



The BACK FENCE

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Principles of biofiltration in the water garden

By Bridgette Marzluf, Class of 2005

(Editor's Note: Bridgette's class essay tied for Second Place)

Planning a water garden full of lush water plants and brightly colored fish swimming through clear water requires careful consideration. Natural streams and ponds have an efficient method of utilizing waste that we can use to our advantage. Waste is created by fish and decaying organic matter can be removed by three methods, mechanical, chemical and biological filtration. Mechanical filtration includes physically removing debris via a mat, brush, or sponge. The accumulated matter must then be physically removed to prevent clogging the medium which is filtering the pond. Chemical filtration, including commercial preparations and UV light sources, kill all suspended living organisms they contact. Biological filtration typically includes a mechanical filter which then uses bacteria to convert waste into beneficial nitrates which are used by the plants growing in the water garden. A biofilter in combination with mechanical filtration is commonly the best choice for the home water garden. Knowing how and why a biofilter functions is

essential to creating a healthy water garden.

In order to understand how a biological filter works, one must understand the microscopic ecosystem in our pond. Understanding the pond's environment allows the gardener to provide the best possible support for their water garden's wildlife. The pond ecosystem, like any ecosystem, contains a life cycle. The life cycle of the pond is a natural process to convert ammonia from animal and plant wastes into nutrients for the water garden. Fish waste is excreted by fish from their gills, kidneys and gastrointestinal tract. Decaying plant matter and uneaten fish food also add to the amount of waste created in the pond. This waste is then decomposed into toxic ammonia by heterotrophic bacteria. Nitrosomonas bacteria process the ammonia into a second toxic product, *nitrite*. Nitrobacter bacteria then break down the nitrite into *nitrate* which is much less harmful. Nitrate is then released naturally into the air as nitrogen gas or used by algae and water plants to produce chlorophyll and complete their life cycle. The "nitrogen cycle" is a natural process that systematically eliminates toxic ammonia by converting it to less

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toxic compounds. A diagram of the nitrogen cycle is provided on the last page of this essay.

The creation of an efficient biological filter is necessary for the welfare of the pond. Ammonia, a form of nitrogen, can be highly toxic to fish and is a major contributor to prolific algae growth. Complications of high ammonia will burn the gills of fish, rob the fish of oxygen and in turn kill them. Without biofiltration the fish are apt to get sick because the deadly ammonia and nitrites are not efficiently removed through the nitrogen cycle. Algae growth related to high forms of nitrites creates cloudy water. Providing plants that utilize nitrites and nitrates inhibits growth of algae providing clarity to the pond's water.

In nature, water is balanced by a continual renewal of fresh water and just enough life to keep the water healthy and void of toxic substances. In our water gardens we can duplicate this process via a source of water and a means to circulate and filter the water. With the correct use of a biological filter we can mimic Mother Nature by creating an environment and a nitrifying cycle. A balance of plants, water, animals and microorganism in the water garden creates an ecosystem. Biofiltration is a crucial component in maintaining this ecosystem.

To provide a good environment for the bacteria you must understand how they like to live. Nitrifying bacteria, like all life, have specific environmental needs that must be met. Correct temperature, adequate oxygen supply, adequate food source and surface to house bacteria all work together to create the correct environment to support nitrifying bacteria. In addition, the water's pH must be between 6.5 and 7.8 for maximum efficiency of nitrifying bacteria.

A biological filter in the water garden typical involves a container or

tank that provides a suitable accommodation for nitrifying bacteria. Water is brought to the tank via a submersible or external pond pump. The biological filter can be as simple as a Rubbermaid tank or as extravagant and expensive as a pre-made biofilter sold at garden stores. Once the water enters the tank it is filtered through a media containing nitrifying bacteria. For any biological filter to work there literally needs to be billions of bacteria living in the pond to provide adequate purification. A housing tank containing a minimum of approximately ten percent of the pond's volume is necessary to provide adequate biofiltration. Circulating the entire water volume of the pond through the tank every hour ensures adequate filtration.

As previously discussed, nitrifying bacteria require a home or tank containing water and oxygen which is circulated via a pump. Oxidation is the chemical process used by both nitrosomonas and nitrobacter to process ammonia into nitrite then nitrate. Because the nitrifying bacteria require oxygen, the pump must circulate water through this tank twenty four hours a day, seven days a week. If the pump shuts down the bacteria can quickly use up the oxygen and die. During periods of shutdown an airblower in the tank can provide much needed oxygen. During normal operation, the oxygen supply to the housing tank can be enhanced with an airbar at the water's entry to the tank.

Temperature of the water is critical in determining the rate of growth of beneficial bacteria. A bio-filter will not function in temperatures less than fifty to fifty-five degrees Fahrenheit. During these cooler months, there is less waste produced by fish and plants decreasing the need for beneficial bacteria. Ammonia levels will rise, however, if there is an excessive

amount of fish and decaying organic matter. Proper seasonal cleaning of dead leaves can prevent this. As the temperature rises above fifty degrees the bacteria become more energetic and efficient at nitrifying. Above eighty degrees productivity of the bacteria slows secondary to increased oxygen needs during increased temperature. The lack of ample oxygen becomes a limiting factor.

