ponds: Part II*

TEXT BY KATE EASTON PHOTOGRAPHY BY MOLLY SHURTLEFF

Creating a water garden takes some thought and care in design and implementation. The first part of this series covered creating the water vessel. This article goes deeper into creating that balanced ecosystem that teems with life that is the modern water feature. The components of the balanced ecosystem include water, fish, and plants along with sunlight and temperature. The latter two components are up to Mother Nature; however, a balanced system can be achieved by careful attention to the first three.

### **Water — Quality for Life**

Water quality is important to all types of water features. In a balanced ecosystem, aquatic plants draw nutrients from the water and soil and they release oxygen into the water through photosynthesis. Some plants provide shade for fish. Fish consume the oxygen and insects and provide nutrients to the plants. Some fish also eat plants, helping keep them under control. A stable relationship between plants, fish and nitrifying bacteria keeps the water clear by controlling algae growth.

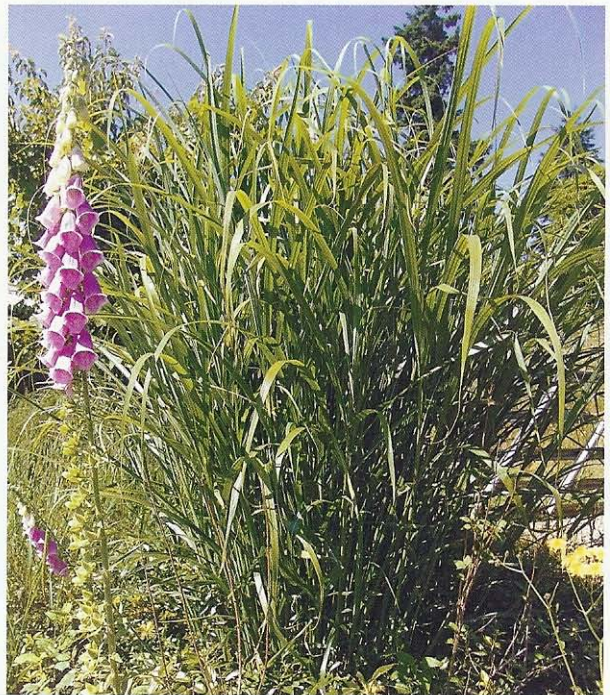
Too many fish or overfeeding are the primary reasons for reduced water quality. Too many plants or plant debris also contribute to water quality issues. Pond construction materials can also influence water quality by off-gassing or dissolving chemicals. Water from public systems may contain chlorine, chlorine dioxide, chloramine or ammonia. Aeration can remove chlorine; however, chlorine dioxide and chloramine require chemical treatment to neutralize them.

Many resources recommend monitoring the water quality regularly — visually and with test kits. The typical water gardener in Puget Sound does not need to test the pond water. However, checking regularly for proper functioning of the bio-filter is needed with fish in the pond. For those who like to be precise, water test kits that check pH (potential Hydrogen — acidity or alkalinity), nutrients (nitrogen, phosphorus, potassium), dissolved oxygen, and hardness (calcium, magnesium) are available. When filling the pond for the first time, rinse it well and drain it several times until there is no debris remaining. Fill the pond and wait 24 to 48 hours (to allow any chlorine to dissipate) before adding plants. The water may turn color initially, but it should clear on its own after a few



weeks. Once the water is clear again, and chlorine and chloramines have been neutralized, you can add fish.

Algae will grow in the pond and it will need to be controlled. According to Jan Bahr of Roadhouse Nursery, "Algae is part of the ecosystem and a certain amount is always in a healthy pond." The keys to the control of algae are: prevention through water movement, surface plants that shade the water from sunlight, ►





oxygenating plants that outcompete algae for nutrients and sunlight, and fish (tadpoles especially) or snails that eat algae. Mechanically removing surface algae scum while the pond is finding its natural balance is essential.

