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ONLINE MAGAZINE



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Biofertility:
Plants &
Nutrition

Wild Bird
Control:
Trying to do
the Right
Thing

Tree Spirits of
Early Cultures

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Wild Bird Control: Trying to Do the Right Thing

By Bruce F. Shank, Editor

In this era of environmental impact statements, our government attempts to protect even those creatures that few know exist at all. Millions of acres of land have been set aside to eliminate the harmful effects of man on such exotic beasts as the snail darter minnow, rare desert tortoises, and butterflies. Some animals, on the other hand, have managed quite well living amidst man and his urban world. They present a very contrary problem because their abundance and adaptability generate an economic impact on man and his businesses. We enjoy their presence under our terms. Yet, when their economic impact gets serious, the question becomes, how do we meet our role as protectors of nature, while at the same time controlling innocent, yet problematic creatures? How do you do the right thing?

Golf course superintendents, park superintendents, commercial property managers and homeowners today are frequently confronted with tough decisions regarding wild animal control. The list of species whose habitat we have invaded while building new frontiers

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Controlling Animals With Animals CONTINUED

include many birds. Geese, ducks, mudhens (coots), sea gulls, starlings, mourning doves, and ravens have been able to breed very successfully among us, too well some would believe. We have reduced their threat of predators, built habitat for them to gather, and provided a food source which diverts them from their more natural options.

In essence, we are to blame. Yet, are we now to change the way we live to repel birds that lived here before us? What can we do in a humane way to keep birds beneath the economic threshold? That is the challenge we face either during migratory periods or year-round. This story explores some of the acceptable and creative ways to let birds know when they get out of line.

Humane Management

“There is a tremendous difference between pest control and wildlife nuisance control,” emphasizes Kirk LaPierre, chief animal control officer for A-1 Saver Emergency Animal Services, Rutherford, NJ (www.goosecontrol.com). “In wildlife control, we are looking for non-lethal methods to discourage, relocate or moderate nuisance populations. That requires using a combination of techniques designed around the problem animal’s life cycle and behavior.”

The expertise required for nuisance wildlife control centers around the particular animal, its needs, and its predators. Coots don’t respond to a border collie’s stare like Canada geese do. But both need considerable space to take off. The trick is finding the discomfort point for the nuisance animal. Once that is known, the wildlife specialist can manipulate habitat, predators (real or artificial), and food supply.

Preferred habitat for many waterfowl includes open space for clear visibility and escape. Break up open spaces and birds will not be comfortable there. “Effective control boils down to pressure exerted by the birds on a particular location,” LaPierre remarks. “Control methods are least effective in areas where the birds have nested before. That’s where the pressure is the greatest. It’s important to have a plan in place before birds nest. Selection of control measures depends to a large extent upon the area, but also upon the time of year.”

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Controlling Animals With Animals CONTINUED

He warns that disrupting the nesting sites of protected bird species can cause legal problems. “Contact your state department of natural resources for regulations before implementing a bird control program,” LaPierre says. “Permits and licenses could be necessary before certain techniques are allowed.”

There are measures, that if approved, can be taken once nesting has begun. They include addling eggs, a process which kills the embryo in the egg. The addled eggs are left in the nest to stop the mother bird’s instinct to lay more eggs.

“Birds return year after year to where they grew up,” La Pierre says. “The location is imprinted in their minds. That is why relocation programs have only limited success.” Relocating geese appears to be most successful when they are moved following egg laying. The parents molt and lose their ability to fly for a period of four to six weeks. Capturing geese and moving nests must be carried out in a humane way and a suitable site for relocating the birds must be selected in advance.

Predator Pressure

Imprinted or not, birds will flee from areas where predators are abundant. The actual predator doesn’t necessarily have to be there in person. La Pierre is famous for playing tapes of coyotes howling and positioning coyote figures in areas with high bird pressure. He is nearly finished with a coyote figure that moves on tracks and moves its head and tail.

“Geese are very suspicious creatures,” he remarks. “If one thing seems wrong in the surrounding area, you’ll get their attention. If two or three things are wrong, chances are they’ll find a safer location. That’s why I always recommend a combination of different techniques.”

Geese also see in a different spectrum than humans. A product registered by a company called Flight Control (www.flightcontrol.com), when sprayed on turf, makes it look different than other turf. When geese feed on the different colored turf, they get a mild stomach ache. They associate the color of the turf with their discomfort. To humans, the turf looks completely normal.

