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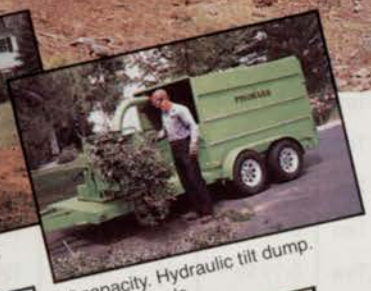

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it does so at the expense of the root system. Carbohydrates in the root system move toward the topgrowth, resulting in some slowing, and possible dieback of root growth. Once topgrowth reaches equilibrium, it starts to regenerate itself."

The aeration timetable differs according to turf type. Cool-season turf is best aerated in early sring and early fall, when the grass is growing vigorously and has ample time to recover from the aeration before dry weather or frost.

Chapman suggests aerating Northern grasses in late August through September. "If you're spreading preemergence herbicides, and doing a lot of other things to prepare the turf, you can justify aerating in early spring," assures Chapman. "However, commercial landscape, in which the grass grows from 2½ to 3 inches, is a different situation."

Carrow at Georgia suggests that commercial turf might require more attention after coring.

Warm-season turf should be aerated during the late spring and early summer.

Frequency of aeration depends on the landscape, volume of traffic and type of soil. Says Chapman. "If the turf receives moderate traffic, and you have sandy soil, once a year is suffi-

CORING AERATORS

COMPANY AND PRODUCT MODEL	TINE TYPE	TINE DIMENSIONS/WIDTH IN INCHES	PENETRATION DEPTH IN INCHES	TINE SPACING IN INCHES	TYPE OF MACHINE (TOW OR WALK)	SPEED OF OPERATION	MACHINE WIDTH IN INCHES	WEIGHT IN LBS.	SUGG. RETAIL PRICE	COMMENTS
JACOBSEN										
590	Slicing	4-6	4-6	7 Ctr	Tow	0-10 MPH	72	1240	2729.00	
590	Open	½-¾	4-6	7 Ctr	Tow	0-10 MPH	72	1240	2729.00	
590	Closed	½-¾	4-6	7 Ctr	Tow	0-10 MPH	72	1240	2729.00	
595	Slicing	4-6	4-6	7 Ctr	Tow	0-10 MPH	48	1018	1989.00	
595	Open	½-¾	4-6	7 Ctr	Tow	0-10 MPH	48	1018	1989.00	
595	Closed	½-¾	4-6	7 Ctr	Tow	0-10 MPH	48	1018	1989.00	
LESCO										
Aerator - 30	Open-closed	6 x ¾	2-4	5½ Ctr	Walk	2.5 MPH	30	254	965.00	
OLATHE										
88	Closed	7⅜ x ⅝	0-3	3 3/16-9½	Walk	3½ MPH	32.5	295	1450.00	
SALSCO										
FTA-60-24	Hollow	¼-¾	4	2¼ x 2¼	Tow	Varies	84	1200	10,838.00	Seven tine sizes are available
30-12	Hollow	¼-¾	4	2¼ x 2¾	Walk	1 MPH	30	300	5064.00	Seven tine sizes are available
30-65	Hollow	¼-¾	4	2¼ x 4½	Walk	2½ MPH	30	300	4304.00	Seven tine sizes are available
30-6	Hollow	¼-¾	2¾	4½	Walk	2½ MPH	30	300	3531.00	Seven tine sizes are available
SNAPPER CO.										
PP-5000	Open-closed	¾ OD 9/16 ID	0-2	4 x 7	Walk	17,200 FPH	16	175	1195.00	