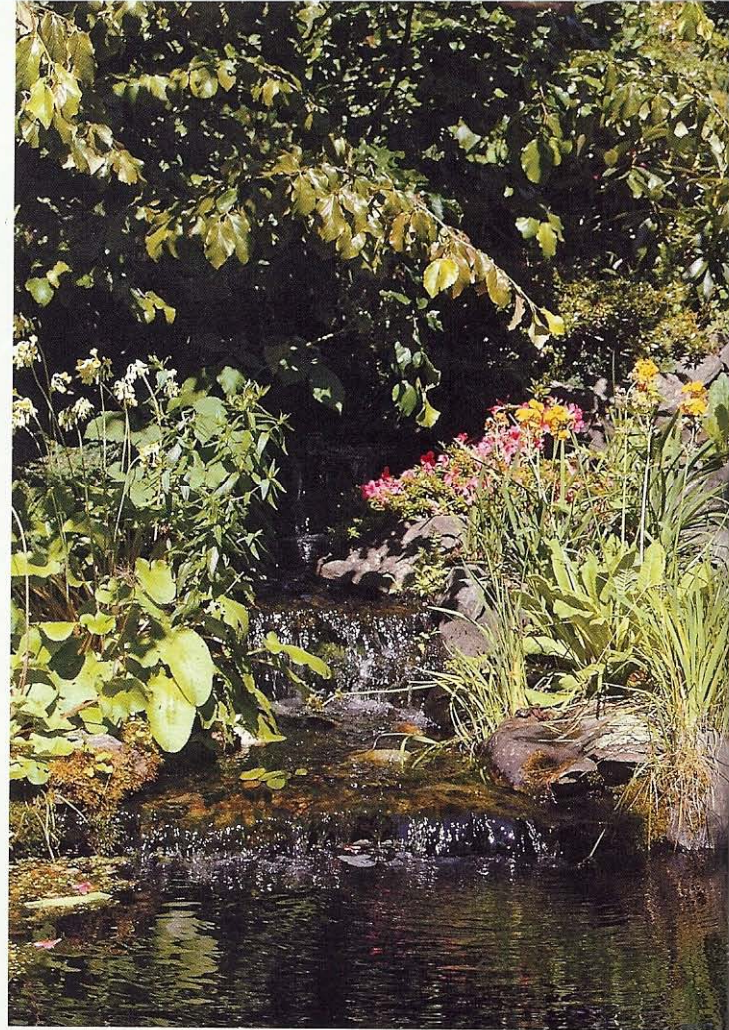
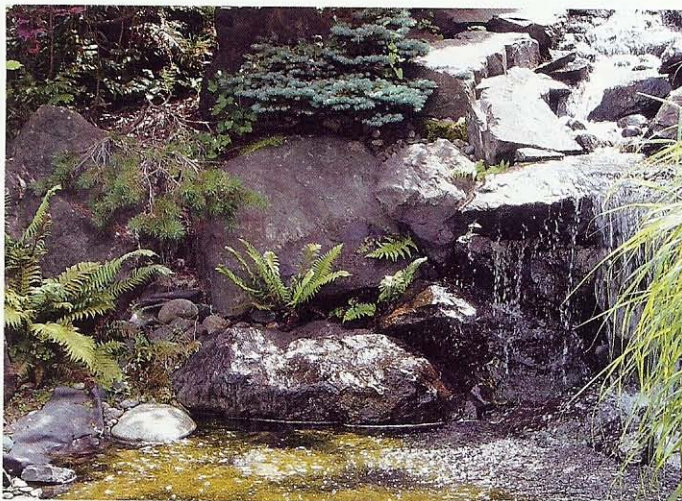
In the water ecosystem, nitrites result from the breakdown of ammonia introduced by fish defecation. Ammonia can be controlled by managing the number of fish, and by replacing 20 percent to 30 percent of the water volume once a month, or using zeolite in a mesh bag as an emergency filter. Ammonia and nitrites decompose into nitrates, which are used by plants to grow. Too much nitrates can cause algae blooms, leading to reduced oxygen that can result in fish death. Addition of oxygenating plants can help with nitrate processing. Since fish need oxygen, a waterfall, bubbler or fountain can help provide sufficient oxygen to the pond.

### Swimming Along — Fish

Fish add movement and color to the pond as well as assist in balancing the ecosystem. Most fish like relatively calm water, so placing the deep-water area away from a waterfall or fountain is necessary. Fish also need a place to hide from predators such as raccoons. Stocking rates are usually based on cubic feet or gallons; however, the following guideline can help with initial planning: One square foot of well-balanced pond water can support 2 inches of fish. For example, 6 square feet can support four 3-inch fish or two 6-inch fish. Consult with local water garden nurseries for more precise stocking information.

While Koi may be the most recognized of the pond fish, other species may be more appropriate for smaller ponds. Koi can grow to 2 to 3 feet, so they will need more room to live. Four to five Koi need at least 100 square feet with at least 10 square feet at a depth of 5 feet (or 20-25 square feet per fish). Three to six Goldfish (6 inches each) need at least 30 square feet with at least 10 square feet at a depth of 28 inches. Goldfish can tolerate shallower water and warmer temperatures (up to 95 degrees), and can over-winter outdoors.