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Controlling Animals With Animals CONTINUED

Many birds are afraid of predator birds, such as owls, hawks, and falcons. Even large birds fear for their eggs and young when these birds are in their area. They consider the presence of such birds before they nest. Migratory birds will move on when they feel unsafe.

But some migratory birds are more difficult to move, such as seagulls and coots, says Tom Stephan, whose trained falcons are for hire. Air Superiority Falconry Services in Ramona, CA specializes in predator birds. His primary markets are airports, where errant starlings and gulls can destroy jet engines and vineyards where birds cause millions of dollars of crop damage every year.

“Migratory birds are protected under an international treaty, The Migratory Bird Treaty Act,” Stephan warns. Wildlife agents, farmers, and airport managers often disagree about how some migratory birds are managed. He agrees that two or three techniques used together are more effective than any single remedy. Consequently, he uses predatory birds in conjunction with dogs.

Man’s Best Friend

Dogs play a valuable role in wild bird control. But dogs, like falcons, require direct control from a human. The standard dog for goose control is the border collie. Barbara Ligon, of Seclusival Farm and Kennels in Shipman, VA, (www.seclusival.com) has placed more than 450 collies on golf courses in the United States. “It’s about temperament and the relationship between the handler and the dog,” she says. “Dogs aren’t machines, they need feedback and training. They respond to commands and praise, plenty of it.”

Ligon is married to a veterinarian and is very conscious of her dogs’ needs—psychological, as well as physical. “Just like a K-9 police officer, a superintendent should treat his dog like a partner. You don’t send a dog out on the course without supervision.” Ligon is not a breeder. She gets the collies as 10-month-old pups and molds them into working dogs in two to three months.

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Controlling Animals With Animals CONTINUED

“We train these dogs as long as it takes to achieve the temperament and herding characteristics that are needed,” she says. “They should not bark or growl at birds, and they definitely do not bite! If they do, they aren’t placed for bird control. We provide a manual and video with each dog we ship, and we’ve shipped across the country. We encourage handlers to call us and keep us updated on their new employee and family member.” The attribute that makes border collies right for goose control is their herding instinct. They do not kill for play. They try so hard to please their owners that some actually go insane, says Ligon. “Training helps them as well as their owner,” she comments. “They are so focused on herding that they are oblivious to anything else, like golfers, cars, or maintenance equipment. Their handler must protect them. We urge superintendents to keep the dog within 200 yards of their cart, so they don’t wander off and get in trouble. They need one primary handler with whom to relate. That person should take them home and include them in their daily life.”

Stephan with Air Superiority teams up border collies, Jack Russell terriers, and Labrador retrievers to move birds. “When you have stubborn flocks of coots or seagulls, nothing moves them like our Jack packs. When they move to the water, the Labradors dive in to chase them away from shore. Collies aren’t water dogs and the birds pick up on that.” Ligon says that border collies can be trained to enter water, if needed.

“It’s amazing when you have the birds confused by the falcon overhead and the terriers and retrievers on the ground,” Stephan says. “Nature is a powerful force when concentrated on a particular species. It’s a fast form of natural selection by enlisting a number of species to work together to scare away another species.”

A trained dog can cost approximately \$5,000. One dog should be adequate for a golf course and one person needs to be responsible for it, says Ligon. If more than one dog is needed, each dog should have its own handler.

Man-Made Options

Trapping, noise makers, decoys, and habitat manipulation are also valuable tools for nuisance bird management. But no single technique is a complete solution. And, the *(continued)*



Controlling Animals With Animals **CONTINUED**

final determinant is often the golfer or park user. The use of the land can restrict the available bird control options.

That's why bird control should be considered part of a facility plan, much like Audubon International's Cooperative Sanctuary and Signature programs (www.audubonintl.org) described in the March 2000 issue of PlantHealthCare.com Online Magazine. Predators can be encouraged with overall planning and implementation. However, the organization does not want to be seen as a proponent of wild bird control.

In an world unhindered by man, nature balances itself. When we build new golf courses, which have the perfect combination of water and turf that geese and coots seek, we should consider the needed natural predators to balance their populations. It might seem like we are playing God, but in fact we are letting nature take its course.



Tree Spirits of Early Cultures

by Sir James George Frazer
(1854—1941).

Excerpted from *The Golden Bough*
(1922).