Bacteria need to be anchored to something in order to survive. Three factors to consider when selecting a filter media include surface area, ability to easily clean, and total volume. To encourage as many bacteria as possible you must provide a large amount of surface area. There are a number of sources to provide large surface area for the bacteria including, bio balls, lava rock, and filter ribbon. When selecting a filter media, the gardener must consider a media that does not collect large amounts of organic debris. Organic debris creates a layer of sediment to be trapped in the filter media. This sediment then provides an area for heterotrophic bacteria to live. Although this bacteria is necessary in the nitrification process for decomposition of organic matter to ammonia, there are other locations in the pond where growth of this bacteria should be encouraged. Providing a mechanical filter to accumulate organic debris prior to entering the biofilter allows the heterotrophic bacteria to a place to create ammonia. The ammonia then is directed to the biofilter to begin the nitrifying process, or feed the beneficial nitrifying bacteria. We must remember our primary goal in creating a biofilter is to provide a good environment for nitrifying bacteria. When the filter media for the nitrifying bacteria becomes clogged do not use chlorinated water to clean the filter. Gathering pond water to rinse

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the filter media of organic debris is the preferred method of cleaning. Placing a mechanical filter prior to the biofilter is an efficient way to prevent the need for frequent rinsing of the biofilter media.

So where do these bacteria come from? Nitrifying bacteria are readily available from Mother Nature. Pond professionals have differing opinions on the "seeding" process of nitrifying bacteria. Nitrifying bacteria are introduced to the water garden through plants introduced into the garden which are generally supplied from healthy gardens containing beneficial bacteria. The process of naturally establishing beneficial bacteria in the biofilter may require as much as three or four months. The addition of commercially available bacteria can speed up this process by two or three weeks. Commercially available bacteria come in dry-inactive and liquid-live forms. Adding the bacteria to well oxygenated water at temperature greater than fifty degrees is necessary for the bacteria to flourish. Other methods of introducing bacteria include adding a filter media given to you by a generous gardener with an already established biofilter. Healthy bacteria will be observed by the presence of a reddish to orange-brown film covering the filter media.

Waste removal from the water garden is a very important and necessary component of water gardening. Through personal research and experience I have created a biofilter for my water garden using a 100 gallon Rubbermaid stock tank, a coarse nylon filter mat, and Savio brand spring coils. I circulate the total volume of my 3500 gallon pond water every hour with a submersible pump which contains a mechanical filter. The success I have personally had with my biofilter cannot be overstated. Once a biofilter is established, maintenance of the pond includes routine

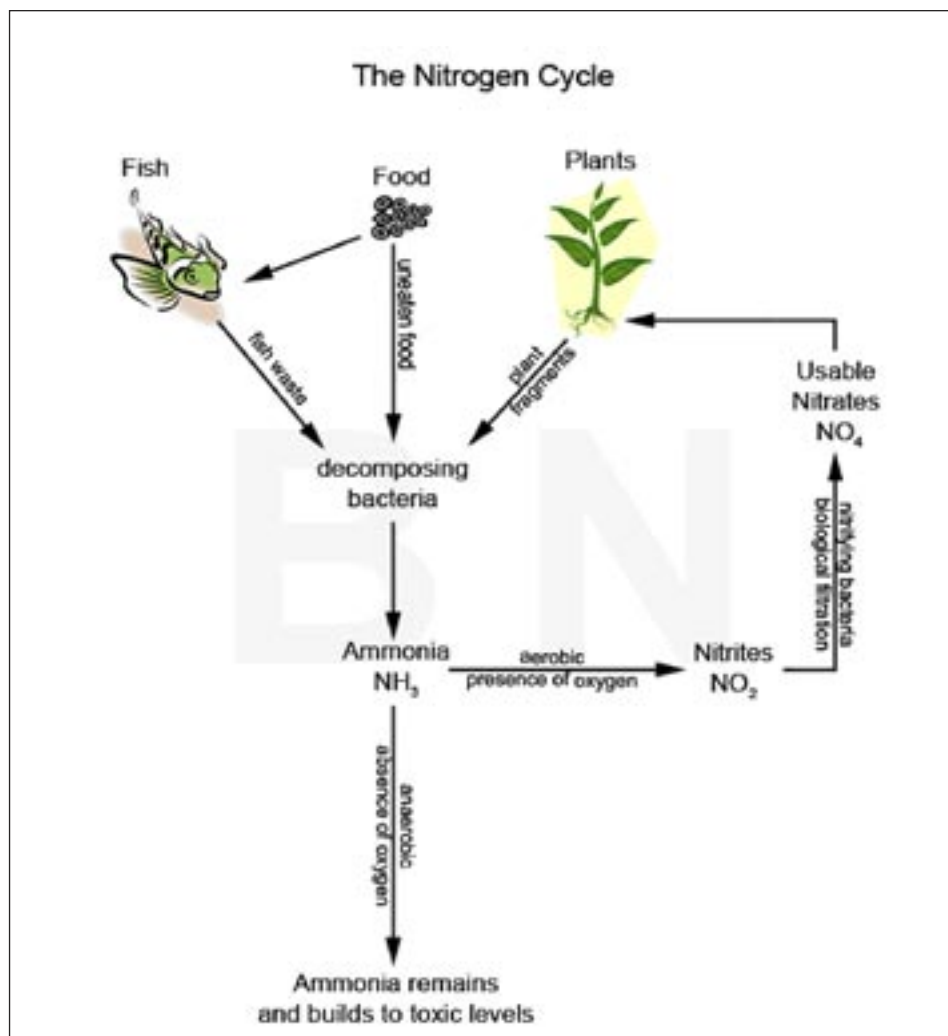
spring and fall cleaning with the seeding of beneficial bacteria in the spring. Occasional seeding of bacteria is recommended after new water is added to the pond. As summer rolls around, beneficial bacteria are busy working, allowing you to sit back and enjoy the lush foliage and brightly colored fish water gardens have to offer.