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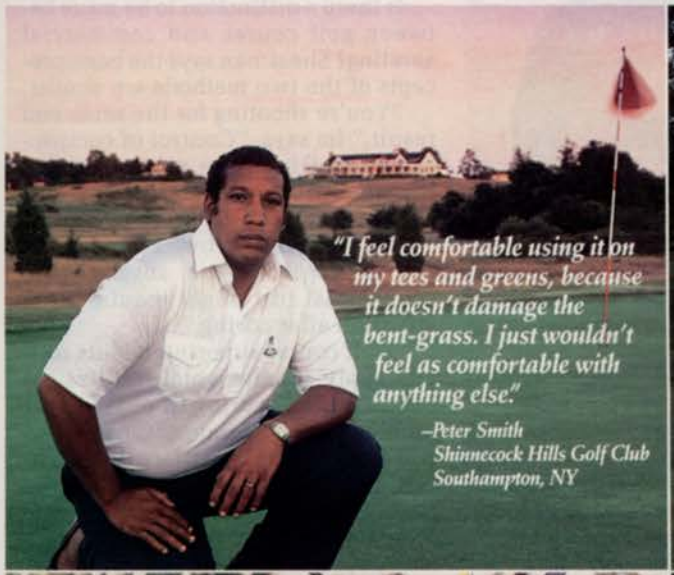

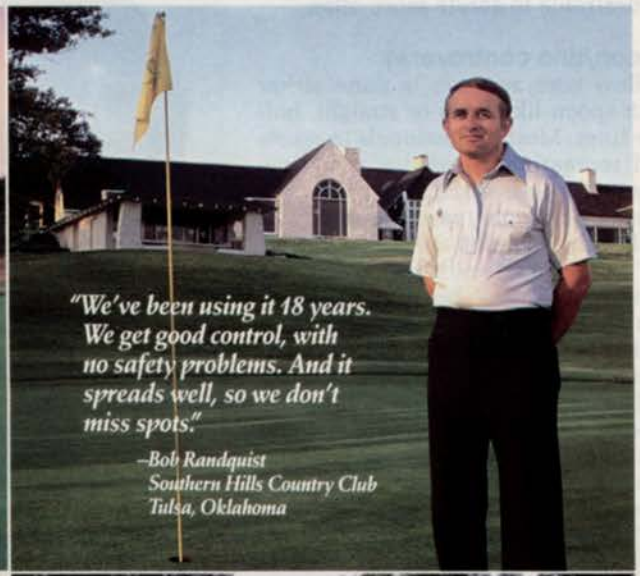

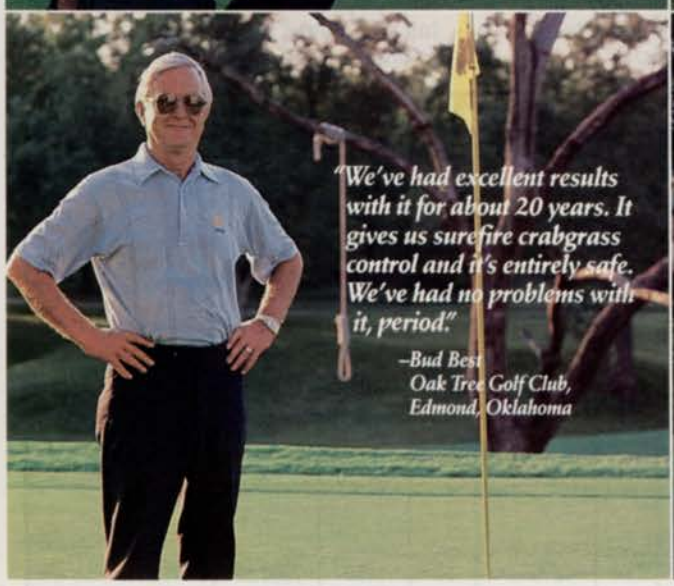

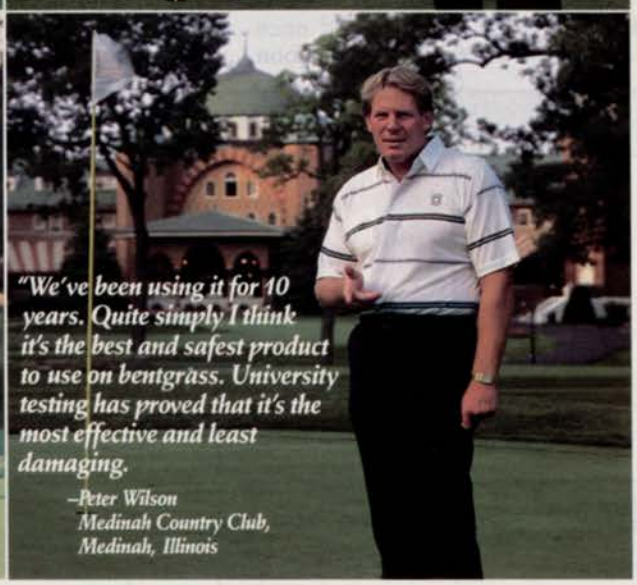

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cient. "If traffic volume is high, or if the soil is heavier than most, it might be desirable to aerate more often."