Sir James George Frazer, a Scottish classicist and anthropologist, first published The Golden Bough in 1890. Described as a monumental study in comparative folklore, magic and religion, The Golden Bough contains Sir Frazer's research into the rites and beliefs of early cultures that worshiped trees. Although the work is hardly "politically correct" by today's standards, we thought our tree-loving readers would enjoy this rare look at "tree spirits" as excerpted from The Golden Bough.

IX. The Worship of Trees

1. The Tree Spirits

IN THE RELIGIOUS history of the Aryan race in Europe, the worship of trees has played an important part. Nothing could be more natural. For at the dawn of history, Europe was covered with immense primeval forests, in which the scattered clearings must have appeared like islets in an ocean of green. Down to the first century before our era, the Hercynian forest stretched eastward from the Rhine for a distance at once vast and unknown; Germans whom Caesar questioned had traveled for two months through it without reaching the end. Four centuries later, it was visited by the Emperor Julian, and the solitude, the gloom, the silence of the forest appear to *(continued)*



Tree Spirits of Ancient Cultures CONTINUED

have made a deep impression on his sensitive nature. He declared that he knew nothing like it in the Roman empire. . .

From an examination of the Teutonic words for “temple,” Grimm has made it probable that amongst the Germans the oldest sanctuaries were natural woods. However that may be, tree-worship is well attested for all the great European families of the Aryan stock. Amongst the Celts, the oak-worship of the Druids is familiar to every one, and their old word for sanctuary seems to be identical in origin and meaning with the Latin nemus, a grove or woodland glade, which still survives in the name of Nemi. Sacred groves were common among the ancient Germans, and tree-worship is hardly extinct amongst their descendants at the present day. How serious that worship was in former times may be gathered from the ferocious penalty appointed by the old German laws for such as dared to peel the bark of a standing tree. The culprit’s navel was to be cut out and nailed to the part of the tree which he had peeled, and he was to be driven round and round the tree till all his guts were wound about its trunk. The intention of the punishment clearly was to replace the dead bark by a living substitute taken from the culprit; it was a life for a life, the life of a man for the life of a tree.

At Upsala, the old religious capital of Sweden, there was a sacred grove in which every tree was regarded as divine. The heathen Slavs worshiped trees and groves. The Lithuanians were not converted to Christianity till towards the close of the fourteenth century, and amongst them at the date of their conversion, the worship of trees was prominent. Some of them revered remarkable oaks and other great shady trees, from which they received oracular responses. Some maintained holy groves about their villages or houses, where even to break a twig would have been a sin. They thought that he who cut a bough in such a grove either died suddenly or was crippled in one of his limbs.

Proofs of the prevalence of tree-worship in ancient Greece and Italy are abundant. In the sanctuary of Aesculapius at Cos, for example, it was forbidden to cut down the cypress-trees under a penalty of a thousand drachms. But nowhere, perhaps, in the ancient world was this antique form of religion better preserved than in the heart of
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Tree Spirits of Ancient Cultures CONTINUED

the great metropolis itself. In the Forum, the busy center of Roman life, the sacred fig-tree of Romulus was worshiped down to the days of the empire, and the withering of its trunk was enough to spread consternation through the city. Again, on the slope of the Palatine Hill grew a cornel-tree which was esteemed, one of the most sacred objects in Rome. Whenever the tree appeared to a passer-by to be drooping, he set up a hue and cry which was echoed by the people in the street, and soon a crowd might be seen running helter-skelter from all sides with buckets of water, as if (says Plutarch) they were hastening to put out a fire.

Among the tribes of the Finnish-Ugrian stock in Europe, the heathen worship was performed for the most part in sacred groves, which were always enclosed with a fence. Such a grove often consisted merely of a glade or clearing with a few trees dotted about, upon which in former times the skins of the sacrificial victims were hung. The central point of the grove, at least among the tribes of the Volga, was the sacred tree, beside which everything else sank into insignificance. Before it the worshipers assembled and the priest offered his prayers, at its roots the victim was sacrificed, and its boughs sometimes served as a pulpit. No wood might be hewn and no branch broken in the grove, and women were generally forbidden to enter it.

