Designing and Building a Water Garden

Spillways and pools enliven a courtyard-garden entry

by Jeff Gold

One of the challenges facing people who move to the country is finding a landscaping method that is compatible with the natural scenery. How do you create a garden in the midst of an already complete landscape without suburbanizing the homesite? And what about the herbivores that come out at night? Do you have to put up a fence to keep out the deer?

That was the dilemma facing me and my clients as we considered the options for their new home in the foothills of the Sierra Nevada Mountains, in northern California. They wanted their wooded site, with its beds of pine needles and native grasses, to remain as natural as possible. But they also wanted a place to garden—for herbs, ornamental flowers and water plants. They wanted their home to be integrated with this garden space so that it could also be a place for quiet meditation and social occasions.

Not your average concrete pour. With the upper and lower pools cast, the job of linking them begins with the intricate formwork of the water channel. Drain lines in the lower pool and in the patio keep the water garden from overflowing.

Satisfying these goals led naturally to a courtyard garden, a sheltered, outdoor space that has selectively admitted the outside world for as long as people have built houses. And from the very beginning of my design work, water figured prominently in the overall scheme. Water adds a powerful, magical dimension to any garden. Water is the essential ingredient for cultivation, and the sight and the sound of water are constant sources of peace and meditation.

In this garden, the water springs from the ground in a higher pool at the apex of the courtyard, spilling over a fall and passing through a narrow channel (photos facing page). Then the water glides over a second fall into the main pool at the patio level. The upper pool is the mystery (the source of the water) and is not completely visible from the courtyard. The channel is the flow, and the lower pool is the place of repose in which the plants and fish reside.

Stylistically, the courtyard is a marriage between two seemingly contradictory influences. The owners of this garden have traveled a great deal, and they wanted the courtyard to reflect their love for the lush, symmetrical gardens of the Mediterranean and the sparse symbolism of Chinese gardens. The result is a rigidly rectilinear watercourse that cuts through a courtyard populated by boulders, raised flower beds, raked gravel mounds and floating water lilies. Beneath this placid garden scene is a network of drains, irrigation lines, filters and a pump that keep the water garden humming along in any kind of weather. There's nothing really complicated about the mechanics of the system, and the same components can be combined to create any style of water garden.

Capture the sun, drain the rain—Embedded in the C-shaped plan of the house, the courtyard is surrounded by walls on three sides, which gave us the required amount of shelter from the prevailing winds. In positioning the water channel and pools, I took the exposure to the sun into consideration to make sure that both the garden beds and the pools would receive direct sun to nurture the plants.

Work began with drain lines. From past experience, I've learned that water gardens occasionally need emptying for maintenance, and it is a lot simpler to open a valve to empty the water than siphoning, pumping or bailing it out with buckets. The upper pool and the channel have 1-in. dia. PVC drain lines (drawing p. 66) that are sloped a minimum ¼ in. per ft. to a valve box. From there, the drains lead outside the courtyard to daylight downhill.

The lowest pool has a 3-in. dia. overflow drain. It pokes through the side of the pool, then turns upward to create the drain's inlet. The inlet is hidden by the stone coping around the edge of the pool, and it is flush with the surface of the pool when it's full. This drain has no valve because its job is to handle the overflow due to rain or other water that may run into the pool.

The water-garden drains aren't the only ones in this project. We get between 60 in. to 80 in. of rainfall per year here, and to manage the runoff we included a 4-in. dia. drain to collect rainfall from the concrete patio and the gravel beds. In addition, we installed a French drain (a buried trench filled with loose stone) 24 in. below the raised-bed planters along the courtyard's perimeter to keep the planters from turning into bogs.

Before pouring any concrete, we also installed the 1-in, conduits for the electric lines and the plumbing-supply pipes. One line serves the low-volt underwater light in the lower pool. The other line powers the submersible recirculating pump. Both the pump and light are attached with flexible cords, so the conduits only needed to be extended to an inconspicuous area under the pool lip. A water-supply pipe to the lower pool makes up for any water lost by way of evaporation. A ball valve activated by a float takes care of the makeup water automatically.