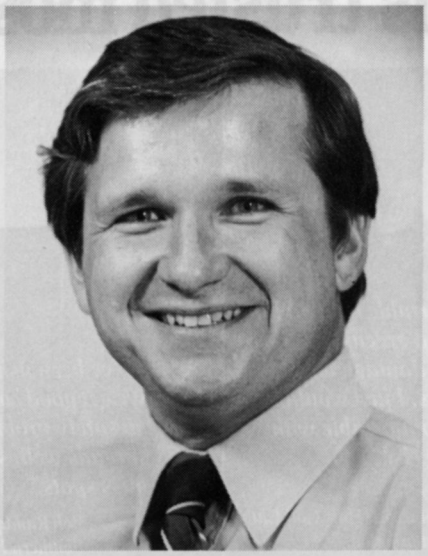
Spoon/tine controversy

Hollow core aeration is done either with spoon-like tines or straight, hollow tines. Most professionals in sports and recreational turf prefer hollow tines, citing less surface damage as the reason. Shearman says the effects of hollow tine aeration are longer lasting.

"Spooning tends to be shorter lived," he says, " because the divot can fit back into the location from which it was removed and be compacted down."

Shearman feels spoon aeration is used by those who want to spend less time and energy, as a spoon type aerator covers more ground in less time.

"We on the commercial scene prefer spoons," says Chapman. "Soil is better able to be redistributed once it's brought to the surface. The spoon removes the core, and distributes it over the turf."



Robert Carrow: His research at the University of Georgia Tends to support the belief that solid-tine coring is less effective as a turf cultivating procedure.

Is there a distinction to be made between golf course and commercial aerating? Shearman says the basic precepts of the two methods are similar.

"You're shooting for the same end result," he says. "Control of compaction and soil interface, management of thatch buildup, layering and enhanced water flow."

But Robert Carrow, Ph.D. at the University of Georgia, suggests that commercial turf might require more attention after coring.

"Golf course superintendents usually apply supplemental fertilization before or after coring in order to get rapid recovery," reminds Carrow, "so you don't see much surface deterioration. But in a lawn care situation, the routine fertilization is not sufficient to promote rapid recovery. Applying a half-pound of nitrogen right after coring will guard against excess damage in commercial situations." **LM**

CORING AERATORS

COMPANY AND PRODUCT MODEL	TINE TYPE	TINE DIMENSIONS/WIDTH IN INCHES	PENETRATION DEPTH IN INCHES	TINE SPACING IN INCHES	TYPE OF MACHINE (TOW OR WALK)	SPEED OF OPERATION	MACHINE WIDTH IN INCHES	WEIGHT IN LBS.	SUGG. RETAIL PRICE	COMMENTS
TERRACARE PRODUCTS, INC.										
Terra 320	Open-closed	½ x 3¾; ⅝ x 3¾	2¾	3½ x 4¼	Tow	3 APH	60	1450	7000.00	
Terra 200	Open-closed	½ x 3¾; ⅝ x 3¾	2¾	3½ x 4¼	Tow	1½ APH	36	1060	5000.00	
Walk-R-ide	Open-closed	¼ x 3¾; ⅝ x 3¾	2¾	3½ x 4¼	Walk or Ride	¾ APH	18	600	3000.00	
Terra 98	Open-closed	½ x 3¾; ⅝ x 3¾	2¾	3½ x 4¼	Tow	1 APH	22	500	2000.00	
TORO CO.										
Fairway aerator	Hollow	¾ x ⅞	3-5	5.3 x 6; 3½ x 3	Tow	2.2 MPH	63	2600	19,400.00	New for Spring 1989
Greens Aerator	Hollow	⅜-¾	0-3	2¼ x 2½	Walk	1.1 MPH	27	1275	9325.00	
686	Open, closed, slice	½ x 4	N/A	6 x 6	Tow	0-10 MPH	78	1420	3400.00	
687	Open, closed, slice	½ x 4	N/A	6 x 6	3 Pt Tow	0-10 MPH	78	1290	2634.00	
96	Open, closed, slice	½ x 4	N/A	6 x 6	3 Pt. Tow	0-10 MPH	42	600	1620.00	