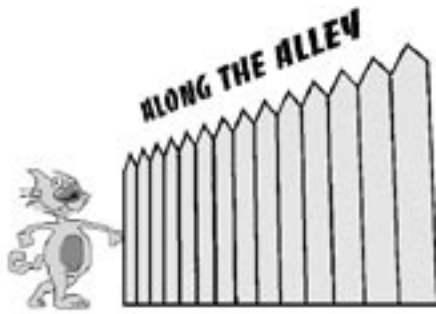
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by Joanne Couture, Class of 1991

PLAY GARDEN JEOPARDY! *This spring perennial was the formal design of France's royal flag from the 12th century to Napoleon. WHAT IS? . . . (Solution at end of column)*

The garden hype began in late winter: "60 lbs OF TOMATOES FROM ONE SINGLE PLANT!". . . "HARDY HUMMINGBIRD VINE! A Pillar of Flaming Trumpets Zooms Roof High the First Year!" Just *Campsis radicans*, your plain old trumpet vine, folks. There's Siberian lavender, which "Thrives Magnificently From 110 Above To 40 Below!" (the common Russian sage, *Perovskia atriplicifolia*—and not at all a lavender). And of course, the infamous Royal Paulownia—mentioned in a previous "Alley"—the "SUPER GROWING FLOWERING SHADE TREE GROWS ROOF-HIGH IN JUST ONE YEAR!!!" Scoffs arborist/writer Ray Moritz, "Never trust any statement that has three exclamation points, particularly in three colors." Has any MG ever tried these just for fun? Let me know. (Note: check out all these "bargains" at www.GardenersChoice.com).

What if your dream vacation turned out to be a nightmare? Imagine being hustled from a comfy hotel, pushed into a bus, and jammed with 25 frightened people into one cinder-block room with no electricity or running water. One five-gallon toilet.

No fresh food. Only two flashlights. Sleeping upright on a hard floor as 160+ mph winds and rain send trees crashing outside, exploding

generators, crushing cars, shattering windows. That was Rose Patterson's October vacation in Cancun, Mexico, devastated by Hurricane Wilma. But Rose is a die-hard Master Gardener (Class of 2000) as well as a survivor. Finding all planes were grounded just before the main storm hit, Rose phoned Rene Hetrick ('02)—the only MG programmed on her cellphone—that she would not be reporting for Hotline duty in two days!

This column welcomes the following responses from the Class of 2005—and more will follow in the future issues of *Back Fence*.

Gisela Purcell had a much better travel experience in New Zealand in February (their winter) where "hydrangeas grow wild by the creeks." At home, her favorite spot is a French sculpture garden "created with 108 boxwoods I started from cuttings." (Note: Spring is an excellent time for such cuttings). In addition to annuals and perennials, Gisela has a berry garden—strawberries, raspberries, blackberries, blueberries, and grapes. What would she never plant again? Yuccas, common daylilies, vinca, and tall, invasive ornamental grasses. "I've learned to be very cautious about plants often disguised as 'spreads beautifully' and 'fills in quickly!'"

Marilyn Patterson evokes memories of her Southern California origin by planting *Nandina domestica*, aka Heavenly Bamboo. Despite its name, it's not a bamboo, but a shrub in the barberry family. And, in a protected place, can survive north of Zone 7. It's leathery, evergreen leaves resembles bamboo (but not its stems), and it turns red in the winter. White May flowers become red winter berries. A professional dietitian, Marilyn lauds the value of berries (especially blueberries) and is planning a variety in this season's patch. A row of asparagus

will also be added to her 1-2/3 acres. In shade, the ever-popular hydrangea 'Annabelle' with its huge, snowball blooms, is her favorite.

Cynthia Smith is another West Coast transplant—from Oregon, where almost everything grows enthusiastically in the cool, misty climate, "except tomatoes." Here, Cynthia's favorites are 'Better Boy' and 'Early Girl'. An avid container gardener, Cynthia also grows the old favorite cucumber 'Straight 8' (so-called for its length). Only 6-12" tall, it's a tidy pot plant, besides having excellent flavor. For flowers, Cynthia likes to cluster primary colors: red geraniums, white petunias, blue lobelias, yellow marigolds. Impatiens is a favorite hanging plant.

Richard Rice is planning a Philadelphia vacation—including the famous Longwood Gardens. (Please take notes, Richard, for a future "Alley" column!). In his own garden, cherry-colored 'Profusion' zinnia is a favorite—it "grows a foot tall and does not get mildew." He is also planning a rain garden this year (with all the Metro promos for such water-conservation gardening, we'd like to check on his results next fall or winter). When not taking notes for this column, Richard is executive director of a non-profit organization, is married with two grown daughters and three grandchildren.

Wendi Branson so loves the popular rose 'Knockout' that she has "a whole herd of them—about 15 on her three acres near Platte City. Considered one of the best-ever shrub roses, it resists black spot, can take some shade, and supposedly does not need dead-heading, but obligingly drops its petals. Among other favorites: long-blooming gaura 'Whirling Butterflies' (it attracts them, too) and sweetspire 'Henry's Garnet,' a superior, spring-bloomer with long white flower

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spikes, so-named for its striking red-dish-purple and burgundy autumn foliage. A native plant, it thrives in heavy moist soil but can also take heat and drought. Wendi has two sons; her four-year-old “has his own garden tools and . . . the enthusiasm of a veteran gardener” (a future MG!). In May, Wendi will visit her sister, a missionary in the Dominican Republic.

Cindy Wharton’s family (“When I say ‘family’ I mean . . . something like ten adults and ten to fifteen children”) are renting a houseboat for a weekend down in Arkansas. “It will be a blast!” When she recovers, she’ll be tending her sungarden with lambs’ ear, lirope, and salvia. Cindy grew up near the old local favorite, Stephenson’s apple orchard. (Any MGs remember when Stephenson’s was considered “in the country”?)