Keep the water moving—Unless it's in motion, a water garden will soon turn into a murky quagmire that's home to algae and mosquitoes. Therefore, a pump to keep the water moving is essential. There are lots of different kinds and sizes of pumps to use in water gardens. From my experience, submersible pumps are the least costly and easiest to install, and they require little maintenance. Submersible pumps are designed to operate underwater by means of impellers that push the water. And because they're underwa-

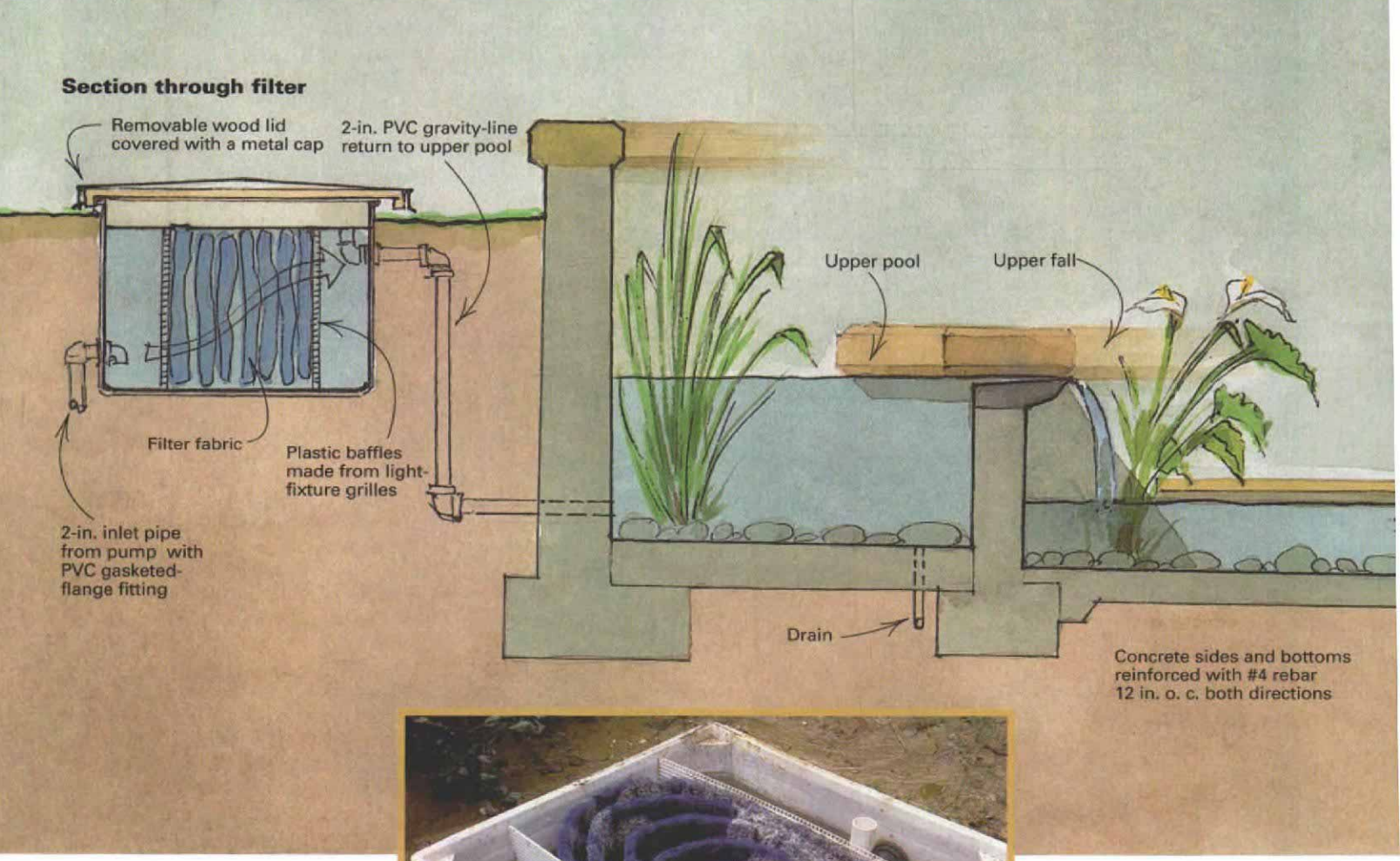
Photo this page: Jeff Gold

A courtyard at the edge of the forest. Water spills from the upper pool into a narrow channel that points the way to the center of the house. On the uphill side, the courtyard boundary is a trellis composed of concrete columns, redwood beams and copper cross ties. The broad trellis keeps the deer out of the courtyard.

ter, submersible pumps are also quieter than nonsubmersible pumps.

The pump we installed in the garden is a Cal Pump model # S-580 (Calvert Engineering, 13278 Ralston Ave., Sylmar, Calif. 91342; 818-364-2888). This pump is designed to pump 580 gal. per hr. with a head of 15 ft. (the maximum height above the pump at which the pump's outlet can be placed), and it has a valve on it to adjust the flow rate. The pump has a rating of 1/20 hp. and operates at 115v. The pump size is based on the desired flow effect and the overall size of the pool-in this case about 1,200 gal. The pump costs about 50¢ a day to operate. It's wired to a wall switch so that the pump can be shut off for cleaning and servicing, but the pump's continuous operation is important to the fish and plant life as well as the filter system. All of the plastic piping for the recirculation system is 2-in. dia. in order to reduce the friction for ease of pumping. A basket strainer atop the pump's intake keeps large debris out of the pump.

Keep the water clean—Before the water emerges again at the top of its run, the water passes through a filter. There are plenty of filter systems on the market that use a cartridge to clean the water. But this type of cartridge requires frequent cleanings. The clients spend a lot of time traveling, so we put in another type of site-built filter that can typically go a year between cleanings. Called a biological filter (photo p. 66), this design lets the water pass through a fiberglass mesh that becomes a medium in which natural