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PEOPLE ARE OFTEN A TREE'S WORST ENEMY

More urban trees are being killed today by the activities of people than are lost due to all the diseases and insects problems combined.

by Terry A. Tattar, Ph.D, Shade Tree Laboratory, University of Massachusetts, Amherst

Trees along our streets, in our parks and near our homes improve the quality of life in our cities and towns. And though all trees are threatened with pathogens, insects and stresses from the extremes of the environment, these urban trees face a much more formidable enemy, abuse by *people*.

It is ironic that urban trees provide so much enjoyment for people who in turn are often responsible for acts that result in tree death. The activities of people that stress, injure and often kill trees are known collectively as "people-pressure diseases," or PPDs.

The urban environment however, is not the only area where PPDs are found. Greater demands on campgrounds and forest recreation areas has resulted in PPDs being found there as well.

The most common forms of PPDs are caused by construction, soil abuse, lawn and garden equipment and improper tree care.

Recognition of the most frequent examples of PPDs will enable us to become aware of the PPD problem and be more effective in its control.

Supports should not be left on the tree for more than one growing season.

Building and road construction are by far the most frequent causes of injury to trees by people. Trees are injured by earth-moving equipment and by changes in ground level.

To protect these trees, barriers must be erected to protect the root system from being disturbed by construction.

In the past, efforts to protect the trunk from injury were mistakenly thought to be adequate to preserve trees. Small wooden "cages" were erected by contractors around large shade trees. The efforts failed because trees' roots extend far beyond the edge of the branches. These trees often died from extensive root injury and soil disturbance after construction was completed. It is important to remember that the roots of a tree extend far beyond the drip line. Roots can often be found at a distance from the trunk that exceeds twice the height of the tree.

Efforts must be made to protect as much of the soil area as possible from any disturbance by construction equipment. Identify trees scheduled to be preserved on construction sites before construction begins and then protect them from root injury and ground level change until all construction is completed.

Trenching, surface grading and storage of construction fill can all result in tree death.

The loss of either large or small roots places the tree in a state of imbalance and stress. The affected tree slows its growth and often begins to "dieback" in the branches of the crown. The tree in this state is often susceptible to attack by weak pathogens and secondary insects that wouldn't have been able to attack it when it was healthy and vigorous.

Loss of large supporting roots can also make a tree a potential hazard from falling. Root-injured trees should be examined by a professional arborist and removed if hazardous.

Construction-damaged trees often decline progressively in the years after construction, leaving property owners confused as to the cause of the tree's poor health. Ground-level changes can cause cut roots if the level is lowered or smothering from fill if it is raised.

The addition of asphalt, concrete, or more than a few inches of soil will change the amount of water and oxygen available to the roots below. If gas exchange is inhibited between the air and the roots, smothering will occur. Carbon dioxide from root respiration builds up, oxygen decreases, and eventually the roots die of suffocation.

Fill-damaged trees, like root-injured trees, grow more slowly and often die back in the crown within a few years after construction is completed. Secondary pathogens and insects are also a threat as decline progresses.

Too little, too late

It is possible to regain balance in some root injured trees by crown reduction pruning in the early stages of decline. It is also possible to remove fill from

over the roots soon after it has been added to prevent suffocation. However, these efforts usually come too late, and the total amount of injury sustained during construction is often fatal to the trees.

It is recommended, therefore, that tree protection, through the use of barriers to all construction activities around trees, be the main strategy to prevent construction damage to trees.