Jean Brookens is adding a Japanese garden to her sun area, in addition to tree peonies, echinacea, shasta daisies, begonias, and of course, tomatoes. Jean gardens three sides of the periphery of her house. In the shade are spring-blooming dogwood, red bud, daffodils, azaleas, and astilbe. She’ll be testing Brunnera ‘Jack Frost’ this season; this fairly new variety has silver, heart-shaped leaves with green veins, bright blue flowers in mid-late spring, and tolerates dry conditions better than most shade plants. Jean’s sun garden has peonies, iris, and liatris ‘Kobold,’ (aka Blazing Star and Gayfeather). Jean’s request: “I am looking for a good perennial edger for this area. Any suggestions?” What she’ll never plant again: Missouri primrose—“too, too aggressive!”

[Writer’s comment: My ‘Showy’ Primrose—*Oenothera speciosa*—is also extremely aggressive. Planted years ago in the front parking area, between sidewalk and street, it thrusts up in pavement crevices, wriggles under brick edging, even has cheerful-

ly rooted in a crack in the street. But its explosion of pink trumpet blooms are so magnificent in late spring and to a lesser degree in midsummer, that I don’t have the heart to zap them . . . And a warning to anyone considering euonymous and English ivy: Grow as ground covers but not as foundation plants, or near fencing. Like the weird villain, Jason, in those slasher thrillers, they refuse to die. They yank paint and siding from houses and smash fists through fencing. Vegetation killers don’t faze them. A desperate neighbor considered “blowtorch—maybe battery acid.”

On a gentler, more romantic note, MU-Columbia researchers are investigating the “courtship” of plants via “molecular conversation . . . between the pollen (the male part) and the pistil (the female part).” So reports leading research investigator Bruce McClure, adding, “The result of this conversation is a decision about whether or not the pollen will be allowed to fertilize the plant. So, if the bee that is looking for sweet nectar brings unsuitable pollen, the plant will reject it.” (*Kansas City Star* Feb. 25, B-4, from the Feb. 16 edition of *Nature*.)

And speaking of publications, Powell Gardens was featured in the March issue of *Birds & Blooms*.

This and That...

Natalia Howard, speaker at “Native Plants for Kansas City Gardens” last October, warned that adding soil amendments to native plants makes them tall and spindly. They prefer unfertilized clay soil. And “whack back” tall natives when about a foot tall to encourage bushiness and promote bloom (see also **grownative.org**). Her co-speaker at the meeting, the well-known Dr. Allan Armitage, of course supports botanical names

but said, “Don’t get intimidated by pronunciation. Just get the syllables in order, and fire away!” Dr. Armitage, a Canadian by birth but an Atlanta, Georgia, transplant, got a big laugh by describing himself as “A Canuck gone bad!”

Slug and snail problems? A proven defense hint from Carolyn Chambers (‘98): mulch vulnerable plants with the spiny, seed balls from sweetgum trees. Carolyn gathered bags of the sharp burs from Mary Medley’s lawn several years ago.

Speaking of Mary (‘97), Chair of the 2005 State MG Conference in KC, she couldn’t believe her eyes one afternoon last year. A “neighborhood” groundhog was stretched out at ease on her backyard chaise lounge! (Mary’s garden, featured on a MG tour, IS inviting—but that’s going too far!)

Tips from Mariane Benetti, professional organic gardener: For cabbage worms that also munch on kale, broccoli and ornamental brassicas, “sift self-rising flour on the leaves, preferably in the morning.” If you see slugs or snails in the daytime, “blast them with a mixture of half ammonia, half water. They’ll have a rapid melt-down, and the nitrogen in the ammonia will benefit your garden.” Black spot or mildew on roses? In addition to your regular spraying, use a combination of half skim milk, half water. [Not for Hotline advice, fellow MGs, but worth a try].

JEOPARDY solution: What is the iris (the French “fleur-de-lis”)? Meaning “rainbow” in Greek, she was the goddess who carried messages to mortals over her rainbow bridge. Two schools of thought why they are called “flags” in some languages: because of the French flag, or because in their bud and bloom stages, they represent furled and unfurled flags.

Fairy rings—fact, fiction, fungaloid

By Cheryl Ann Novick, Class of 2004

The fungaloids fascinate me. Always have. They are just so very *different* from all the other life forms in our yards and gardens and woods. One form of fungal growth is especially appealing – the fairy ring. Perhaps because of its name, or because of the stories surrounding it, but mostly, because of its looks, I am inexplicably drawn to it. So imagine my surprise (and perverse joy) at finding one on my own property this year (see photo).

I had noticed the dead spot in the grass, but had assumed that some lawn chemical that got loose from the tool shed during 2003's tornado had done the damage. As it turns out, the dead circle of grass is one of the calling cards of the fairy ring fungus. And as it also turns out, a lot of people want to rid their lawns of it! So for those on both sides of the "Fairy Ring Controversy" (this makes it sound pretty important and article writing-worthy), here's some history and helpful information.

Fairy rings can appear in any lawn or turf area during the warm months of the year. In less scientific times, the rings were ascribed to the dancing of fairies, pixies and elves during the night. The most visible signs of this fungal infection is a dead circle or ring of turf followed by a ring of weakened grass, then a ring of beautiful dark green grass with umbrella shaped mushrooms sprouting up along the ring's path. One can see how it would appear to be a supernatural event, as the mushrooms literally pop up overnight in this perfect circle!