But it is necessary to examine in some detail the notions on which the worship of trees and plants is based. To the savage, the world in general is animate, and trees and plants are no exception to the rule. He thinks that they have souls like his own, and he treats them accordingly. "They say," writes the ancient vegetarian Porphyry, "that primitive men led an unhappy life, for their superstition did not stop at animals but extended even to plants. For why should the slaughter of an ox or a sheep be a greater wrong than the felling of a fir or an oak, seeing that a soul is implanted in these trees also?"

Similarly, the Hidatsa Indians of North America believe that every natural object has its spirit, or to speak more properly, its shade. To these shades some consideration or respect is due, but not equally to all. For example, the shade of the cottonwood, the greatest tree in the valley of the Upper Missouri, is supposed to possess an

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Tree Spirits of Ancient Cultures CONTINUED

intelligence which, if properly approached, may help the Indians in certain undertakings; but the shades of shrubs and grasses are of little account. When the Missouri, swollen by a freshet in spring, carries away part of its banks and sweeps some tall tree into its current, it is said that the spirit of the tree cries, while the roots still cling to the land and until the trunk falls with a splash into the stream. Formerly the Indians considered it wrong to fell one of these giants, and when large logs were needed they made use only of trees which had fallen of themselves. Till lately some of the more credulous old men declared that many of the misfortunes of their people were caused by this modern disregard for the rights of the living cottonwood.

The Iroquois believed that each species of tree, shrub, plant, and herb had its own spirit, and to these spirits it was their custom to return thanks.

The Wanika of Eastern Africa fancy that every tree, and especially every coco-nut tree, has its spirit; “the destruction of a cocoa-nut tree is regarded as equivalent to matricide, because that tree gives them life and nourishment, as a mother does her child.” Siamese monks, believing that there are souls everywhere, and that to destroy anything whatever is forcibly to dispossess a soul, will not break a branch of a tree, “as they will not break the arm of an innocent person.” . . .

Sometimes it is only particular sorts of trees that are supposed to be tenanted by spirits. At Grbalj in Dalmatia, it is said that among great beeches, oaks, and other trees there are some that are endowed with shades or souls, and whoever fells one of them must die on the spot, or at least live an invalid for the rest of his days. If a woodman fears that a tree, which he has felled, is one of this sort, he must cut off the head of a live hen on the stump of the tree with the very same axe with which he cut down the tree. This will protect him from all harm, even if the tree be one of the animated kind.

The silk-cotton trees, which rear their enormous trunks to a stupendous height, far out-topping all the other trees of the forest, are regarded with reverence throughout West Africa, from the Senegal to the Niger, and are believed to be the abode of a god or spirit. Among the Ewespeaking peoples of the Slave Coast, the indwelling god of this giant of the forest goes by the name of Huntin. Trees in which he specially dwells—for it is not every silk-cotton tree that he thus honors—are surrounded by a

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Tree Spirits of Ancient Cultures CONTINUED

girdle of palm-leaves; and sacrifices of fowls, and occasionally of human beings, are fastened to the trunk or laid against the foot of the tree. A tree distinguished by a girdle of palm-leaves may not be cut down or injured in any way; and even silk-cotton trees which are not supposed to be animated by Huntin may not be felled unless the woodman first offers a sacrifice of fowls and palm-oil to purge himself of the proposed sacrilege. To omit the sacrifice is an offense which may be punished with death.

Among the Kangra mountains of the Punjaub, a girl used to be annually sacrificed to an old cedar-tree, the families of the village taking it in turn to supply the victim. The tree was cut down not very many years ago.

If trees are animate, they are necessarily sensitive and the cutting of them down becomes a delicate surgical operation, which must be performed with as tender a regard as possible for the feelings of the sufferers, who otherwise may turn and rend the careless or bungling operator. When an oak is being felled “it gives a kind of shriekes or groanes, that may be heard a mile off, as if it were the genius of the oake lamenting. E. Wyld, Esq., hath heard it severall times.” The Ojebways “very seldom cut down green or living trees, from the idea that it puts them to pain, and some of their medicine-men profess to have heard the wailing of the trees under the axe.” Trees that bleed and utter cries of pain or indignation when they are hacked or burned occur very often in Chinese books, even in Standard Histories.