Tree wells with an aeration system over the roots can be helpful in saving them where a raise of grade is necessary. Too often the well is simply constructed around the trunk and most of the root system is covered with suffocating fill, often several feet thick. An aeration system is the key to preserving trees where the grade is raised (see related story). A properly constructed tree well can allow sufficient air to reach the roots to permit the tree to live and grow normally after construction. Many trees in such wells have been growing for more than 40 years.

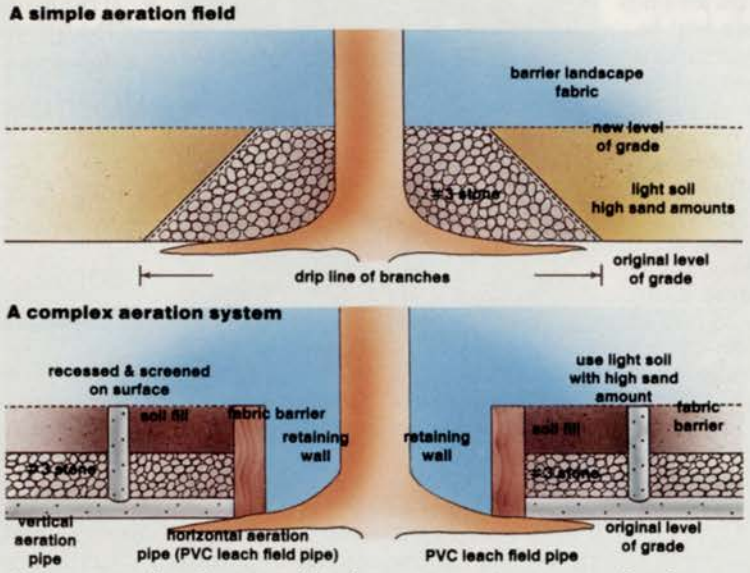
Proper soil conditions are critical to the health of all trees. Chemical and physical changes in soils as a result of peoples' activities are termed "soil abuse."

Chemical injury from deicing salts, herbicides and improper use of agricultural chemicals are common forms of soil abuse.

Deicing salts, now in use on highways and walks in many parts of the country, contain sodium and/or calcium chloride, both of which are toxic to trees.

Small trees and shrubs that are exposed to salt-laden spray from traffic should be screened with burlap or other appropriate materials. Also, channel salt in water runoff away from the roots of trees and use salt-tolerant species in areas where exposure to salt is unavoidable.

AERATION ENSURES URBAN TREE SUCCESS



Anyone who has walked through a forest has felt the soft organic layers of soil, covered with natural mulch from rotted leaves, beneath their feet. This soil, full of holes between organic matter and soil particles, is ideal for tree root growth.

Urban soil however, has often been disturbed so much from construction and other human activities that it is as hard as concrete.

Soil compaction in the urban environment is one of most important sources of soil abuse. The urban tree professional needs to understand the most common forms of soil abuse and the means to restore urban soils around trees to a "forest-like condition."

Alleviating compaction

Compacted soil contains little air and roots are often unable to penetrate it. Urban trees often become confined to small areas of soil that provide insufficient nutrients and moisture to sustain them. Low air conditions also cause root suffocation.

Trees suffering stress from soil compaction grow slowly, appear in poor vigor and often begin to decline a few years after planting. Soil compaction can be avoided by channeling heavy foot or vehicular traffic to specific paths and by adding cushioning mulches over the roots of trees.

Barriers to traffic, such as walls, curbs, benches, shrubbery and fences are effective in keeping people and vehicles away from trees and can be an attractive addition to the landscape as well.

Compacted soil needs to be aerated by making a series of holes in the soil in a grid around the trees. Aeration can be performed while applying dry fertilizer via soil drill or liquid soil injection. Aeration can also be performed by using a liquid soil injection using only water, or simply by drilling holes, if fertilization is not desired.

Aerated soil, however, will only be a temporary solution if foot and vehicular traffic are again allowed to compact the soil.

—Terry Tattar

Pesticides and fertilizers can be beneficial or injurious to trees, depending on if they are used properly or improperly. A commom misconception is "if a little is good, a lot more will be better." Proper use of these chemicals includes strictly following label recommendations.