According to Richard L. Duble, Turfgrass Specialist at the Texas Cooperative Extension, here's the

cycle of growth: "Development of the fairy ring starts with a germinating spore or a strand of mycelium and grows outward in all directions. The fungus feeds on organic matter in the soil. Fungal strands (mycelium) spread throughout the soil to a depth of 10 to 12 inches. As the fungus grows, the first visible evidence of a new fairy ring is a cluster



of mushrooms (the fruiting structure of the fungus) or a tuft of stimulated dark green grass. Later, as the fungi spread outward from the point of origin, the ring-like pattern develops. This initial tuft of dark green grass and the ring of stimulated grass that develops later results from the nitrogen released after the fungus breaks down the organic matter in the soil. A ring of brown or dead grass may also develop, caused by the depletion of soil moisture in the area where the fungus is concentrated. If you dig into the area of dead grass, you will find a dense growth of white mycelium. Water will not penetrate this zone of dense mycelial growth." You mean it's not because I have fairies at the bottom of my garden?

In case you have a fairy ring in your lawn, and you don't want the neighbors to talk, there is really only



one sure cure: Dig up the entire ring, from the center out past the lush growing grass, to a depth of about two feet. Dispose of the soil containing the mycelium and put down new soil. Either seed or sod this area. Pretty drastic. Some success has been obtained by tilling and drenching the area with antifungal preparations. Or you could just *disguise* it by mowing down the mushrooms and applying extra nitrogen fertilizer to the weaker growing areas.

However, by my way of thinking, you've got a marvelous conversation piece. Consider mentioning the following myths to your nosy neighbors:

- In Germany, they are called "Hexen Rings" and are from the dancing of witches on the eve of May Day.
- In France, they are called "Ronds de Sorcieres", and enormous toads

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with bulging eyes are said to appear within the magic circle.

- In Holland, they were said to be the marks of the Devil's milk churn.
- In England, people claimed to see fairies dancing around fairy rings as recently as the early 1900's.
- In Wales, if you plowed one up, you would incur the wrath of the fairies. Eeeks! Fairy Wrath!
- In other tales, they are from lightning strikes or are the marks of dragon's tails.

All these myths have a recurring theme of dire consequences befalling anyone foolhardy enough to enter the ring. Things like blindness, lameness, soured milk (oh, that's for cows *only*). But there are some good fables as well, such as buried treasure in the center (don't dig for it by yourself, though, you need a fairy or witch's assistance). And for those of us with, let's say, less than perfect facial complexions, the dew gathered from the ring and applied to the face was magically curative.

As a final note, fairy rings are said to bring luck to anyone who owns the property they reside on. That's good enough for me . . . mine's a keeper!

For more information on fairy rings, and where I found information for this article, start by visiting the following web sites:

<http://www.virtualmuseum.ca/Exhibitions/Mushroom/English/Folklore/fairy.html>

<http://aggie-horticulture.tamu.edu/plantanswers/turf/publications/fairyings.html>

<http://www.colostate.edu/Depts/CoopExt/TRA/PLANTS/fairing.html>

<http://www.extension.umn.edu/projects/yardandgarden/ygbriefs/p316fairyings.html>

<http://herbarium.usu.edu/fungi/FunFacts/Ringsfct.htm>

“Having a ball” with sweet gum

By Sara Scheil, Class of 2004

Every fall, my church's landscape is showered with the seed pods of fourteen sweet gum trees.

Every fall, the volunteers who rake leaves despise the massive quantity of yard debris. One year, we had over 70 bags of yard waste. Members of the trustees have threatened to cut all the sweet gum trees down. I was determined to find an economical, compromising solution for all.

In the 1950's when the church was built, the sweet gum, known as *Liquidamba styraciflua*, was popular as a landscape tree choice. It grew quickly, had few problems, and provided wonderful shade. Those trees planted on the east and west side of the building probably have saved the church thousands of dollars in cooling costs; that has been all forgotten due to that issue over the annoying gum balls.

The sweet gum had admirable qualities. It is a Missouri native named for its chewing gum sap. Knowledgeable youngsters of the past would pry off the bark, scrape off the yellowish brown fragrant liquidambar, like its Latin genius name, and chew it like the “store-bought” stuff, savoring its licorice-like flavor. It is reported by historians that Aztec emperor Montezuma relaxed by stuffing a cane full of tobacco flavored with the liquidambar from a tropical variety of the sweet gum species. As a medicine, it was a cure for diphtheria, dysentery and flatulence. Asian traders considered it an important perfume and fragrance source; crush its leaves and you will enjoy the appealing fragrance. Sweet gum wood, especially the heartwood, makes high quality furniture and gun stocks. It is referred to as “red gum” or “satin walnut.”

The sweet gum has an important role in the ecology of Missouri. Each spring, the tree produces small greenish male flowers and round clusters of yellow female flowers in the same tree. Hummingbirds are attracted to the flowers for the nectar. In fall, the 3-7 lobed palmate leaves turn yellow and burgundy offering splendid fall color. The seed pods develop into round spiked balls resembling a mace weapon staying on the trees long after the leaves have fallen offering a winter food source for animals. Each pod can emit an excess of 50 seeds each. Goldfinch, house finch, squirrels, and chipmunks find the seeds quite tasty. The trees offer habitat for squirrel, mourning doves, luna moths, katydids, tent caterpillar moths and others.

How could you despise a lovely tree like this? It's those pesky gum balls. They are large, plentiful, and unattractive and can be dangerous underfoot. If you are determined to control the situation, there is a contact growth regulator, Forel™, which breaks down into ethylene. When a plant is experiencing stress, it produces ethylene naturally. By applying Forel™ at the exact time of blossoming, this excess ethylene triggers blossom abortion. It is expensive (about \$30 per quart), labor intensive to apply as a spray, and can harm paint surfaces on vehicles.