Old peasants in some parts of Austria still believe that forest-trees are animate, and will not allow an incision to be made in the bark without special cause; they have heard from their fathers that the tree feels the cut not less than a wounded man his hurt. In felling a tree they beg its pardon. It is said that in the Upper Palatinate also old woodmen still secretly ask a fine, sound tree to forgive them before they cut it down. So in Jarkino the woodman craves pardon of the tree he fells. Before the Ilocanes of Luzon cut down trees in the virgin forest or on the mountains, they recite some verses to the following effect: “Be not uneasy, my friend, though we fell what we have been ordered to fell.” This they do in order not to draw down on themselves the hatred of the spirits who live in the trees, and who are apt to avenge themselves by
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Tree Spirits of Ancient Cultures CONTINUED

visiting with grievous sickness such as injure them wantonly. The Basoga of Central Africa think that, when a tree is cut down, the angry spirit which inhabits it may cause the death of the chief and his family. To prevent this disaster they consult a medicine-man before they fell a tree. If the man of skill gives leave to proceed, the woodman first offers a fowl and a goat to the tree; then as soon as he has given the first blow with the axe, he applies his mouth to the cut and sucks some of the sap. In this way he forms a brotherhood with the tree, just as two men become blood-brothers by sucking each other's blood. After that he can cut down his tree-brother with impunity.

Sir James George Frazer, 1854—1941, b. Glasgow, was educated at the universities of Glasgow and Cambridge. The Golden Bough was published originally in two volumes (1890); in later editions it was enlarged to 13 volumes. An abridged one-volume edition was published by the author in 1923. A new one-volume version, cut and annotated by T. H. Gaster, appeared in 1959 as The New Golden Bough. Frazer's other writings include Totemism and Exogamy (1910) and its supplement, Totemica (1937); The Belief in Immortality and the Worship of the Dead (3 vol., 1913—24); Folklore in the Old Testament (1919, abr. ed. 1923); and Anthologia Anthropologica, ed. by R. A. Downie (4 vol., 1938—39). For the complete text of The Golden Bough, visit www.bartleby.com

Biofertility: Plants & Nutrition

By Felicia Gillham, Managing Editor



Man has burned fields, shaken fertility symbols, and spread manure, all in the search for the ideal fertilizer. Thankfully, scientists have made fertility more convenient in the last millennium with their ability to synthesize the chemistry of nitrogen, phosphorus and potassium. Although the reliance on chemical N-P-K fertilizers today is very common, a new form of fertility product has emerged—biofertilizer.

In the plant world, fertility refers to the ability of soil to produce healthy plants. In general, that ability to produce is based on two important factors: one, the mineral constitution of the soil, and two, the solubility of those minerals. For soils to have the correct chemical makeup, they must contain the mineral elements nitrogen (N), phosphorus (P), potassium (K) and various micronutrients. Further, these materials must be present in the appropriate form—they must be soluble, so they can be extracted easily by plants. Typically we apply N-P-K fertilizers—a chemical approach—to ensure that our soils have the correct chemical makeup.

The chemical approach is just one fertility strategy, says Mike Kernan, Ph.D., a scientist at Plant Health Care, Inc. (PHC) of Pittsburgh, PA. (PHC is the publisher of this magazine). Another
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Biofertilizer: Low Dose, Long Term CONT'D

strategy of fertility, Kernan says, is biological and involves microbial activity in the soil. In this case, we apply to the soil a biofertilizer that contains specific microbes.

“Many microbes have the ability to increase fertility through their activities,” Kernan says. “Some microbes, bacteria in particular, can fix nitrogen from the atmosphere into nitrate or ammonia which are available to plants. In forests, most of the nitrogen that trees and other plants can access comes from microbial activity, otherwise known as biofertility. So biofertility is another type of fertility that addresses nutrition.”

A biologically fertile soil, Kernan says, has increased nutritive capability. Just as some microbes are busy fixing nitrogen, others are converting insoluble materials into soluble forms that are now available to plants. This is the case with certain bacteria that solubilize phosphorus. Microbes also improve soil structure by secreting sticky compounds that cause soil particles to aggregate into larger particles, making the soil more porous.

Fungi also play a role in increasing the fertility of soil. “There are many saprophytic fungi and bacteria that take leaf litter and other complex organic molecules and break them down into simple mineral nutrients. These nutrients are released into soluble forms to be used again (recycled) by plants. That’s important, because saprophytes allow the recycling of otherwise trapped mineral nutrition,” Kernan says. Saprophytic fungi include edible mushrooms and most non-mycorrhizal mushrooms that you see in landscapes.