Rudd (*Scardinius erythrophthalmus*) is a gold or silver surface feeder that needs plants to hide its eggs. Rudd tolerates water temperatures up to 102 degrees. Tench (*Tinca tinca*) is silver and lives on the bottom, eating waste matter. They grow to 18 inches



and tolerate swings in oxygen and temperature. Some resources recommend Orfe (*Leuciscus idus*), a silver schooling fish that eats insects and sometimes jumps out of the water. (Note: This species is not permitted in Washington.) Rudd, Tench, Goldfish and Koi work well in ornamental ponds while other fish are best for the natural pond system. These include: Bitterlings (*Rhodeus sericeus sericeus*), Brook stickleback (*Evacalia inconstans*), Minnow (*Pimephales promelas* or *Cyprinodon variegates*), Mosquito fish (*Gambusia affinis*), Three-spined Stickleback (*Gasterosteus aculeatus*), Gudgeon (*Gobio gobio*), Alburnus alburnus, and Phoxinus phoxinus.

Add fish to the pond when the water quality is stable and the temperature is consistently at 50 degrees. Float the bag in which the fish are transported on the surface of the pond until the temperatures equalize. Then, open the bag under water and let the fish out. Monitor them to ensure they like the new home. If they continually jump out of the water, there is something wrong. Don't feed the fish for two days after introduction to the pond, then only sparingly for a few days. Regular feeding of fish commences once they are acclimated, and only with an amount eaten within a few minutes.

Regardless of the type of fish, monitor them regularly for disease or illness. Lethargy, huddling against the edge of the pond, swimming frantically, bumping the pond edge, and gasping for air are all signs something is wrong. Check the water quality and correct it immediately if the fish have these symptoms. If the



behavior continues, the fish could have a disease or parasite. Ill fish should be removed from the pond and put in an aquarium while being treated. Consult your fish supplier for information on treating sick fish.

**Plant It — Adding the Green**

There are three main plant zones around ponds: in the water, along the wetter edge (marsh) and the drier marginal area. Plants in the pond are essential for healthy fish. Plants absorb nutrients from the water and provide oxygen. Some plants require their roots and stems be submerged (water lilies), some are totally submerged (Pond weed), others float on the water (Bladder wort) and some live in the margins that occasionally dry out (Cotton grass). Some plants can harm fish — yew, holly, rhododendrons, and mountain laurels contain toxins in their leaves that kill fish when they decompose in the pond, and pine needles contain tannins that turn water brown and sicken fish. If these plants are nearby, extra care will be needed to skim and remove the leaves.

In addition to plants native to ponds and marshes, some ornamentals are also adapted to the marshy and marginal areas. Ornamentals suited for around ponds include these for marsh conditions: *Aruncus dioicus* (Goat's Beard), *Ascleias incarnate* (Swamp Milkweed), *Astilbe* (False Spirea), *Camassia*, *Crinum* (Bog Lily), *Eupatorium purpureum* (Joe Pye Weed), *Gunnera manicata*, *Liatrix spicata* (Gayfeather), *Hibiscus Moscheutos* (Rose Mallow), *Ligularia wilsonii* (Wilson's Ligularia), *Lobelia*, and *Rodgersia*. Ferns include: *Adiantum* (Maiden Hair), *Athyrium filix-fimina* (Lady Fern), *Dryopteris* (Wood Fern), and *Osmunda regalis* (Royal Fern). Ornamental grasses include: *Brizia media* (Common Quaking Grass), *Calamagrostis* (Feather Reed Grass), *Carex* species (Sedges), *Juncus* species (Rush). Beware *Spartina* grass — it is invasive in the Northwest. Plants for marginal areas include: *Campanula* (Bell Flower), *Delphinium*, *Scabiosa*, and *Thalictrum* (Meadow Rue). Shrubs and small trees include: *Acer palmatum* (Japanese Maple), *Andromeda polifolia*

(Bog Rosemary), *Cornus* species (twig type), *Fothergilla*, *Hammamelis* (Witch Hazel), *Myrica Gale* (Bayberry), *Sambucus* (Elderberry), and *Styrax* (Snowbell).