Weed-and-feed mixtures, in which herbicides are mixed with turf fertilizers, should be avoided around trees since the herbicide may be absorbed by the tree's roots in toxic amounts.

All herbicides should be considered potentially injurious to trees.

If a spill occurs, identify the herbicide and try to pick as much of it up as possible. This may mean the removal of contaminated soil or detoxification of the soil using activated charcoal.

It is best not to water the herbicide-injured tree until as much herbicide as possible is removed. Even then, water only after the exact nature of the herbicide is known.

Some industrial strength non-specific herbicides are extremely toxic to trees and are quite persistent. Watering in these cases could spread the still-active herbicide, increasing the injury and possibly endangering nearby trees as well.

Carelessly used lawnmowers, string trimmers, snowplows, rototillers and other mechanized lawn and garden equipment are often involved when serious tree root and trunk injuries occur. Lawn and garden crews and homeowners need

to learn how to avoid injuring trees when using this equipment.

By removing sod near trunks and exposed tree roots, the need to mow or trim near trees is eliminated. Adding organic or inorganic mulches around the trunk and buttress roots will inhibit weeds, improve soil moisture retention and remove the need to drive equipment near the trunk and over exposed roots. Bright-colored guideposts along driveways will help keep snowplows and motorists on course and away from trees and shrubs.

Rototilling should not be allowed near trees because many tree roots, which grow in the top few inches of soil, will be cut.

If plantings are desired under trees, select only perennials and place them in a mulched area around the tree. Annuals that require yearly soil disturbances around the tree should be sited as far as possible away.

Improper tree care

Trees greatly benefit from proper care but can be severely damaged or killed by well-meaning but misdirected attention. Improper pruning and wound treatment, guy wire injury, petroleum jelly injury and suffocation from plastic wrap are some common examples of improper tree care.

Proper pruning helps trees by removing diseased, dying, dead and defective branches. A proper pruning cut is made by severing a branch as close as possible to the outside of the branch bark ridge.

The "wooden cage" fails because it doesn't adequately protect tree roots.

Avoid injuring or removing the branch collar during the pruning cut. Trunk and root wounds should be trimmed of loose, ripped and torn bark. Any wood splinters must also be trimmed and smoothed to facilitate wound closure. The wound should be shaped to remove minimal live bark and also to avoid creating pointed edges.

It is, therefore, not necessary to achieve an oval shaped wound. A thin coat of tree paint may be applied over the surface of a pruning cut or wound surface for cosmetic purposes. Guy wires, cords to secure wraps or anything restricting the growth of the tree will eventually strangle it if they are not removed. Many valuable shade trees are killed each year because those who planted trees neglected to return and remove guy wires when they were no longer needed.

Trunk supports should not be left on the tree for more than one growing season. Hemp cords used to secure trunk wrap or planting ball wrap do not biodegrade fast enough to avoid trunk or trunk collar strangulation. Tree wrap should be secured with string or masking tape and removed after the first growing season.

Building and road construction are the most frequent causes of injury to trees by people.

Cords around planting balls should be removed at planting and never left around a tree after it has been planted.

Inspect all newly-planted trees on a regular basis to eliminate problems. Planting wrap on a balled and burlapped tree may be left in place after planting a tree if it is made of biodegradable material, such as burlap. Recently, woven plastic or plastic sheeting has often been used for wrapping balled and burlapped trees. These materials will not break down and will prevent outward movement of plant roots, suffocating the balled tree.

Always remove the cords that tie the ball around the trunk and roll back the wrap from around the trunk. You may leave burlap wraps around the planting ball, but remove **all** plastic containing wraps from trees when planting.

Avoiding bark injury

During a recent insect epidemic, many homeowners applied petroleum jelly directly to tree trunks to trap leaf-eating caterpillars, in hopes of protecting their trees without spraying. Petroleum jelly, like many petroleum products, injures tree bark, and many trees were killed by these homeowners. In fact, most insect-defoliated trees survived while the petroleum jelly-treated trees did not.

Avoid placing any chemicals on tree bark. It is living tissue and will be killed by oil-based paint, grease and oil—as well as petroleum jelly.