At least two seedless sweet gum cultivars have been successfully developed. ‘Rotundiloba’ produces no seeds and has a distinctive leaf with rounded leaf lobes. A nearly seedless ‘Ward’ cultivar is available under the trademarked Cherokee name.

Approaching the problem of the

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The Plants of San Antonio

By Becky Peck, Class of 2003

San Antonio was recently ranked the seventh largest city in the United States. No other city has a Riverwalk and only three others have a Seaworld. San Antonio is also the home of the San Antonio Botanical Garden (www.sabot.org).

The San Antonio Botanical Gardens (SABOT for short) is organized in a very different way than other botanical gardens. Texas has a range of landscapes and they have reflected that in their gardens. There is a Hill Country section, the East Texas Piney Woods and South Texas. The Piney Woods has a lake surrounded by cattails that is viewable from a cabin. If you toss a little duck food toward the opening in the cattails, ducks magically appear from the reeds.

The Garden for the Blind features a small model of the sensory garden's layout and braille is added to each sign. The plants either give off wonderful aromas, or you notice it when you rub the leaves.

A series of glass pavilions highlight palms and cycads, tropicals and desert plants. A watersaver garden gives tips on how to grow plants with less water. Throughout the gardens, the visiting Dinosaur Tex Exhibit features dinosaurs surrounded by the plants they would have been inclined to eat. One dinosaur was covered with Spanish moss and his back was outlined in flat cactus.

Earlier this summer, a very interesting exhibit was at SABOT to give a larger view of artistic pieces the locals are familiar with from all around their town: Sculptures by Carlos Cortes and family (www.studiocortes.com). This is an exhibit of textured concrete sculptures that look like wood. Many are benches. Mr. Cortes's work is a permanent fixture in many San

Antonio locations. Along the San Antonio River and in Brackenridge Park are the largest number of his permanent pieces.

Please enjoy a few pictures of a couple of the plants I found in my favorite portion of SABOT: the old-fashioned garden. A little profile is included for each:

Caesalpinia pulcherrima is called the Pride of Barbados, Red Bird of Paradise or Peacock flower. From the family *Fabaceae*. The Pride of Barbados is originally from Central America, Northwest South America and the West Indies. It is zoned in USDA 8b-10. The leaves are hardy to 30 degrees Fahrenheit and the roots are hardy to 15 degrees Fahrenheit. The plant will regrow if frozen to the ground, and the roots are not frozen below their hardiness. The Pride is an evergreen bush that grows fast to 6 to 15 feet tall and wide. The leaves are bipinnate, 8 to 14 inches long, 3 to 9 pairs of pinnae, each with 7 to 15 pairs of leaflets. The stem and branches are armed with spines. The red, orange, yellow and pink flowers grow at the end of the prickly branches. Small and graceful, the tree/shrub flowers throughout the year. The fruits are legumes, 3-4 inches long, that when ripe, they split open and release the brown bean. The plant requires infrequent, deep watering and it can be propagated from seeds and cuttings. Seeds are easy if you sand or soak them first. The plant likes full sun and well-drained soil that is alkaline to acidic. Tolerant to drought, it would at least make a



fast-growing and interesting annual (so many flower colors on one plant!) if not a potted plant you could bring indoors for winter.

The copper plant (*Acalypha wilkesiana*) I have also seen at Powell Gardens in the atrium area on occasion. Originally from the Pacific Islands, the copper plant is a true tropical with a need to be in zone 10 to 12 to be a perennial (or zone 5 in the summer and zone "indoor" for the winter). It likes full sun and does not take any frost. It is weakened or possibly killed by extended periods of low temperatures. A semi-deciduous shrub, it can grow up to 15 feet tall. It is grown for its attractive leaves, which are found in a variety of colors. Give it regular to abundant water, with good drainage. Propagate with cuttings.

Don't forget that spring comes earlier in Texas! Round trip air fares are currently very reasonable for a direct flight from Kansas City. How about a day at the gardens and a day with Shamu?

Landscaping earth berms for beauty and practicality

By Kellie J. Rodriguez, Intern, Class of 2005

When my husband and I had an above-ground pool installed in our backyard last year, we were left with six tons of dirt piled high all over our beautiful sod. I never dreamed they would need to dig out so much for an above-ground pool! As the work crew finished, I stood on the deck in awe. I was not envisioning our future pool fun, but trying to imagine what we were going to do with all that dirt. Should we spend \$600 and have the laborers remove the dirt (a hefty unexpected expense)? Or, should we save the money and incorporate the volumes of dirt back into our landscape design?

After some serious anxiety, we managed to make a decision. Always fascinated with gardening and landscape design, I knew commercial and subdivision developers use earth berms for practical means and as a way to make areas more attractive. And, knowing that berms might provide us some measure of privacy on our corner lot, it was an opportunity we ran with.

We paid \$50 for the laborers to move the dirt, by the Bobcat already onsite, into spots I thought would be ideal for berms. Little did we know a great adventure was about to begin.

Practicality and Value-Added.

Earth berms are sensible for many reasons and the rewards are really value-added for any commercial or residential property. And, did you notice? Earth berms are IN . . . and for good reason. Take a look at new construction and you will find that many developers are incorporating

berms into their landscaping designs simply because the berms are practical and attractive when landscaped.

Berms are multi-functional. They serve to enhance privacy, screen undesirable views and add energy efficiency if placed in the right spots. Berms add interest, provide enclosure, soften hardscapes or architecture, and separate areas of conflicting usage. They can change direction of water flow, whether continuous water or run-off after a rain. Berms can enhance or emphasize a landscape design and can be used to protect quality sounds from fountains, birds, chimes, rustling bamboos and grasses from outside annoying noises. For these reasons, it is wise for any property owner to consider adding serviceable and beautiful berms to their landscape design.