Kernan says there is another aspect of biofertility—mycorrhizal fungi. These specialized fungi enter into an association, or partnership, with plants by colonizing the plants’ roots. The plant produces the complex sugars which the fungus uses for its energy needs, while the fungus extracts mineral nutrition and water from the soil for itself and for the plant. Mycorrhizae absorb and accumulate more N-P-K and calcium faster and for longer periods of time than the plant root can alone. Studies show that by doing so, mycorrhizae can increase the life of the plant root and increase the plant’s tolerance to drought, high soil temperatures, heavy metals, soil salinity, organic and inorganic toxins, extremes in soil-acidity caused by high levels of sulfur or

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Biofertilizer: Low Dose, Long Term CONT'D

aluminum, fungal and bacterial root pathogens and parasitic nematodes.

“Mycorrhizal fungi help plants to extract more mineral elements, while the fungi as well as bacteria make them soluble. The plant produces even more sugars, and everybody wins,” Kernan says.

“Modern farmers, horticulturists and arborists have typically looked at chemical fertility, and most of the fertilizer products have centered around increasing fertility chemically—putting N-P-K and micronutrients into the soil,” he says. “That’s good; it’s important. The chemical strategy has been very, very successful, but it’s also been abused. We shouldn’t be putting in so much fertilizer that it leaches into the groundwater and into streams and lakes. That clearly indicates that we’re putting on too much.”

Kernan acknowledges that most everyone wants to achieve maximum plant growth. If you apply X pounds of fertilizer, you will achieve a dramatic increase in growth. But if that amount is doubled, only a slight increase will occur. Triple the amount, and the growth increase may be smaller still. Excess fertilizer ultimately returns smaller increases in growth but large problems in groundwater pollution.

Chemical fertilizers are very successful, very promising and very useful to plants, Kernan says. “The only problem, the only bad side is that we tend to overuse them and they contribute to pollution. But there is nothing evil or notorious about them.”

Biofertilizers are not “better” than chemical fertilizers either. They are different, Kernan says, and they offer characteristics that chemical fertilizers cannot. Kernan says biofertilizers are more versatile, because they involve living organisms. For example, trees planted on roadsides are rarely fertilized. Usually there is no funding to maintain the trees after planting. Chemical fertilizers that may have been applied when the tree was put into the ground, eventually play out. “But bacteria don’t, because they are alive and can reproduce. If you use biological fertility, you supply the microbes that begin to fertilize the soil as a part of their normal activity. They will reproduce in the root zone and continue the slow, but steady and reliable process of biofertility that is so useful in the long term. You may not always produce a record

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Biofertilizer: Low Dose, Long Term CONT'D

umper crop with a biofertility approach, but you will produce nice, healthy trees and flowers without repeated human intervention.”

The differences between chemical and biological fertility, Kernan says, can be summarized with the following catch phrases. Chemical fertility: Supplies fertilizers in high dose over the short term. Biofertility: Supplies fertilizers in low dose over the long term.

Microbes are normally found in soil, but urban soils have particular problems. Kernan says, “While there are microbes in urban soils, the populations are not mature, rich and diverse.” Urban soils are remotely different from forest soils. The soils of forests are aged and matured, and their microbial complement is full and active.

“By adding specifically selected microbes, which you get in commercial biofertilizers, into urban or landscape soils, you will improve the fertility of that soil,” Kernan says. “By adding a balanced complement of these microbes into urban soils with the plants that support them, then the strategy is a winning one. We know this from experience and from studies.”

Kernan points out that the microbes cannot, initially, support themselves alone. That’s why manufacturers include organic food for the microbes within the formulation. The “food” includes vitamins, amino acids and sugars. This food supply helps the microbes acclimate to their new soil environment, but Kernan says, the microbes “very quickly” begin to depend on the root exudates supplied by plant roots to maintain them over the long term.

“Plants have evolved to use some of their sugars to produce root exudates that are nutritious and attractive. The material is exuded into the root zone specifically because it stimulates beneficial microbial activity in that area,” Kernan says.

The area surrounding the root zones of plants is known as the rhizosphere, a microbially rich environment where microbes are most plentiful because of the plants’ exudates. This rhizosphere is also fiercely defended by the microbes, which points to another potential benefit of biofertility—reduction of soil-borne diseases.

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Biofertilizer: Low Dose, Long Term CONT'D

“Imagine what would happen to the microbial populations if every root pathogen that came along could enter the rhizosphere and devastate these plant roots, several populations would suffer,” Kernan says.