Some plants from other regions have become invasive in the Pacific Northwest. Use care when choosing plants, especially through mail-order catalogs. Invasive plant information is available from Washington State Nursery and Landscape Association's Certified Professional Horticulturists or WSU Master Gardeners. These websites may also be ►



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useful: [www.invasivespeciescoalition.org](http://www.invasivespeciescoalition.org) and [www.nwcb.wa.gov](http://www.nwcb.wa.gov). (Also see plant recommendations in the sidebar.)

### Wildlife Will Come

Because water is essential for life, the new pond will be discovered by other wildlife. In the Pacific Northwest, blue heron, gulls, kingfishers and raccoon are among the more unwelcome visitors. Bird netting over the surface of the water can deter them. Frogs and newts will eat the water insects that will come. Perhaps a turtle or snake (especially the garter in the Puget Sound) will come. Turtles and snakes may eat the fish, but they can be discouraged by a rocky edge. Sparrows, chickadees, robins, and other song birds all enjoy a drink and the occasional bath in shallow water and they will eat the insects that come. Dragonflies, damselflies and butterflies will come. Sit back, relax and enjoy the show. ♦



## WATER GARDEN PLANTS

<u>BOTANICAL NAME</u>	<u>COMMON NAME</u>	<u>USE</u>
<i>Elodea canadensis</i>	Canadian Pondweed, Common Elodea, Waterweed	Bottom oxygenator
<i>Potamogeton natans</i>	Pond Weed	Bottom oxygenator
<i>Carex pendula</i> , and other <i>Carex</i> species	Weeping Sedge	Dry margin
<i>Iris ensata</i> , <i>I. laevigata</i> , <i>I. pacifica</i> , <i>I. siberica</i>	Japanese Iris, Rabbit-ear Iris, Pacific Iris, Siberian Iris	Dry margin
<i>Molinia caerulea</i>	Blue Moor Grass	Dry margin
<i>Polygonium bistorta</i>	Smartweed	Dry margin
<i>Brusenia schreberi</i>	Water Shield	Floating
<i>Stratiotes aloides</i>	Water Soldier	Floating
<i>Utricularia vulgaris</i>	Bladder Wort	Floating oxygenator
<i>Myriophyllum verticillatum</i>	Milfoil	Floating oxygenator (other species are invasive)
<i>Calla palustris</i>	Bog Arum, Wild Calla	In stream or marsh
<i>Lysimachia nummularia</i>	Creeping Jenny	In stream or marsh
<i>Veronica beccabunga</i>	Brooklime	In stream or marsh
<i>Aponogeton distachyus</i>	Water Hawthorn	Marginal
<i>Thalia dealbata</i>	Hardy Canna	Marginal
<i>Elocharis montevidensis</i>	Fiber Optic Plant	Marsh
<i>Eriophorum angustifolium</i>	Cotton Grass	Marsh
<i>Myosotis palustris</i> , <i>M. rehsteiner</i>	Water and Dwarf Forget-Me-Not	Marsh
<i>Orontium aquaticum</i>	Golden Club	Marsh
<i>Pontederia cordata</i>	Pickereel Weed	Marsh
<i>Trollius europaeus</i>	Globe Flower	Marsh
<i>Alisma plantago-aquatica</i>	Water Plantain	Marsh, shallow water
<i>Caltha palustris</i>	Marsh Marigold	Marsh, shallow water
<i>Sagittaria latifolia</i>	Arrowhead	Marsh, shallow water
<i>Sparganium erectum</i>	Bur Reed	Marsh, shallow water
<i>Hippurus vulgaris</i>	Mare's Tail	Shallow water
<i>Acorus calamus</i>	Sweet Flag	Shallow water, marsh
<i>Ranunculus aquatilis</i>	Water Crowfoot	Shallow water, marsh
<i>Nuphar lutea</i>	Yellow Pond Lily, Spatterdock	Water
<i>Nymphaea alba</i>	Water Lily	Water (12")
<i>Polygonum amphibian</i>	Water Smartweed	Water, marsh

## NOXIOUS WEEDS

The following plants are often listed in water garden resources. Some are classified as noxious weeds in Washington and others are known to be invasive. Please do not purchase these plants for use in Washington:

<u>BOTANICAL NAME</u>	<u>COMMON NAME</u>	<u>USE</u>
<i>Butomus umbellatus</i>	Flowering Rush	Dry margin
<i>Hydrocharis morsus-ranae</i>	Frogbit	Floating
<i>Nymphoides peltata</i>	Floating Heart	12" water
<i>Trapa Natans</i>	Water Chestnut	12-28" water
<i>Iris pseudacorus</i>	Yellow Flag	Water & marsh
<i>Nymphaea odorata</i>	Water Lily	12" water