A prime example of a successful earthen berm addition is found at the Chicago Botanic Garden. They created a combination berm and wall along a busy expressway adjoining their property. Being plant people, they planted it with thousands of beautiful and interesting species that have essentially created a phenomenal new garden while solving a noisy distraction for their guests. That's a large-scale solution, however the same effects can be achieved on smaller properties, too.

What things do you need to consider when planning earth berms?

Size. You can achieve many varying results by modifying your berm height and width to achieve what works best on your property. Generally berms range from a height of twelve inches,

creating little more than a raised bed, to over six feet at the highest point of a larger berm, which would create some serious noise diffusion and privacy. Remember though that earth berms needn't be huge to achieve the advantages of making them.

The width is dictated by the height you desire. Allow for a natural tapering into the regular landscape. A rule of thumb is, the higher your berm, the larger the width. You should ensure gentle transition and soft natural form. Keep the berm lump free and naturally contoured. And remember, a natural incline is easier to landscape with plants and trees.

Placement. Placing the berms on the right spot is just as important as dimensions or what you put on them. There are several factors that affect placement. Always allow for property easements. You may need to consult your city zoning and planning department for guidance and perhaps even hire an engineer if you are planning some major alterations to your property.

One of the main reasons people add berms is to add energy efficiency to their home or building. Imagine adding a fair-sized berm plus some tree coverage along the northwest corner of a property to protect from northerly winds. Envision adding a berm in the southwest corner if you live in hot climates to provide shade and heat-diffusion. Berms placed for energy efficiency purposes are not only practical in your landscape, but will save on energy and increase your property-value (both add money to your wallet—cha-ching!).

Lastly, when considering berm placement, be creative. Tie it into existing architecture, patios and planters, curve them around walkways and water gardens to create nestled nooks and a sense of mystery. Don't like the

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Webworms

By Larry Theiss, Intern, Class of 2005

Not too many people find webworms interesting. I really didn't either until one evening I drove up my driveway and there they were in my cherry tree. The web mass covered half my tree! My tree wasn't that big, probably six feet tall. But I was worried. Last fall this tree had a lot of color and I was looking forward to this year. At the moment it didn't look very promising. The webworms were devouring the tree's leaves. This is the experience that prompted me to find out more about webworms.

Webworms are the larval stage of a small moth found from northern Mexico to southern Canada. There are several other types of caterpillars that also infest plants in our area. Webworms can be identified by the large silken web that seems to engulf parts of the infested shrub or tree.

Fall webworms are scientifically known as *Nyphantria cunea* (Drury). They have been found to infest over a hundred different plants. However, they are most commonly found on pecan, persimmon, black walnut and hickory trees. In years of heavy infestations they quickly invade other trees like sycamore, birch and redbud. Webworms do not infest conifers. They are one of the few pests that have been introduced to Europe and Asia from North America.

The webworm moth is white with a wingspan just over an inch. It has small dark spots on the forewings and orange red hairs at the base of the front legs. The larvae are one inch long, pale green or yellow and are covered with tufts of long white hair. There is a dark streak down the back with two rows of wart-like structures on the sides called tubercles. The

tubercles are useful for identifying the two types of webworms. There is an orange-red type which has an orange head with orange tubercles and a black type which has a black head with black tubercles.

In west-central Missouri we have two generations of webworms each year. There may be three or four generations farther south. The pupae overwinter in the ground, under leaf debris, and under tough tree bark. The first generation starts with the adult moths emerging in April or May from slender silken cocoons. After emerging they quickly mate. The females then deposit up to 600 eggs on the underside of a leaf in May or early June.

After hatching, the larvae begin to build a silk web. All the larvae in a web mass are from the same egg mass. The larvae molt six to seven times before leaving the cocoon. When fully matured the caterpillars start to feed individually away from the protection of the web. Soon they make a cocoon and the cycle starts again. The life cycle is about 50 days. The second generation from which they get their name, fall webworm, is busy building webs from August through early October.

Controlling webworms is not as difficult as it seems. Always be proactive. Remove fallen leaves in the winter and early spring. Once an infestation occurs, remove the webs manually before they get large. Wait until dark or a cloudy day to remove the web to be sure the worms are clustered. A good way to remove the web is with a long stick to which two nails are attached in the end at a 90 degree angle. Twist the web like you would cotton candy. You will probably enjoy doing it as much as when you were a kid.

Webworms can also be controlled with chemicals. Some are organic products. I saw one which was based on a soap solution and another which was a garlic extract product. These

treatments will be more effective if applied before the web gets big. Be sure to rip holes in the web to allow the solution to penetrate.

Commercial insecticides are also available at your nursery. Be sure to read and follow the directions on the containers. BT (*Bacillus thuringensis*) has been shown to be effective. Since it is a bacterial insecticide and lasts for only a few days, it may need to be reapplied. There is also a systemic insecticide for very high infestations. Some of these products may require applications by a professional.

Another option is to let nature take its course. Yellow jackets, paper nest wasps, stink bugs, ichneumon moths, braconid wasps and birds eat webworms. In total there are 50 species of insect parasitoids and 36 other species of predators that feed on the larvae. Natural predators are especially important in years of cyclic population explosions which occur every four to seven years.

Many people become quite alarmed when they find webworms on a plant. Webworms can certainly ruin the aesthetics of a garden landscape for several months. A tree's vigor may decrease when a severe defoliation occurs. This can lead to decreased nut production in certain species like pecans and walnuts. Most of the time webworm infestations affect only the beauty of the plant and are more a nuisance than a real threat to the survival of the tree. This is especially true in the fall when the tree may lose its leaves anyway in a few weeks.