Microbes employ natural defensive mechanisms to keep pathogens from doing damage to their host plants. The microbes might defensively out-compete the pathogens for food, preventing the disease agent from establishing itself in harmful numbers. Some microbes may bar the pathogen from the kitchen door by surrounding a plant root so completely that the pathogen is excluded from reaching it. Other microbes may be armed with biological antibiotics, a process called antibiosis. This mustering of defenses by microbes actually reduces the number and incidence of disease infections among plant roots. For those landscapers using biofertilizers, the defensive nature of microbes to preserve their rhizosphere environment can result in a reduced need for fungicides to control soil-borne diseases.

With all these benefits, can it be said that biofertilizers are better than chemical fertilizers? Kernan says no. “It’s not that one is superior to the other. They are just two different approaches. The chemical approach might be the best in certain situations. It is certainly the quickest in response, but that response won’t last long-term. The chemical approach is the most economical in the short-term, but it is not in the long-term. Also, the biological approach is environmentally friendly. You can be environmentally friendly with the chemical approach, but you have to be very careful about it.”

Furthermore, biofertilizers have fewer constraints than chemical fertilizers. For instance, you cannot overdose the soil with microbes. Once applied, the microbes establish a population level that the soil can support. If there are too many present, the rest die off and decompose. Also, application of too many microbes will not burn plants.

Kernan says biofertilizers are low cost in the long-run, because there is less maintenance involved. Microbes last indefinitely in a self-perpetuating system. Reapplication in natural systems only becomes necessary when new plants are
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Biofertilizer: Low Dose, Long Term CONT'D

ntroduced or the soil system becomes overwhelmed by unnatural environmental stresses, such as long-lasting drought. Pesticides can also damage populations of beneficial microbes, if not used properly. In the case of mycorrhizal fungi, once they become established, they typically survive as long as the tree or plant lives, thereby providing life-long benefits to the plants.

As a practical matter, however, following the biofertility approach alone is probably not ideal for most people, Kernan says. Although bacteria quickly set up residence in the soil and begin providing benefits fairly soon, it does take time for the entire ecosystem to adjust to a completely organic approach. If you do not have a season to devote to the transition, the combined use of chemical and biofertility is probably the most appropriate. By combining the approaches, you may:

- Reduce the amount of chemical fertilizer you normally use by one-third to a half, depending upon how fertile your soil is to begin with.
- continue to input nitrogen and phosphorus into the soil even as the chemical fertilizer is used or leaches away.
- Reduce the amount of fungicide used due to decreased incidence of soil-borne diseases.
- Reduce plant losses long-term as the soil increases in porosity and productivity.
- Simplify your maintenance schedule because the microbes provide fertility even after the chemicals are gone.
- Lower costs, through less use of chemical fertilizers and longer-term fertility provided by the microbes.

When you go to select a biofertilizer, don't become confused by the terminology. Read the product label, Kernan advises. "When I use the word 'biofertilizer,' I am talking about the products that contain living components that actually add live fertility." Biofertilizers represent a new product category, so it may take several years
(continued)



Biofertilizer: Low Dose, Long Term CONT'D

before the marketplace sorts out the terminology. Currently there are products sold as biofertilizers that do not contain bacteria or fungi. Kernan prefers to see these products referred to as biostimulants. These products include substances that are “derived” from a living organic source and contain growth-stimulating substances that plants would produce. Examples include sea kelp, which are rich in cytokinins, a growth regulator in plants. Biostimulants are the racehorses of the bio-arena by quickly stimulating growth. They are, Kernan says, good adjuncts to use in either a chemical or biological fertility program.

The classic biofertilizer, however, contains living microorganisms. When biofertilizer is used, Kernan says it is important to remember that you are not applying fertilizer. Instead, you are applying a fertility system.

“When you use a biofertilizer,” Kernan says, “you are giving your soil the means to maintain fertility rather than leaving it strictly dependent upon you and your bags of N-P-K.”

About Planthealthcare.com Online Magazine

PlantHealthCare.com Online Magazine is posted at www.planthealthcare.com for professionals who produce, design and maintain plant material in the arbor, landscape architecture/design, landscape maintenance, nursery/greenhouse, and parks and recreation industries. Published as an educational service by Plant Health Care, Inc., the PlantHealthCare.com Online Magazine is designed to engage, educate and inform professionals about new technologies that promote the health of plants, specifically those that create “sustainable” landscapes that cost less, provide more value and last longer. The magazine also seeks to open discussion about issues that impact the many businesses that serve the plant health industry.