## RESOURCES

"Complete Guide to Water Gardens"  
Kathleen Fisher  
Creative Homeowner, 2000

"Gardening With Water"  
James Van Sweden, Oehme,  
van Sweden & Associates, 1995

"How to Build Ponds and Waterfalls:  
The Complete Guide"  
Jeffrey Reid, Voyageur Press, 1998

"Water Gardens"  
Peter Stadelmann, English translation  
by Barron's Educational Series, Inc., 1992

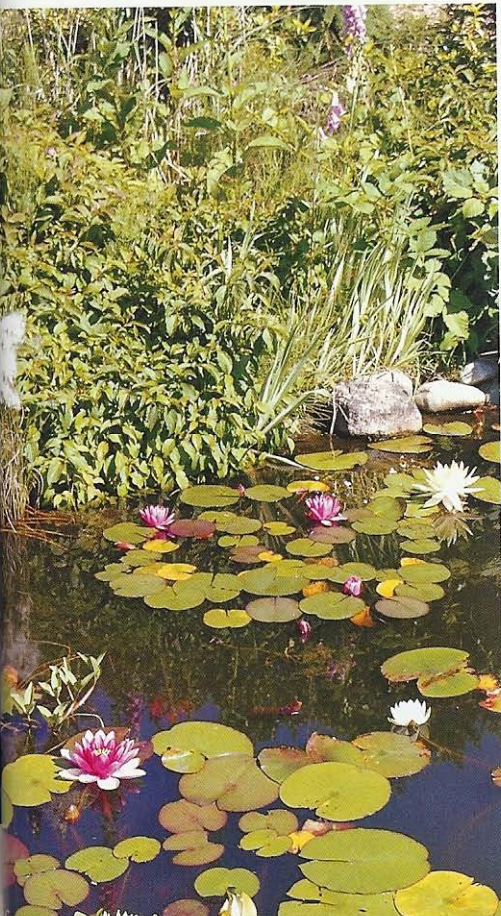
"Water in the Garden:  
A Complete Guide to the Design and  
Installation of Ponds, Fountains,  
Streams, and Waterfalls"  
James Alison, Bulfinch, 1991

"The Master Book of the Water Garden:  
The Ultimate Guide to the Design and  
Maintenance of the Water Garden"  
Phillip Swindells, Bulfinch, 2002

"Calculating pond volume and pump size"  
[www.aquaart.com/pondcalc.html](http://www.aquaart.com/pondcalc.html)

"Zen and the Art of Pond Ecology"  
Roadhouse Nursery, 12511 Central  
Valley Road, Poulsbo 360.779-9589  
[www.aquaart.com/Plonski.html](http://www.aquaart.com/Plonski.html)

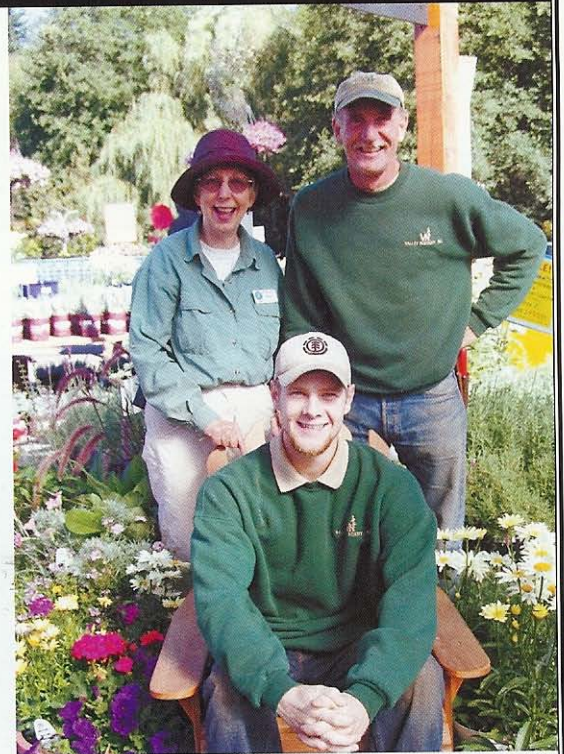
See pond pictures at  
[www.olympickoiclub.org/memberponds/  
georgenjan/georgenjan.html](http://www.olympickoiclub.org/memberponds/georgenjan/georgenjan.html).



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