A biological filter. Biological filters rely on organisms to cleanse the water of nutrients such as algae. The organisms live in the filter medium, in this case the fiberglass filter from a forced-air heating system. This site-built filter was made from a fiberglass tank typically used in the agriculture business.

organisms flourish. The organisms feed on wastes from the pools, such as algae and the ammonia excreted by fish.

I made the filter from a variety of standard fittings and parts, beginning with a fiberglass tank that's commonly used in the agriculture business as a tub for hauling vegetables. As shown in the drawing (above), the tank is 4 ft. square by 3 ft. deep. The plumbing connections are standard compression-flange fittings set in silicone caulk.

I divided the tank into three chambers with baffles made of plastic light-fixture grilles. The baffles are held in place by aluminum channels glued to the inside walls of the box with silicone caulk. The middle chamber houses the filter medium, which is a coil of 1-in. thick mat fiberglass, the type used in forced-air heating-system filters. I unraveled the coil and arranged it in the tank so that all the water passing from one end to the other has to pass through the mesh.

I buried the filter tank in the ground near the uphill pool, just outside the courtyard wall. A flat lid made of a wood frame and a sheet-metal cap covers the tank and allows easy access for inspection and cleaning.

The pools and channel are monolithic concrete—The water pools and channel are cast concrete, and we formed the bottoms and sides in a single pour wherever possible to avoid potential leaks at the joints. The sides are 6 in. thick, and the bottoms are 4 in. thick. We reinforced both sides and bottoms with #4 rebars on 1-ft. centers, arranged in a perpendicular grid. To ensure good drainage, we sloped the bottoms of the pools and the channel to their drain outlets.