Meet Your Editors

Bruce F. Shank Editor

Bruce Shank is owner of BioCOM, a horticultural communications company based in Palmdale, CA. He is the editor of *Irrigation Business & Technology*, managing editor of *TurfGrass Trends*, and former editor of *Landscape & Irrigation*, *Landscape Management* and *sportsTURF* magazines. He was graduated by the University of Missouri—Columbia with a degree in agricultural journalism in 1973. He is a past president of the American Society of Business Press Editors and a member of the Turf & Ornamental Communicators Association.

■ [Send an e-mail message to Bruce Shank](#)

Felicia L. Gillham Managing Editor

Felicia Gillham is owner of Gillham & Associates Marketing Communications, a San Diego, CA firm she established in 1989 to service the needs of turf and ornamental, agricultural and biotechnology companies. Articles written by Gillham on behalf of her clients have appeared in more than 100 Green Industry and farm trade publications. She is a 1980 graduate of the University of Missouri—Columbia with a degree in agricultural journalism. Gillham is a member of the Turf & Ornamental Communicators Association, American Agricultural Editor's Association and the National Association of Farm Broadcasters.

■ [Send an e-mail message to Felicia Gillham](#)

Calendar of Industry Events

December

4-7

Ohio Turfgrass Foundation Conference and Trade Show, Columbus, OH
(888) 683-3445.

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Southern California Turfgrass Council Institute, Buena Park, CA (800) 500-7282.

January

7-9

Western Nursery & Landscape Assoc. Convention, Kansas City, MO (816) 233-1481

8-11

North Carolina Turfgrass Conference, Charlotte, NC (888) 695-1333

9-11

Eastern Pennsylvania Turf Conference, King of Prussia, PA (610) 828-0253

14-16

Tennessee Nursery & Landscape Convention, Chattanooga, TN (931) 473-3951

17-19

Mid-America Horticultural Trade Show, Chicago, IL (816) 561-5323

19-20

11th Plant Health Care, Inc. Plant Biology Workshop, Frogmore, SC (843)838-7505

19-20

Oklahoma Nursery & Landscape Trade Show, Oklahoma City, OK (405) 942-5276

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Northeastern Pennsylvania Turf School, Wilkes-Barre, PA (814) 863-1368

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Golf Course Turf Day, Fisher & Son—Eastern Shore Green Industry Education Seminar, Speaker: Dr. Donald Marx, PHC, Inc., Rehoboth, DE (610) 644-3300

Calendar of Industry Events

CONTINUED

February

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Fisher & Son Southeastern Pennsylvania Green Industry Education Seminar, Speaker: Dr. Donald Marx, PHC, Inc., West Chester, PA (610)644-3300

1-2

Iowa Nursery & Landscape Convention, Des Moines, IA (816) 233-1481

8-10

South Carolina Nursery & Landscape Show, Myrtle Beach, SC (864) 592-3668

12-14

Illinois Landscape Contractors Association Winter Seminar, Lisle, IL (630) 472-2851

19

Sustainable Urban Landscape Workshop, Speaker: Dr. Donald Marx, PHC, Inc., Oklahoma City, OK (904)483-1766

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Sustainable Urban Landscape Workshop, Speaker: Dr. Donald Marx, PHC, Inc., Dallas, TX (904)483-1766

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Sustainable Urban Landscape Workshop, Speaker: Dr. Donald Marx, PHC, Inc., Austin, TX (904)483-1766

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Sustainable Urban Landscape Workshop, Speaker: Dr. Donald Marx, PHC, Inc., Houston, TX (904)483-1766

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Sustainable Urban Landscape Workshop, Speaker: Dr. Donald Marx, PHC, Inc., Lafayette, LA (904)483-1766

27-28

Western Pennsylvania Turf Conference, Monroeville, PA (724) 837-1402

Calendar of
Industry Events

CONTINUED

February, cont'd

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Connecticut Groundskeepers Association Turf & Landscape Conference, Hartford, CT
(203) 699-9912

March

23-24

12th Plant Health Care, Inc. Plant Biology Workshop, Frogmore, SC (843)838-7505

Calendar