PPDs are created by ignorance and lack of concern. By teaching people how they can avoid injuring trees, all PPDs can be prevented. **LM**

Salt-tolerant and salt-intolerant shade trees

SALT-TOLERANT SPECIES		SALT-INTOLERANT SPECIES	
Austrian Pine	Norway Maple	American Elm	Linden
Birches	Ponderosa Pine	Balsam Fir	Red Maple
Black Cherry	Poplars	Basswood	Red Pine
Black Locust	Quaking Aspen	Black Walnut	Shagbark Hickory
Bur Oak	Red Cedar	Hackberry	Speckled Alder
Honey Locust	Red Oak	Hemlock	Sugar Maple
Japanese Black Pine	White Oak	Ironwood	White Pine
Larches	White Spruce		
	Yews		

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LOW INPUT LANDSCAPING

Lawn grasses are one of the hardiest plant systems known. So why not let them take care of themselves?

by W.M. Mitchell, P.h.D. University of Delaware

The principles of LIL include heavily aerifying the lawn, topdressing it with ½-inch of municipal composte and vertiseeding it.

As landscapers, you've been told from every quarter that lawn grasses and flowers get hungry and must be fed on a regular basis. There are the weekly columns in which you are urged to be on the look out for the weed, bug, or microbe that's about to strangle or suck the life out of your grass or flowers. And, of course, there is a fertilizer, insecticide, herbicide or fungicide to beam at each of these pests or conditions.

Could garden experts all be wrong? Have they missed some startling breakthrough in "green thumbery"?

Probably not. It's just that so-called "proven-practices" don't stay proven. From time to time, current practices are challenged and new insights bring different solutions to old problems.

The theory of less

Lawns and flower beds worthy of bragging rights can be had with far less chemicals (fertilizers and pesticides used so extensively on home grounds) than are normally used.

Some practices that have been followed for a number of years simply are not acceptable for the long run. A kind of internal review is under way in the agriculture community, and buzzwords such as "sustainable agriculture," "integrated pest management" and "low input farming" are being thrown about.

A major thrust of this review is to maintain or improve farm profitability while reducing the use of chemical fertilizers and pesticides. It is anticipated that these programs will also help to improve the quality of surface and groundwater supplies.

Isn't it time to launch similar Low Input Landscaping (LIL) programs aimed at lawns, flowerbeds, shrubbery, and recreational areas? The principles of LIL can easily be applied to home lawns.

A primary reason that low input lawn and garden programs can be successful is tied to stress. Although it may seem an oversimplification, the key to successful lawn care is removal of stresses that normally zero in on lawn grasses.

Research and experience confirm that acid soil, soil compaction and shade are examples of common plant stresses. Though plants may survive these stresses, the introduction of an additional stress—such as a fungus, weed or an insect—may be more than the plant can handle.

Stresses become additive. In a low input plant management system, emphasis is placed on eliminating stresses by using methods that don't call for chemical treatment. For example, thatch and soil compaction can be eliminated by aerification and top dressing. If a tree's shade is responsible for a fungus, its bottom branches can be removed, it can be cut down or red fescue could be planted—instead of or before applying fungicides.

So what is LIL?

In essence, an LIL system provides an optimum environment for plants. Plants respond with vigorous growth. And, under these relatively stress-free conditions, pressures from disease organisms, insects and weeds are more easily thrown off.

Examples of stress-producing practices that should be avoided in LIL lawns include:

- Growing Kentucky bluegrass on fully exposed lawns that face south in the transition zone. Switch to tall fescue blends that have greater heat-moisture tolerance than bluegrass;
- Using excessive nitrogen, which contributes to thatch build-up, shrinks root systems, reduces plant food reserves and decreases vulnerability to some diseases;
- Using Kentucky bluegrass, low cutting heights and excessive nitrogen under shade conditions;
- Mowing Kentucky bluegrass and fescue lawns at less than 1½ inches, shortening the root system, reducing stand density, and encouraging encroachment by crabgrass and annual bluegrass. Avoid stress by raising the cutting height to two inches, or higher; and
- Allowing soil acidity to increase,