

# A Guide to Water Features

A water feature is a wonderful addition to almost any landscape. The beauty and sound of water delight and calm the senses. Water features can be as simple as a ceramic pot, an oak barrel cut in half, or be more elaborate constructions with ponds, waterfalls, and fountains. A fountain must have a basin, or reservoir, and a pump to recirculate the water. Ponds require a flexible or preformed liner, a pump to recirculate the water to keep it from stagnating, and in most cases some form of filtration.

## Safety

Avoid tragedy and liability by planning for safety first. Infants, toddlers, puppies, and small dogs are attracted to water features and left unattended, can drown in even very shallow water. Electricity and water add other important safety considerations. To avoid electrocution, pumps and underwater lights and transformers should be plugged into a circuit protected with a ground fault circuit interrupter (GFI). A GFI shuts off power when it senses moisture or an electrical surge. Households with small children or unfenced yards should not install water features and if one is extant, it should be drained and filled with sand and used as a sandbox until all children with access are old enough to appreciate the beauty and danger of the garden water feature.



## Planning and Construction

When planning a garden pond, carefully choose a site bearing in mind that electricity must be located nearby because most pumps only have 6' or 20' cords. Most water plants require a minimum of 5 hours of sunlight per day, so select a level spot with the appropriate amount of sun. Avoid areas directly under plants or trees so you don't disturb the roots when excavating, and large quantities of leaves falling in the pond which can create maintenance headaches later. Excavate the area, removing all debris and sharp objects which can damage the liner. If using a flexible liner, take final measurements (length, width, depth) after excavation. Preformed liners dictate the shape and depth of the excavation. Flexible liner allows for more natural shapes and depths. Currently, the best material available is EPDM, a rubber product which is watertight, UV resistant, and does not become brittle over time. To determine the size of flexible liner needed, take the maximum length and width of the pool and add the depth twice to each measurement. Provide enough overlap for edging by adding one additional foot to both the length and width.

Calculating liner size example:

$$\begin{array}{rcccl} \text{Length} & \times & \text{Width} & \times & \text{Depth} \\ 10\text{ft} & & 5\text{ft} & & 2\text{ft} \\ (10\text{ft} + 4\text{ft} + 1\text{ft}) & \times & (5\text{ft} + 4\text{ft} + 1\text{ft}) & & = 15\text{ft} \times 10\text{ft} \end{array}$$

Before installing the liner, it is best to line the hole with sand, landscape fabric, burlap, or even old carpet to prevent any rocks or sharp objects from puncturing the liner once the weight of water is added. As the pond is filled, smooth out wrinkles and fold curves and corners. Edge the pond with stone, decking, or plant material.

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### **Pumps**

A pump is used in a water feature to lift the water, circulate the water, or both. Some pumps must be submerged at all times while others may be installed outside the water feature. If outside, the pump should be placed lower than the bottom of the water feature reservoir. Submersible pumps are cooled by oil, water, or air. Aluminum or bronze housed pumps are cooled by oil and have more force or lifting power than magnetically driven pumps, which are cooled by water. Magnetically driven pumps have plastic housings, are more energy efficient, and have longer lives than the aluminum or bronze housed pumps. For large applications, the most powerful submersible pump to use is a sump pump, which is cooled by air, but may have a life expectancy of only one year.

To determine the size of pump needed for a project, you should know two things: the overall height you need to pump from the top of the bottom reservoir to the top of the water feature and the desired flow. Take a garden hose and find the volume that seems pleasing to you and then take a 5-gallon bucket and measure how long it takes to fill it. You then can figure how many gallons per hour at what height you need for the desired effect. With the introduction of fish and plants, water clarity may be partially dependent upon how much water is circulated per hour. With goldfish, for example, circulating half of the entire volume of the pond once per hour is usually sufficient. Koi, however, require at least twice the volume be circulated per hour. To determine the total volume of a pool, multiply the length x width x depth (in ft) x 7.48. This will give you an amount in gallons.



### **Water Clarity and Filtration**

Water clarity is always a factor when dealing with ponds. Initially, it may take anywhere from two weeks to two months for the biological environment to come to balance. Until this time the water will not be perfectly clear. There are three ways to keep a pond clear and algae free: chemical, biological, or mechanical. Chemical methods involve adding algaecides to your pond and are not recommended. Algaecides should only be used in water features that contain no plant material or fish, and can be fatal to animals that ingest treated water. Biological control can be achieved with patience and the right number of plants and fish. Oxygenating (submerged) plants should be used at the rate of one bunch per square foot. Also provide one floating plant for each 10-15 square feet. To introduce fish, allow one inch of fish for every square foot of pond, which allows for the fish to grow. Adding a pump is a mechanical method of maintaining a clear pond. Water circulation, especially through a biological filter, adds oxygen and reduces algae.

The two basic types of filtration are prefilters and biological filters. A prefilter acts like a screen or intake filter, removing any debris that may get lodged in the pump and cause problems. A biological filter consists of a filter box, filtering medium, and plastic bio media. The filtering medium, often foam pads, sifts out debris and particles. The plastic bio media creates a surface area upon which beneficial bacteria that eat algae can grow. The greater the surface area for the beneficial bacteria, the more clarity the water is likely to have. A pump can be housed inside of a biological filter box. The entire unit is then submerged in the pond. Filtration can also be installed outside of the pond, which sometimes makes maintenance easier. In some ponds, it may be necessary to have one pump for filtration and one pump for the fountain, waterfall, or streambed.

As of February 1998, the East Bay Municipal Utility District (EBMUD) converted from chlorine to chloramine for disinfecting tap water. Water disinfected with chloramine must be neutralized before adding it to fish ponds because it will harm or kill fish and shellfish. For more information on chloramine and how to neutralize tap water, call EBMUD at (510) 287-0138. Marin Municipal Water District also treats its water with chloramine.

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### **Raccoons**

Raccoons are attracted to the sound and presence of water. They feast on tender bulbs of waterlilies and other aquatic plants and fish. Planting in tubs protected by wire mesh can foil both raccoons and nibbling koi. Tubs also allow for changing and rearranging water gardens. To discourage raccoons, design and build the pond a minimum of 18-24 inches deep with straight or very steep sides and overhanging edges. Raccoons, skunks, and most other mammals will not venture into a pond if they cannot touch the bottom, and a swimming animal has a much tougher time catching fish. Providing a safe spot for fish to hide also helps. Construction of a screened-off “bay” that allows fish access, but not animals, can help eliminate midnight marauding. As a last resort, install an electrical wire fence. The fence consists of a small transformer and a single strand of wire surrounding the pond, about 6” to 8” above grade.

### **Lighting**

A final and exciting addition to any water feature is lighting. Light reflected, diffused, or filtered through water can create captivating effects. There are two styles of underwater lights: uplights and spread lights. Uplighting is directional and can be aimed at subjects above the surface of the water. A spread light, however, distributes light throughout the reservoir of the water feature, illuminating fish and plant life. Low-voltage (12 volt) underwater fixtures can be easily installed and require a transformer. Small transformers with a maximum capacity of 16 watts can be plugged directly into an outlet protected by a GFI. Transformers with greater load capacity are available that can be mounted indoors or outdoors.



There are many excellent books and videotapes available to give design and construction ideas for pools and ponds. In today’s water-conscious landscape plans, a small water feature gives the impression of a great deal of water for very little actual water use.