The upper pool is at the intersection of the concrete planters, which step down from the retaining wall (photo p. 64). The slot between the tops of the planters encloses the spillway that leads to the lower pool. Once the two pools were cast, we connected them with the channel.

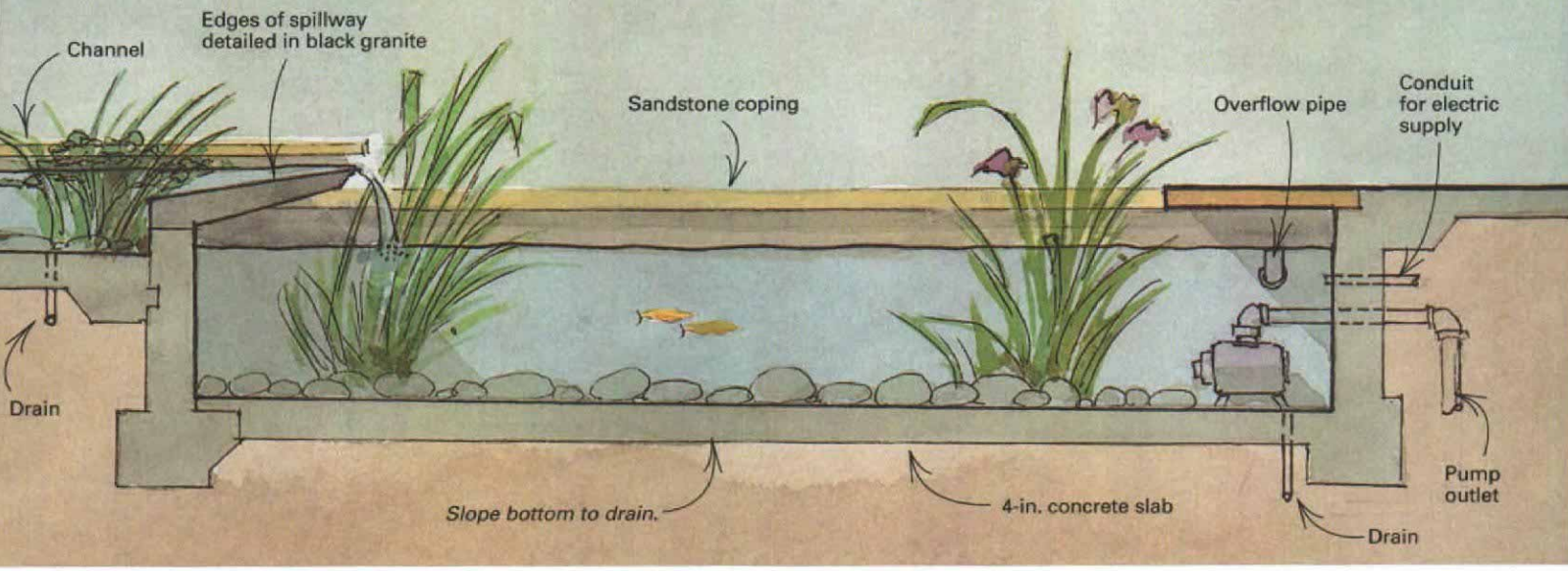
We covered the rough, board-form texture of concrete with pool plaster, which we colored black with an integral pigment. As soon as the pool was plastered, it was filled with water. This process helps the plaster finish cure slowly without cracking. The pools were emptied and refilled a few times to allow the lime to leach out of the plaster.

Stone coping and colored concrete cap the edges—The watercourse edges are sandstone slabs, 2 in. thick and 8 in. wide (inset photo to p. 65). These coping pieces were set in mortar atop the concrete walls. The stone projects 2 in. over the concrete edge to create a shadowline around the water and to help conceal the plumbing lines beneath the lip. The sandstone was quarried in Arizona and ordered at a nearby masonry yard to approximate lengths. Final fitting and cutting was on site with a diamond-toothed masonry blade on a circular saw. When cutting sandstone with a dry saw, it's best to run duct tape over the cutting surface to prevent the saw plate and blade guard from marring the stone surface.