Webworms are an annoyance that you may be able to tolerate. Removing the web early and opening it to predators are simple steps to try. Remember that infestations late in the summer and fall are probably not going to hurt your plants. As for my tree, it grew some new leaves, but for whatever reason chose not to share its colors that fall.

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looks of your neighbor's neglected yard? Use berms to create that privacy and attractive screening you crave. It's amazing what a little dirt and vegetation can achieve!

Good old dirt. Once size and placement considerations are made, carefully consider the materials you will use to build your berms. For most planting purposes, I recommend utilizing a clay-based soil for your berm foundation and adding six to twelve inches of good topsoil on top of the clay. The clay will stabilize your earth berm, and although the berm will settle over time and shrink, it will always be solid unlike a sandy-loamy filled berm. Fortunately clay for the foundation is usually plentiful and therefore cheap. You'll want to invest in quality topsoil, however, to ensure good aeration, no rocks, no living roots and no compaction.

Once you have the foundation and topsoil on, amend the berms by adding organic matter and compost to provide the most perfect soil environment for your plants. I recommend you test your soil before adding amendments so that deficiencies may be corrected as well as pH. After the soil test results have been returned, work any recommended materials into the upper six to twelve inches of soil. Possibly top this, before or after planting, with weed barrier and then cover with 1-1/2" of good mulch.

The water situation. Effective water drainage is vital for a good earth berm. You don't want water to pool at the top of your berm, which would provide an environment for mosquitos. So if too much water is an issue, consider installing a French drain to provide fast drainage, especially when placing an berm across an area of natural water runoff. You also don't want the berm to dry out too quickly,

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seed balls in an ecological way, I conducted my own experiment in composting. Depositing huge amounts of seed pods, I layered the yard waste with alternating amounts of horse manure. After one year of composting, the gum balls were slightly distinguishable but crumbled easily in my hand into dark, rich, sweet-smelling organic matter. Composting had conquered the gum ball!



The gum ball can be a handy material in the garden. Used as mulch around hostas or others plants, they deter slugs and other sensitive creatures due to their prickly nature. Add them as top dressing to your container plants to discourage digging animals. Fill the bottom of a container pot with gum balls to decrease the amount of potting soil needed.

If you are craft guru, spray paint these little treasures with silver or gold paint to create holiday tree ornaments. Stack them to create a tree or a snowman. String them together for garland or add them as accents to wreaths.

I have reached a peaceful relationship with this highly criticized tree. The huge compost facility at church welcomes the gum ball yard waste and graciously yields rich compost for organic landscape practices. Each fall, I look forward to "having a ball" with the sweet gum tree.





illustration by
Laurie Chipman

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Editorial Staff:
J. Braswell

Layout
Laurie Chipman

Contributors
Joanne Couture
Stephen Stone
Bridgette Marzluf
Cheryl Ann Novick
Sara Scheil
Becky Peck
Kellie J. Rodriguez
Larry Theiss

Lal Kumar
Lala Kumar
Horticulture Specialist

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Department of Agriculture & Local University
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which can easily happen since berms naturally dry out faster than the normal yard soil around it. This is another good reason to choose clay soil for your berm foundation. Clay soil retains water longer than other soils.

Obviously, you'll have no need to worry about dry soil if you have an irrigation installed, or if you utilize vegetation that thrives on low rainfall. Whatever your case, planning for your water situation will ensure your berm gets the adequate water and allows excess water to run off properly.

What goes on top. Now that your berm's foundation and placement are complete, the fun really begins. Berms are perfect for creating themed beds or special looks. You can plant according to the height you want to achieve, placing larger pieces to the rear of each landscaped berm or 3/4 way up or on the center of the berm if it is utilized as an island garden with paths around it. Gradually go down in height from your larger specimens until you nestle the smaller plants around the base of the berm. Allow for recommended plant spacing so your berm doesn't look overgrown once the plants mature.

If you plan well and choose quality plants, you will add interest, beauty and drama to your yard that will be unlike anything your neighborhood is used to. You can choose among endless themes based upon color, an annual or perennial theme, or for a special look, such as a cottage or butterfly garden berm. Ornamental grasses are a great addition, adding drama, height and noise diffusion. They also add winter interest. Think seasonal too. What will the berm look like in spring or in autumn? Try to have interest all year long.

Don't have a green thumb or enough time? You can create a garden bed berm using plants native to your

area. Growing natives is an excellent way to assure good looking gardens with little fuss. It's amazing the variety of native plants available in any area.

If you would like to add trees to the mix, ensure the berms are well-sized in proportion to the number of trees you want to plant. A small berm cannot accommodate many trees, but small ornamental trees and evergreens look great on earth berms if planted with great consideration.

For more effects, you can use different mulches, create a rock garden or add hardscapes such as statues with nice lighting. Leverage off the berm height and provide aesthetic focal points for you and your visitors. Berms will automatically draw the eye so you'll want to carefully consider what you place on them.

When you are planning your berms, think about what functional objectives they need to achieve. Plants and trees make effective sound barriers, mask noise and clean the air by producing oxygen and removing carbon dioxide from the air. Include a diversity of trees, shrubs, or turf or other groundcover to capture noise and make it visually appealing. Plants not only work hard, but they do a great job of beautifying an area.

In conclusion: For my husband and I, our earth berm adventure is far from over. After a little more than a year, my husband and I are the proud owners of some beautifully landscaped berms that serve many purposes. Though there are many more things I plan to incorporate within the three berms, they have already paid for themselves in added interest and drama to our yard. Their potential is still growing too, as the vegetation matures and I add other plants. I anticipate only continued rewards and...to think I was nearly woeful over the loss of my flat yard! Amazing!