Sandstone is soft, and it will erode if subjected to constantly running water. So we detailed the edges of the spillway with pieces of ¾-in. thick black granite that was left over from the kitchen-counter slabs. The edges over which the water passes were back-beveled at 45° so that the water could fall as a thin, straight curtain (drawing above). Because of the complex geometry of these spillway stones, I made up a full-scale model of ¾-in. plywood scraps for the stone fabricator to follow as a guide. Where the water meets the stuccoed sidewalls of the planter, a row of 2-in.

Drawing: Malcolm Wells

Inside a water garden
Concealing the drains and mechanical systems while emphasizing the movement of the water is the task facing the water-garden designer. The bottoms of the pools and channels should be sloped toward the drains for easy maintenance. The pump is located in the bottom pool, hidden from view by a removable slab of sandstone.



square tiles provides a surface that is easy to clean. Without the tiles at the waterline, organic matter in the water would deposit tough-to-remove stains on the stucco.

We colored the planter's concrete cap, the trellis columns and the courtyard patio with a chemical stain and sealer (L. M. Scofield Co.; 800-222-4100). The stain is applied after the concrete is fully cured, at least a month after the pour.

The beauty of this stain finish is the variegated color. The smoother the concrete, the more varied and richer the final color stain will be. If you're new to this method, as we were, I recommend testing the stain before jumping into the real project. We did our apprenticeship on the garage floor.

A word about costs—Creating a courtyard water feature does not have to be expensive. This water garden's costs included $500 for the recirculating pump and filter; $400 for all of the plumbing pipes and valves; $650 for the concrete, form wood and plaster finish; $350 for the sandstone coping; and $150 for the spillway stone fabrication. In addition to these material costs of about $2,000, the water feature required about 150 hours' labor, including plumbing, electrical, concrete work and finishing details. □

Jeff Gold is an architect in Nevada City, California, and has been in practice for 20 years in the Sierra Nevada foothills. Photos by Charles Miller except where noted.

On water-garden plants, fish and books

Planting the water garden can begin once the water quality is stabilized. The water is stabilized once the acidity or alkalinity is in the range of 6.5 to 8.5. Acidity testing for the pH level can be accomplished by using a simple test kit available at pool-supply stores or your local water-filter company. Low or high pH will not allow some oxygenating plants to grow, and fish are more prone to disease.

Plants have a number of useful roles to play in the pool. But most important, they are attractive and bring magical, exotic colors to the aquatic garden. They also provide shade and shelter for fish and other forms of water life, and by absorbing nutrients from the water, they help to deter the growth of unwanted algae.

Achieving the right balance of plants is an unfolding process, best begun with a few water lilies, some plants along the perimeters to soften the edges of the waterways and some oxygenating (submerged) plants to help purify the water and add diversity to the pools. Visit your local aquatic nursery to get visually acquainted with the many possibilities for plant life.

Before stocking the main pool with any exotic fish such as colorful koi, my clients stocked their water garden with some common goldfish to see if they would survive the test of a winter with snow, and the possible preying grasp of raccoons. So far, so good.

There are many wonderful books about water gardens that have detailed discussions about pumps, filters, water plants, fish propagation and options for forming water features. Two of the references that I have found most useful over the years are *Water in the Garden* by James Allison (Little, Brown & Co., 200 West St., Waltham, Mass. 02154; 800-7594)190; $32.50, 160 pp.) and *The Water Gardener* by Anthony Archer-Wills (Barren's Educational Series Inc., 250 Wireless Blvd., Hauppauge, N. Y. 11788; 516-434-3311; 1992, $45, 192 pp.).—*J.G.*